Island State

An ecological footprint analysis of the Isle of Wight

Best Foot Forward

Imperial College of Science, Technology and Medicine

with support from

ISLE of WIGHT COUNCIL

Biffaward investing in the environment

Programme on Sustainable Resource Use

Biffaward Programme on Sustainable Resource Use

Objectives

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

Background

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

- Information is not adequate in terms of quality and quantity
- The UK Government is finding it very difficult to meet even relatively unchallenging targets of waste reduction and resource recycling
- Businesses are faced with increasing costs of waste disposal.

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

- The Environment Agency
- The Department of Environment, Transport and The Regions
- The Office for National Statistics

This entails:

- Careful co-ordination of the projects
- Information sharing and mutual awareness between projects

In addition to the projects having their own means of dissemination to their own constituencies, their data and information will be gathered together in a common format to facilitate policy making at corporate, regional and national levels. For a current project listing see page 51.

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If you would like to know more about ecological footprint analysis, there is an email discussion group moderated by Best Foot Forward on the subject. To subscribe, send a blank email to ecofootprints-subscribe@egroups.com.

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Executive Summary

The Island State project was carried out by Best Foot Forward, the Environmental Policy and Management Group of the TH Huxley School at Imperial College, and the Isle of Wight Council.

The project explores a methodology for measurement of natural resources usage and links this with environmental aspects of sustainability. The Isle of Wight was chosen as the geographic area of study. Firstly, data was collected and analysed to determine the Island's consumption of energy and materials. The throughput of these was examined to understand the volume and nature of the material and energy flows and waste arisings.

Secondly, using this consumption data and other relevant data sets, an Ecological Footprint Analysis of the Isle of Wight was conducted to demonstrate the pressures that the island's population places on the local and global environment thereby providing a measure of ecological sustainability.

Finally, scenarios were proposed for reducing the Ecological Footprint of the Island, whilst maintaining or enhancing the quality of life for visitors and residents.

The main results of the project were:

- The Isle of Wight population 'consumed' 753,368 tonnes of materials in 1998/99. This represents 5.8 tonnes per capita. The largest single category of materials consumed was bulk stone, aggregates etc (368,838 tonnes or nearly 3 tonnes per capita of which about two-thirds was imported).
- The majority (around 3.5 tonnes per capita) of these consumed materials were retained in the economy, primarily as buildings. Around 1 tonne per capita was disposed of as solid waste. The rest were:
- Transformed into air emissions
- Disposed of as liquid waste
- 33,337 tonnes (250 kg per capita) of domestic waste was sent to landfill. 43% of domestic waste is diverted from landfill by recycling, composting and incineration for energy recovery. This is significantly higher than the national average diversion rate of 18%.
- 108,951 tonnes (838 kg per capita) of commercial waste was collected, of which 97% went to landfill, either for landfill cover and restoration (66,403 tonnes – 61%) or disposal (39,074 tonnes – 36%). There is little data available on sectoral commercial waste arisings.
- The per capita Ecological Footprint of the Isle of Wight for 1998/99 was 5.15 hectares. Of this, 0.68 hectares is attributable to the tourist population and 4.47 hectares to Island residents.
- This is greater than the global average Ecological Footprint for 1998/99 of around 2.28 hectares per capita.
- It is also greater than the global average 'earthshare' of available bioproductive land for 1998/99 of around 1.87 hectares per capita, which includes 12% of available land allocated to biodiversity.
- If everyone lived like the population on the Isle of Wight, we would need nearly 2½ planets.
- If the Isle of Wight was to be self sufficient or bio-regionally sustainable whilst maintaining current lifestyles and technologies, the Island would need to be about 2¼ times its actual size, or the population would need to reduce consumption by 56%
- A combination of currently feasible local food production, waste recovery and waste minimisation initiatives, renewable energy generation and energy efficiency measures could reduce the Island's per capita Ecological Footprint by up to 0.47 hectares per capita, i.e. by over 10% of the resident population's Footprint.

Table of Contents

Note: The aggregated nature of much of the data presented in this report means that some of the numbers presented in the Figures and Tables do not add up due to rounding errors.

Introduction

The environmental imperative

There is evidence to suggest that the rate at which industrial societies consume resources is unsustainable. If we are to achieve sustainable development then we need to gain 'more from less', creating more goods and services and more 'value' from less resources.

> Although energy consumption patterns are relatively well documented far less attention has been paid to our consumption of both finite and renewable materials and the subsequent waste which is produced.

Work by Friends of the Earth has estimated that a reduction of 50% of the amount of materials we use and 80% in the amount of energy we use is required for sustainability (McLaren, Bullock, and Yousuf 1999).

Although energy consumption patterns are relatively well documented (for example, see IPCC 1996), far less attention has been paid to our consumption of both finite (such as minerals) and renewable (such as timber and fibre) materials and the subsequent waste which is produced when these are discarded. Despite efforts to improve domestic and industrial recycling rates and promote waste minimisation, the amount of waste being produced in the UK is still rising. In many parts of the country the relevant agencies and authorities are only just getting to grips with reliable measures of materials use and waste generation. In most cases they are still a long way off being able to make any quantifiable link between the two.

For sustainable development to be given substance and made more tangible for the public, policymakers, and businesses, meaningful measures of the materials efficiency of our society need to be developed.

Project goals

This project explores the measurement of natural resources usage over a single year and makes the link with environmental aspects of sustainability. The Isle of Wight was chosen as the geographic area of study. Firstly, data was collected and analysed to determine the island's consumption of energy and materials. The throughput of these was also examined to understand the volume and nature of the waste arisings (see page 5). Secondly, using this consumption data and other relevant data sets, an Ecological Footprint Analysis of the Isle of Wight was conducted to demonstrate the pressures that the island's population places on the local and global environment, thereby providing a measure of ecological sustainability (see pages 19 and 34).

Project partners

The project was a collaboration between Best Foot Forward (BFF), the Environmental Policy and Management Group (EPMG) of the TH Huxley School at Imperial College, and the Isle of Wight Council. The project was funded by landfill tax credits through Biffaward.

BFF were responsible for sourcing and analysing the consumption data, tracing the material flows through the island and conducting the Ecological Footprint Analysis. The Isle of Wight Council were responsible for a significant part of the primary data collection regarding on-island consumption. Together these analyses form the first part of this report.

EPMG were responsible for constructing the scenarios which make up the latter part of this report (page 37 onwards). These take as a starting point the findings as set out in the Ecological Footprint Analysis.

Isle of Wight

The Isle of Wight is an island off the south coast of the UK. It is home to a population of 125,896. The main industry on the Island is tourism with the summer population rising to over 200,000. There is some manufacturing on the Island employing 16% of the workforce, but most are engaged in the tourism sector leading to a predominantly service-based economy.

There is also a large retired population which is increased from that of south eastern England (Figure 1). 54% of households are classified as economically active. Of the remainder, 34% are classified as retired.

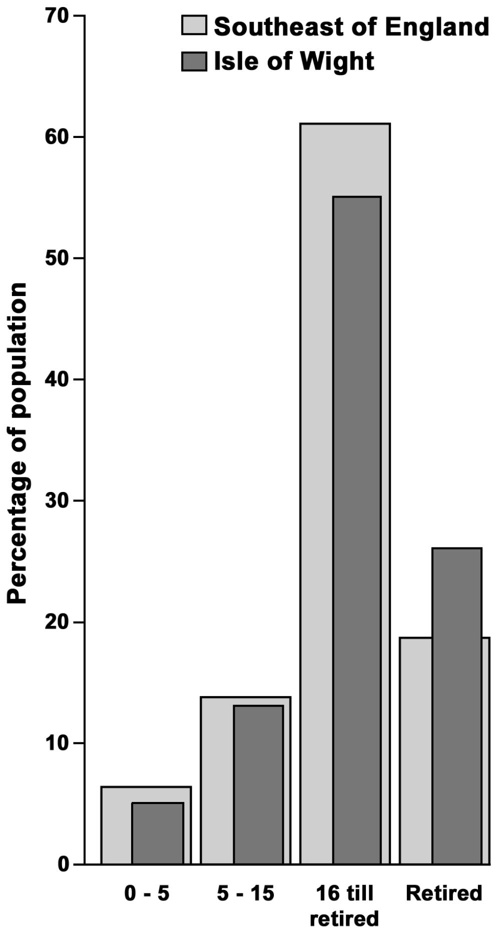


Figure 1: The population profiles of the Isle of Wight and South Eastern England.

The Isle of Wight was perceived to be an ideal study area for the following reasons:

- Being an island, it is geographically well defined.
- With no road access, data on energy, water and material flows through the island was predicted to be more readily available.
- The island has a single waste disposal contractor, which has made data collection easier.
- Its proximity to the mainland and political set up make it a representative sample of the UK population.
- IoW's population of 126,000 is of a significant, but manageable, size for an analysis of this type.
- The Isle of Wight Council and local organisations were eager to support the project as part of their commitment to Local Agenda 21.
- Although small, the island is largely self-supporting in infrastructure and administrative terms. It has its own unitary authority, its own schools, hospital, a range of retail outlets, its own waste collection and disposal services, island bus services and so on.

Although data collection was certainly not easy, the above features did help to make the project boundaries more explicit.

A Summary of the Research Process

The following paragraphs briefly describe the main project stages. Phases 1 to 4, those undertaken by Best Foot Forward, in collaboration with the Isle of Wight Council, form Part 1 of this report. The improvement scenarios, developed by Imperial College from the results of Phase 4, constitute the second part of this report (page 37 onwards).

Phase One – Data Collection

Any studies which seek to capture energy and material flows through an economy are, by definition, highly data intensive. As anticipated, sourcing, collating and aggregating data proved to be the most time consuming phase of the project. This first phase involved contacting potential data providers, defining data specifications and setting up mechanisms for data handling. Over 200 organisations were contacted and around one dozen face to face interviews were held with key data providers (see page 54).

National data were also sourced, both to assist in the validation of local data and to provide proxy measures where local data were not available. Most of the data collected was for the financial year 1998-99.

Phase Two – Resource Flow Analysis

The data collected in Phase One was used to conduct a resource flow analysis of the Island. This involved aggregating and disaggregating the data in such a way as to describe the flow of inputs (energy and materials) onto the island, the materials remaining in the economy as 'stock' and the subsequent outputs (waste and atmospheric emissions). Such an analysis provides an insight into the flow of resources between the island and outside world and enables net consumption to be calculated.

For ease of understanding, and to facilitate later scenario development and policy planning, the resource flows were mapped into the following categories; direct energy, materials and waste, passenger transport, freight transport, water consumption and land use.

Phase Three – Ecological Footprint Analysis

Subsequent to the resource flow analysis, an Ecological Footprint Analysis (EFA) of the Isle of Wight was conducted using the EcoIndex™ methodology[1]. EFA can enhance a resource flow analysis by permitting the aggregation and/or comparison of different environmental impacts, using the common 'currency' of bioproductive land and sea. This simplifies the communication of key findings. The use of world average bioproductive area as a measure also facilitates certain types of environmental sustainability assessment.

The EcoIndex™ methodology is a specific application of the Ecological Footprinting concept, which builds upon an activity, or component approach. It involves collecting data about a range of activities such as material consumption and transportation and converting the impacts of these activities into a land area required to supply the end use services. This land 'requirement' can be monitored over time to determine increase or reduction of impact, can be compared with actual land available to a community, or can be normalised to a per capita basis and compared with global land availability to estimate environmental 'sustainability'.

As with the resource flow analysis, the categories used are direct energy, materials and waste, passenger transport, freight transport, water consumption and land use. This enables environmentally significant activities and potential consumption minimisation strategies to be easily identified. In addition, a number of themes have been developed during the analysis and are presented in the report.

Phase Four – Ecological Sustainability Assessment

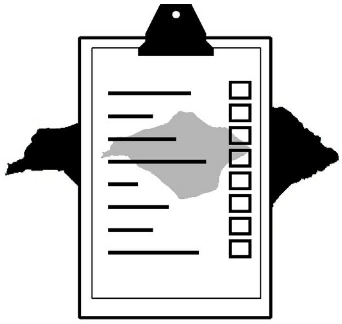
As noted earlier, one benefit of the EFA methodology is that it permits an assessment of environmental sustainability. By comparing the resource demands of the Island's population with the available supply – both locally and globally – it is possible to answer two questions:

1. Whether, or not, the Island's population are consuming more than could be supplied locally.
2. Whether, or not, the Island's population are using more than their global average 'earthshare' of resources.

Phase Five – Improvement Scenarios

Based on the results of Phases 1 to 4, Phase 5 presents scenarios for environmental improvements. Full details can be found in the second part of this report commencing on page 37.

[1] The EcoIndex™ Methodology was developed by Best Foot Forward. For further information see www.bestfootforward.com.



Data Collection

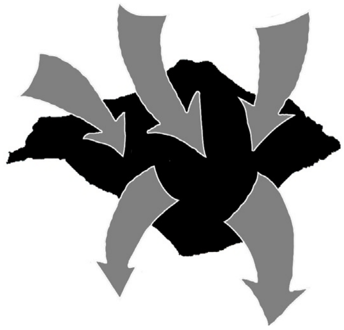
Data were collected by both the Isle of Wight Council and Best Foot Forward. Information was requested from over 200 companies, organisations and individuals both by letter and interview.

Key sources were:

- 'Import' and 'export' data from the harbour records (Cowes and Newport Harbours)
- Island won and consumed aggregate data (Isle of Wight Council)
- Sales data from goods and service providers (i.e. one major supermarket , distributors and so on)
- Resource consumption data from national and regional statistical records (e.g. the Office of National Statistics)
- Waste data (e.g. from Island Waste Services)
- Best Foot Forward's EcoIndex™ database – a 10,000 point catalogue of environmental resource data.

Data quality and availability varied widely. Where possible, a number of sources were used to cross-validate data. For example, the tonnages of retail goods being transported onto the Island by ferry was used to validate market share estimates of the sales collected from retailers.

In some cases data were simply not available. This in itself is illuminating, highlighting shortfalls in public collection or availability of important environmental data. Where data were unavailable, a variety of proxy estimates were used. These have been highlighted as appropriate. For example retail sales information was not forthcoming from all retailers. Retail consumption was therefore derived by using raw data and estimates of retailer market share. Similarly, local car mileage data was combined with national estimates of car occupancy to derive passenger transport figures.



Resource Flow Analysis

Measuring and tracking resource flows is a useful means of understanding human and economic reliance on natural resources.

Natural resources, along with human energy and ingenuity, provide many of the products and services that improve our quality of life and create economic value.

> "Mass Balance Analysis is a key route to determining a more objective and balanced strategy for the reduction of environmental impacts at a time when existing financial measurement systems fail to accommodate long-term environmental costs."
> Biffa (1997)

By identifying where materials and energy are consumed and by relating that consumption to products and services provided, it is possible to:

- identify the ‘resource intensity’ of a range of activities;
- identify ‘big hitters’ in terms of resource consumption; and
- identify likely areas for improvement.

Inputs to the system include energy and natural resources while the outputs consist of waste materials and emissions.

Related to this is the ‘mass balance’ approach. In keeping with law of conservation of matter, the mass balance approach helps us to track the flow of resources – what goes in must come out in some form or another – either as products, services or as waste. The final amount of wastes and emissions is ultimately determined by the magnitude of inputs, although ‘storage’ of materials in stocks needs to be taken into account. Focussing on these inputs may be more illuminating when attempting to identify sustainable ways forward.

Many writers have highlighted the importance of closed loop systems where waste is minimised, reclaimed or reused and where the waste from one process is used as the raw materials for another. Hawken, Lovins and Lovins, (1999) for example, forcefully argue for ‘radical resource productivity’ as both a prudent investment and a critical need in the coming decades. Alongside this they recommend nothing less than the elimination of the very idea of waste through the redesign of industrial processes and materials.

Buitenkamp and Spapens (1999) convey a similar message but tend to emphasise the need to account full life cycle impacts across the entire economy. While it is certainly desirable to increase the efficiency of production, the aim should be to increase the efficiency over the whole chain. For example, even large savings in the production process may be dwarfed by effects at the consumer use stage or the disposal of the product.

Although more production processes are starting to look at closed loop systems, the need now is to close the loop throughout the economy. Figure 2 displays the two contrasting models. On the top the traditional ‘take, make and throw away’ model of resource flows. On the bottom the ‘closed loop’ resource economy.

The next sections present material and energy flows for the Isle of Wight by category:

- Materials and waste – the consumption of foodstuffs, minerals, timber and other raw materials as well as the production of solid and gaseous wastes.

- Direct energy use – electricity, gas, coal and other energy sources
- Passenger transport – covers personal car, bus, train, air and ferry travel
- Freight transport – covers the transportation of goods and solid waste.
- Water – summarises the consumption of water
- Land use – the land quality and designation within the island

All material and energy flows are expressed in terms of inputs into, and outputs from, the Isle of Wight economy. The economic boundaries are not always consistent with the geographical boundaries of the Island. Waste, for example, is clearly an output of the economy yet it does not all leave the Island.

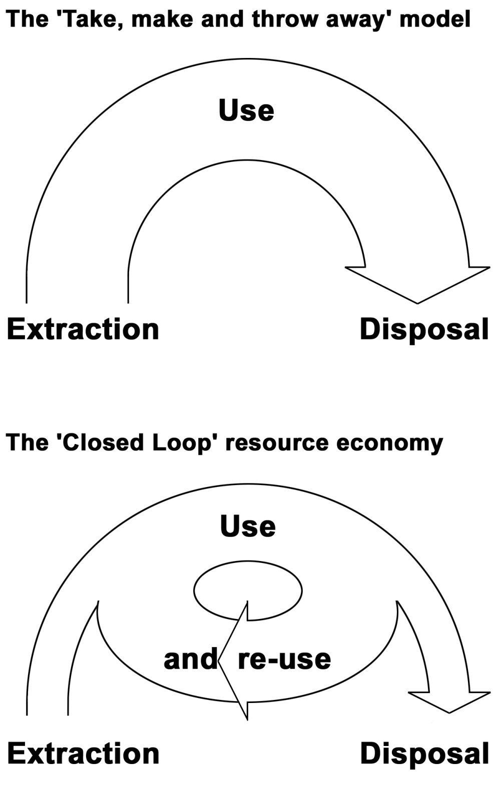


Figure 2: Two models of resource flows through an economy.

Another example of where economic and geographical boundaries separate is that of passenger transport. This relates especially to car and air travel undertaken by Island residents, which may occur anywhere. The general rule applied to ensure consistency is to include, where possible, any personal consumption of Island residents (including off-island consumption, such as car travel) plus all resources consumed on-island whether personal, commercial or industrial. Clearly the issue of on-island consumption by tourists is likely to be significant to the Isle of Wight economy and some attempts have been made in later analyses to tease out the likely impact of visitors.

Descriptions of individual resource inputs and outputs are now presented.

Materials and Waste

Materials and waste are grouped together in the same section as they are essentially the two sides of the same coin. Waste is merely an output material which is perceived to have little value. Looking at material inputs and waste outputs together is also helpful in highlighting where there may be data anomalies, omissions or double counting. It also highlights materials residing in the economy as 'stock'.

Inputs

Overview

Most of the materials consumed within the Isle of Wight are imported from the mainland. Bulk goods arrive by ship into a number of harbours on the Island. Non-bulk goods arrive by ferry in lorries, trucks and vans. This category includes the majority of consumer goods, building materials and food.

Data was derived from sources including:

- Somerfield Supermarkets
- National Farmers Union
- WightLink Ferries
- Red Funnel Ferries
- Steve Porter Transport Group
- Menzies Distribution Ltd
- The Builder Centre
- The Cowes Harbour Authority
- Isle of Wight Council

Materials are the most complex component to quantify and data carry a significant 'health warning'. Few organisations collect physical data on materials imported, transported or sold. Island retailers would have been the most obvious providers of this information. However, for reasons of time and/or confidentiality, most retailers were unable or unwilling to provide data and therefore alternative data and estimates have been used. With help from a few major retailers coupled with market share estimates, it has been possible to proxy retail data to what would seem to be a fair degree of accuracy.

Validation of retail data has come from several sources. Ferry data on incoming lorry numbers and sizes, was broken down into sectors (retail / food, agricultural products, and general haulage). From this data it was possible to calculate capacities and estimate tonnes. In some cases, consumption data, such as for white goods, was 'reverse engineered' from UK waste / recycling data (ICER 2000).

The resulting material input estimates were also validated against UK-wide and South East region consumption.

Of course, environmental impacts of consumption are not limited to the impacts of the waste outputs described later in this section. Consuming goods and services leads to life cycle impacts – from the damage caused by winning minerals, to the emissions of carbon dioxide from transporting goods from manufacturer to consumer and even further to the transport impacts of freighting waste from consumer to disposal point. These life cycle impacts are not apparent from a simple materials inventory. More investigative methods are needed to determine more fully the range of environmental impacts arising from materials consumption. These additional impacts are given greater emphasis in the Ecological Footprint Analysis later in this report .

It is estimated that 753,368 tonnes of materials are consumed on the Island each year. It is estimated that about 75% of this is made up from imported materials, the remainder being local aggregates and agricultural products. On the basis of the available data, only milk, meat and animal feedstock could be clearly identified as significant items of local production which are also consumed locally. Most other agricultural products would seem to be exported off the island. Table 1 gives a top level breakdown.

Materials	Tonnes
Bulk stone, aggregates, etc	252,163
Liquid fuel – petrol etc	62,579
General Goods	270,253
Agricultural Products (local)	51,698
Aggregates (local)	116,675
Total (rounded)	**753,368**

Table 1: Materials Consumption – Overview.

Sources: Cowes Harbour Authority, National Farmer's Union, Isle of Wight Council

General Goods

The General Goods section (270,253 tonnes from Table 1) mainly comprises of freight arriving at the Island on vehicles by ferry. Information from the ferry companies indicates a vehicle capacity of 1,091,896 tonnes, made up of the following categories – Food and retail (43%), agricultural products (10%) and general haulage (unspecified retail goods) (47%). Applying this split to the 270,253 tonnes of goods imported, (i.e. only 25% capacity was used, which equates to 50% loading on the one way trip), results in the breakdown of this category as in Table 2.

Materials	Tonnes
Food and Retail	116,210
Agricultural products	27,024
Unspecified retail goods	127,020
Total (rounded)	**270,253**

Table 2: Materials Consumption – Harbour Data – General Goods.

Sources: Wightlink Isle of Wight Ferries, Cowes Harbour Authority

Using data from supermarket sales, Food and Retail consumption (116,210 tonnes from Table 2) can be broken down as in Table 3.

Materials	Tonnes
Food	77,107
Non Food retail	39,103
Total	**116,210**

Table 3: Materials Consumption – Harbour Data – Food & Retail.

Sources: Somerfield Supermarkets, Cowes Harbour Authority

Food Consumption

To the apparent imported food tonnage from Table 3 (77,107 tonnes) must be added locally produced and consumed milk and fodder used to maintain the island's animal stock. This gives a total of 128,805 tonnes. Meat, produced and consumed on the island, is actually taken off-island for slaughter before being re-imported; these tonnages are therefore already included in the shipping data in Table 3. The re-imported meat, associated stock feed and local milk are identified as 'local' in Table 4.

Produce	Tonnes
Milk (Imported)	5,145
Milk (Local)	12,863
Meat (Local - re-imported)	2,475
Fodder (Local)	38,836
Cheese	687
Meat (Imported)	3,069
Fish	693
Eggs	1,094
Oils	594
Sugar and preserves	1,337
Potatoes	6,224
Fruit and Vegetables	16,406
Bread	2,204
Other cereals	7,188
Tea and Coffee	518
Cocoa and drinking chocolate	223
Soft drinks	15,425
Confectionery	666
Pet food	3,425
Unspecified	9,733
Total	**128,805**

Table 4: Materials Consumption – Harbour Data – Food.
Sources: Somerfield Supermarkets, National Farmer's Union, Cowes Harbour Authority

Although it has been adjusted to account for the feed consumed by exported animals, the stock feed tonnage appears high. It is possible that some feed is exported, however no records of this were available. The remainder of Table 8 is based on an analysis of the available supermarket data.

Non-food retail

The unspecified non-food retail categories identified in Tables 6 and 7 are aggregated to give a total retail tonnage of 166,123 tonnes (127,020 from Table 2 and 39,103 from Table 3). The mix of goods within this category has been estimated using supermarket data and some national data statistics (see Table 5).

Products	Tonnes
Nappies	204
Toiletries	357
Tobacco	260
Food Primary packaging	10,302
Non-Food Packaging	2,417
Alcohol	4,228
Clothing and textiles, footwear	10,323
Furniture and Carpets	4320
Timber	60,736
Paper products	6,651
Recreational Goods	490
Paint	326
Batteries	56
Cars	4,752
Car parts	898
Tyres	155
Washing Powders	6,617
Household Cleaning Products	660
Household Electrical Goods	1,976
Unspecified Retail Goods	50,398
Total	**166,123**

Table 5: Non-Food Retail Goods.
Sources: Somerfield Supermarkets, Biffa Waste Services, the Industry Council for Electronic Equipment Recycling (ICER), Cowes Harbour Authority.

About one-third of the non-food retail (50,398 tonnes) remains unspecified. This represents 6.7% of the total tonnage of material inputs.

Outputs

Waste Overview

A total of 169, 497 tonnes of waste is received by Island Waste Services, of which 64% is commercial waste and 36% domestic waste. This represents the vast majority, but not all of the waste produced on the Island. A number of private operators also collect inert wastes. In total, 138, 814 tonnes of waste goes to landfill; 72,411 tonnes for disposal and 66,403 tonnes of inert waste used mainly for landfill cover and restoration. The remainder is either recycled, composted or used for energy recovery. The amount of domestic waste produced by the 126,000 Island inhabitants is 481 kg per capita per year. This is above the national average of 441 kg per capita per year (DETR 2000). This elevated figure is probably attributable to the summer tourist population.

Most waste data was supplied by Island Waste Services and Biffa Head Office. Sources included:

- Household waste survey
- Collection and disposal data
- Data from the Refuse Derived Fuel (RDF) plant

The supplied domestic waste data for the Island was generally of good quality. The majority of domestic type waste on the Island is sent through the Refuse Derived Fuel (RDF) plant operated by Island Waste Services. The RDF provides the opportunity to remove some recyclable waste and generate fuel pellets from the rest. This fuel is then used to create electricity in the adjacent power station. The domestic waste materials that are not suitable for either recycling or fuel pellets are removed and disposed to the Island's landfill site.

Some of the waste generated is taken off-Island as recyclate for reprocessing, but the majority of waste materials are dealt with on the Island through the RDF plant, composting or landfill.

Domestic Waste

A total of 60,546 tonnes of domestic waste was collected and 58,464 tonnes disposed of either to recycling, composting, landfill or energy recovery (see Table 6). The difference is attributable to the water content of the collected waste, which is reduced during the energy recovery process. The mixed waste in Table 6 can be categorised by disposal route. The landfill tonnage of 'Doorstep Mixed' is that portion of the domestic waste which is rejected at the RDF plant. 'Civic Mixed' is civic amenity mixed waste, which is all taken straight to landfill.

All figures in tonnes	**Landfill**	**Recycled**	**Composted**	**Energy Recovery**	**Total Disposed**
Doorstep Mixed	18,628	(see note 1)	-	11,914	**31,337**
Civic Mixed	12,788	-	-	-	**12,788**
Paper	1,861	-	-	1,320	**3,181**
Glass	-	1,253	-	-	**1,253**
Cans (Aluminium)	-	38	-	-	**12**
Other Metal	-	846	-	-	**77**
Plastic	60	-	-	44	**104**
Textiles	-	59	-	-	**59**
Green Waste	-	-	7,895	-	**7,895**
Oil	-	26	-	-	**26**
Bric-a-brac	-	26	-	-	**26**
Whites/Pressing	-	1,632	-	-	**1,632**
Batteries	-	74	-	-	**74**
Totals	**33,337**	**3,954**	**7,895**	**13,278**	**58,464**

Table 6: Disposal routes for domestic waste.

Sources: Island Waste Services. Note 1: 795 tonnes of metals (aluminium and other metal) are recycled from mixed waste entering the RDF plant (doorstep collection) and accounted for in lower part of Table.

A further breakdown of the Doorstep Mixed waste sent to landfill (18,628 tonnes from Table 6), was estimated from information supplied by Island Waste Services. The majority of doorstep collected waste (16, 863 tonnes) all routes through the RDF plant where it is sorted for recycling, energy recovery or landfill. The RDF waste for landfill is further categorised as 'heavies' or 'fines'. Figures and material breakdown of these groups are given in Table 7. In 1998 both were sent to landfill. Since 1999, 'fines' have been composted. The remainder (1, 765 tonnes) is mixed household waste which is sent directly to landfill, due to either being rejected at the RDF plant, or when the RDF plant is closed. Table 8 gives the material breakdown of this household mixed waste.

A breakdown of the landfilled civic amenity waste (12,788 tonnes of Civic Mixed from Table 6) has not been estimated due to data uncertainty. Island Waste Services have analysed this waste stream but found it too varied to collate into categories. The common materials found in the mixed waste consists of a majority of processed goods, including mattresses, broken electrical goods, cable, ceramics and fibreglass.

To enable an Ecological Footprint to be attributed to this waste we have made rough assumptions as to the mix of these materials.

Due to the uncertain nature of these assumptions this waste stream has not been analysed further in the Improvement Scenarios section of this report.

Material	Tonnes
RDF Heavies	6,494
…Paper	454.6
…Textiles	714.3
…Steel	129.9
…Aluminium	64.9
…Glass	0.0
…Plastic	519.5
…Putrescibles	584.5
…Nappies	779.3
…Screenings	1558.6
…Unclassified	1688.4
RDF Fines	10,369
…Putrescible	4840.2
…<50mm screening	5528.8
Total Heavies & Fines	**16,863**

Table 7: Breakdown of Doorstep Mixed waste sent to landfill via the RDF plant.
Source: Island Waste Services.

Material	Tonnes
Paper/Cardboard, Newspaper	476.6
Textiles	70.6
Ferrous Metals	211.8
Aluminium	70.6
Glass	17.7
Plastic	53.0
Putrescible	370.7
Disposable Nappies	70.6
Less than 50mm screening	211.8
Unclassifiable	211.8
Total (rounded)	**1,765.0**

Table 8: Breakdown of Doorstep Mixed waste sent directly to landfill.
Source: Island Waste Services 'Household Waste Analysis'

Commercial/Industrial Waste

The significant majority (97%) of industrial and commercial waste arisings on the Island is disposed of at the landfill site. A total of 108,951 tonnes of commercial waste was collected, of which 39,074 tonnes were disposed of to landfill, and 66,403 tonnes used for landfill cover and restoration (see Table 9).

Data on industrial and commercial waste is less defined than that for domestic waste. The latter is sorted and therefore more information on content is available. Although the volume of industrial and commercial waste is accurately recorded by weighbridge tickets, there is little data available as to what materials this is composed of. The most significant component, 'inert waste' is made up of soil and construction rubble and is mainly used for landfill cover and restoration. Based on Island Waste Services data it is possible to estimate the content of the significant ‘mixed waste’ component in Table 9. Figures are provided in Table 10. Unfortunately, there is only sparse data on sectoral arisings. Without such information it is difficult to guide future waste minimisation exercises. Much benefit would be gained from improved data collection on the composition and source of commercial and industrial waste.

Figures in tones	**Landfill** *Re-use*	**Landfill** *Disposal*	**Recycled**	**Composted**	**Energy Recovery**	**Totals**
Mixed Waste	-	39,074	-	-	1,785	**40,859**
Inert Waste	66,403	-	-	-	-	**66,403**
Paper/Card	-	-	526	-	-	**526**
Glass	-	-	84	-	-	**84**
Cans (ALU)	-	-	3	-	-	**3**
Other Metal	-	-	3	-	-	**3**
Food and Green Waste	-	-	-	531	-	**531**
Totals	**66,403**	**39,074**	**616**	**531**	**1,785**	**108,409**

Table 9: Disposal routes for commercial/industrial waste.
Sources: Island Waste Services, Sainsburys

Commercial Mixed Waste	Tonnes
Mixed Waste direct to landfill	36,547
…Builders Waste	16,446
…Aggregates	5,756
…Ferrous Metal	3,700
…Aluminium	411
…Concrete	2,467
…Wood	1,370
…Plastic	1,370
…Plaster	513
…Paper	342
…Other	515
…Wood	7,309
…Metal	3,655
…Ferrous Metal	3,289
…Aluminium	365
…Plastic	3,655
…Paper/card	5,482
RDF Heavies	973
…Paper	71
…Textiles	107
…Steel	17
…Aluminium	13
…Glass	2
…Plastic	74
…Putrescibles	85
…Nappies	118
…Screenings	229
…Unclassified	254
RDF Fines	1,554
…Putrescible	725
…Less than 50mm screening	829
Total	**39,074**

Table 10: Breakdown of mixed waste from commercial/industrial waste.
Source: Island Waste Services.

Gaseous Wastes

As well as the solid waste outputs outlined above, it should be remembered that gaseous wastes also arise as a direct result of the products and services consumed on the Island. In this study only the carbon emissions arising from direct energy consumption and passenger transport, using the consumption data within this Section, have been quantified (see Table 11). It would be beneficial in the future to calculate a wider range of direct and 'embodied' emissions.

Activity	Carbon (tonnes)
Electricity	63,914
Gas	4,706
Coal	3,134
Oil	525
Transport	97,795
Total	**170,074**

Table 11: Carbon emissions from direct energy consumption and transport.
Source: DETR (1999) and DTI (1999).

Exported Waste

Island Waste Services and retailers transport almost 4,500 tonnes of locally generated waste off the Island for recycling. A breakdown of this exported waste is given in Table 12.

Materials	Tonnes
Glass	1,337
Aluminium	41
Steel	849
Paper/Card	526
Whites/Pressings	1,632
Batteries	74
Totals	**4,459**

Table 12: Exported waste.
Sources: Island Waste Services, Steve Porter Transport Group

Products

In addition to waste, the Island also produces goods for export. The primary exports which have been identified are agricultural products (Table 13). There are some manufacturing organisations on the Island but export data for these were unavailable.

Produce	Tonnes
Grain	37,594
Rape seed for oil	3,497
Tomatoes	12,500
Cucumbers	800
Milk	21,095
Cattle	1,440
Sheep	4,750
Total	**81,676**

Table 13: Agricultural and horticultural exports.
Sources: NFU, Wight Salads, Cowes Harbour Authority

Direct Energy

Inputs

Electricity

All the Island's grid electricity, except that generated by Island Waste Services, is imported. Total annual consumption was calculated as 533 GigaWatt hours[2] (GWh). The main supplier, Scottish and Southern Electricity, provided most of the consumption data. This was augmented by, and cross-referenced with data from several major employers on the Island and the Isle of Wight Council.

[2] One GWh = 1,000,000 kWh

Grid electricity consumption data is shown in Table 14. Overall consumption is slightly less than would be expected from UK per capita data. However, domestic consumption is 33GWh (about 12%) more than would be predicted from the UK average. This is possibly due to the impact of tourists, which swell the summer time population, and perhaps also the anecdotal evidence (somewhat supported by our low gas consumption data) that the Island is more heavily reliant than the mainland population on electricity as an energy source.

Electricity consumption recorded for Industrial and other users is below that expected from UK average data. For example, the Electricity-other category is 139 GWh below UK average and 276 GWh below south eastern England average. This may reflect either a lack of data or the focus of the Isle of Wight economy upon services rather than manufacturing.

Grid Electricity Consumption	GWh
Electricity - Domestic	269.90
Electricity - Other	197.32
…Farming, fishing, forestry	7.46
…Building & temp. construction sites	1.12
…Commercial	99.96
…Misc. commercial	17.26
…Combined commercial & Domestic	0.02
…Farmhouses	2.54
…Public lighting	5.18
…Temporary codes	63.78
Electricity - Industrial	65.40
…GKN Westland	16.80
…Hospital	3.50
…IoW Council Property Services	11.50
…Other	33.60
Total (rounded)	**533.00**

Table 14: Grid Electricity Consumption broken down by category.
Sources: Scottish and Southern Electricity, Isle of Wight Council, GKN Westland, Isle of Wight Health Authority.

Natural Gas

Only minimal information on gas consumption was available. Limited information on winter and summer maximum and minimum flows lead us to estimate an annual consumption of 91 GWh (assuming 12 months at maximum flow). However, information from other sources (regional and national) indicates that this is a significant underestimate. Domestic per capita consumption, for example, appears to be less than one-tenth of national average consumption. The gas data presented in Table 15 should therefore be treated with extreme caution.

Industrial and commercial gas consumption was available from only three, albeit significant, users. Consumption data in this area is therefore incomplete.

Natural Gas Consumption	GWh
Isle of Wight Council	22.5
Isle of Wight Health Authority	20.5
GKN Westland	32.9
Other	14.9
Total (rounded)	**91**

Table 15: Natural gas consumption broken down by category.
Sources: Transco, Isle of Wight Council, GKN Westland, Isle of Wight Health Authority

Other

Anecdotal evidence suggests that the use of wood as a primary energy source is more widespread on the Island than elsewhere in the UK. Some of this will no doubt be wood from trees grown on the Island. Other possibilities are scrap timber or specially imported fuelwood. Such imports are accounted for in the materials section. The use of wood for space heating may well explain some of the low gas consumption data.

Coal consumption is very close to the average UK figures for domestic use. Oil data is lacking from both import data and the consumer side with only the Isle of Wight Council and Isle of Wight Health Authority consumption data available. The available coal and oil data are presented in Table 16.

Fuel	GWh
Coal	33.0
Oil	7.4

Table 16: Available data on coal and oil consumption.
Source: Isle of Wight Council, Isle of Wight Health Authority

Outputs

Electricity

13.26 GWh of electricity is generated on the Island by Island Waste Services at the 1.7 MW capacity Refuse Derived Fuel (RDF) plant (see Table 17). This is sold back to the national grid. As this electricity is effectively derived from embodied energy of goods imported to the Island, which has already been accounted for under ‘materials’, double-counting is avoided by reducing the island’s overall electricity consumption by the amount of electricity generated from waste.

There is also an oil-fired power station in Cowes, run by National Power, which is connected to the national grid. Personal communication with National Power indicates that this station is only brought into operation occasionally – to service high peaks in electricity demand. No specific output data was available. Class D diesel oil is shipped in directly to the power station’s own dock and thus the fuel does not appear elsewhere in our import figures. Output from this station can effectively be ignored as all electricity is supplied to the grid and is thus counted in the electricity consumption data already given.

Electricity Production	GWh
RDF	13.26

Table 17: Output of RDF power station.
Source: Island Waste Services.

Passenger Transport

Private Car

Car travel was estimated from the number of cars on the Island, from the average annual mileage as recorded at annual services, and from national occupancy statistics. This gave a figure of 885,759,000 passenger-kilometres per annum, or an average of 7,035 kilometres per capita. This is significantly less than the South East England average of 11,300 kilometres.

Due to the way in which car mileage is estimated it is not possible to tell where that mileage took place – on or off the Island, although it is likely that a proportion took place off the Island.

Imports of fuel for sale through Service Stations amounted to 62,578 tonnes (Cowes Harbour data). Calculating fuel consumption from car mileage and national statistics on fuel consumption would indicate that 38,433 tonnes is consumed by private mileage. Business and/or tourist visitors may consume the remaining 24,145 tonnes. In addition, Island driving habits or vehicle type may be responsible for a lower than average car fuel consumption.

Ferry, Bus, Train and Air

The Isle of Wight is in a somewhat unique position regarding the mix and usage patterns of its public transportation systems.

The majority of bus services (95%) are run by a single company, Southern Vectis, with a Council bus fleet, Wightbus, operating on a few of the remaining routes as well as providing a 'home-to-school' and a 'Dial-a-Bus' service. Small private operators run the remaining services under contract to the Council. It therefore appears that the relative geographic isolation of the Island has mitigated against the more mixed bus provision seen elsewhere in the South East. Data on bus usage was provided by Southern Vectis and the Isle of Wight Council.

The Island Line rail service, the UK's smallest train operator, runs a 12.5 kilometre route between Ryde and Shanklin. The service uses old electric London Underground rolling stock, running a two-carriage service for most of the year increasing to four carriages during the peak tourist season. Train usage rates in this study were derived from data provided by Island Line who supplied timetable information and estimated occupancy rates.

Excluding mainland rail and bus services from this study could possibly lead to an under-estimate of usage of these modes where, for example, Island residents use mainland services for business or pleasure use. However, patronage rates for bus and train are known to be well below the level of mainland use. Isle of Wight Council data provides a contrast for commuter travel. Rail commutes constitute 1.4%, and buses 4.7%, of journeys compared to mainland figures of 5.8% and 9.9% respectively.

There are two airfields on the Island at Bembridge and Sandown which are for local private use and leisure flights only. No data was available on flights from these airports and it has been assumed that air travel from them is insignificant. Most Islanders take advantage of the good transport links to Southampton International Airport at Eastleigh or use one of the London airports.

South East England proxy data has therefore been used on the assumption that Island inhabitants are likely to use international air transport to the same degree as those on the nearby mainland.

As the main route on and off the Island, ferry use is worthy of closer analysis. There are six main cross-Solent ferry links. Isle of Wight Council describes these as the *'lifeblood of the Island ... vital to the economic, survival, prosperity and social health of the County'*.

The Council – and others – have expressed concern that all these services are totally dependent on private financing putting the Island in a unique, and potentially vulnerable, position.

A range of ferry service types is on offer. Wightlink operate roll-on roll-off (RoRo) vehicle ferries with foot passenger facilities between Yarmouth-Lymington and Fishbourne-Portsmouth. Red Funnel also operates a RoRo vehicle service, with foot passenger facilities, from East Cowes to Southampton.

Supplementary high-speed passenger-only services run from Cowes-Southampton (Red Funnel twin hull fast craft and hydrofoil), Ryde-Southsea (Hovertravel hovercraft) and Ryde-Portsmouth (Wightlink high speed catamarans). Data from Red Funnel was unavailable but, by using aggregated statistics on Trans-Solent crossings, supplied by the Council, and Wightlink passenger figures, it was possible to closely estimate passenger numbers by route.

In addition to the Solent crossings, a chain ferry runs for 200 metres between East Cowes and Cowes 220 times per day. This carries about 265,000 vehicles and 800,000 foot passengers per year.

Travel data for all modes is reported in Table 18 below. All transport statistics are affected, to a largely unknown degree by visitor usage.

Only minimal data is available on the contribution to public and private traffic by tourists. Anecdotal information from Island Line, for example, suggests that train use during peak season is double that of winter.

Trans-Solent ferry travel is also well used by tourists – boats carry close to 24,000 coaches per annum. Conversely, Island residents seem to travel to the mainland relatively infrequently.

An Isle of Wight shopping survey revealed that 81.5% of residents only went shopping off-island once every few months (Research & Marketing Ltd. 1995).

Travel Mode	Passenger kilometres	Modal split (%)
Car	885,759,000	71.0
Bus	8,094,000	0.7
Train	1,803,812	0.1
Air (see note 1)	254,390,000	20.4
Ferry	95,835,895	7.7
Total	**1,245,882,707**	**100.0**

Table 18: Passenger travel estimates and modal split.

Sources: Isle of Wight Council (Wightbus), Southern Vectis, Wightlink, Island Line and Office for National Statistics (1999). Note 1: Air travel is estimated from regional data.

Freight Transport

The contribution of freight transport to the overall environmental impact of goods and services is often overlooked although studies show that it may be highly significant in many cases. The distance and amount of goods transported in the UK is rising significantly. For example, freight transport in the food, drink and tobacco sector increased from 26.1 billion tonne-kilometres in 1986 to 39.3 billion tonne-kilometres in 1996 (DETR 1997) – an average rise of 5% per year.

The complexity of supply chains in industrial systems means that measuring freight transport for an individual product, or product supply line, is difficult. Each item could easily warrant a study in its own right. Island supply side freight data has been obtained from sources including The Steve Porter Transport Group, Wightlink, and a variety of retailers.

To estimate the Island's freight transport demands National and EU data has been adjusted to the Isle of Wight population. Based on these figures, consumption on the Island is responsible for some 477,327,000 tonne-kilometres of freight transportation split modally as in Table 19.

Of course, in addition to the transportation of goods by road, sea, rail or air within, or to, the UK mainland, the Island has the additional 'cost' of ferrying goods across the Solent.

Some EU, National, and local supply chain data is available which, when combined with the materials input data, provides an indication of the relative contribution of the different import categories. Eurostat estimate an average freight distance to be 320km per tonne. Based on consumption of 77,106 tonnes (see Table 3) this gives a freight transport figure for food for example of 24,673,920 tonne-kilometres (5% of the total).

Data from several retailers also provided an indication of freight distances between mainland distribution centres and the Island for non-food retail goods. A working estimate of 171km was determined as the average distance. Using retail tonnage data (166,123 tonnes from Table 5), this gives a distribution centre to Island figure of 28,407,033 tonne-kilometres (6% of the total). This is certainly only a proportion of the overall freight demand as these goods, and/or their component parts, are likely to have travelled considerable distances before reaching these distribution points.

Freight Mode	Tonne-kilometres	Modal Split (%)
Road	317,063,000	66.4
Rail	29,374,000	6.2
Sea	121,166,000	25.4
Air	9,724,000	2.0
Total	**477,327,000**	**100.0**

Table 19: Estimated freight transport adjusted from UK and EU data.
Sources: DETR 1997, Eurostat 1999.

Due to a lack of data, a significant portion of the freight transport cannot easily be attributed to imported materials.

Information from Island Waste Services also permitted the estimation of waste transportation – both in-Island and off-Island. This is set out in Table 20 subdivided by the different waste transportation routes from civic amenity site and doorstep collection to landfill and RDF. Some recyclables are also taken off-Island and freight figures for these are also provided from the Island to the facilities where they are recycled.

Activity	Tonne-Kilometres
CA to Landfill	80,336
Household Collection	62,088
RDF to Landfill	291,600
Recycling Collection	72,279
Composting	19,152
Recyclables	256,428
Total	**781,883**

Table 20: Freight transport attributable to waste handling both on-Island and transportation off-Island.
Source: Island Waste Services.

Water & Sewage

Water Consumption

Though it has a reasonable rainfall (979mm in 1998), the Isle of Wight has historically suffered from water supply problems due to its limited local surface and groundwater sources, combined with the high summer peak demand.

There are six major abstraction points on the Island, each providing more than 5Ml per day, and numerous smaller sites. Together these place a significant demand on the Island's limited water resources. Comprehensive data on water resources was provided by the Environment Agency and Southern Water.

The Isle of Wight is not self-sufficient in water. In 1998, a total of 11, 663 Ml of water was consumed on the Island; 66% of this demand was met by Island resources with the remainder supplied by pipeline from Hampshire.

Demand varies by season due to both tourism and agricultural needs. Peak demand is in August (963Ml); lowest demand is in February (560Ml).

Table 21 gives a breakdown of supply and Table 22 a breakdown of consumption by category for the year 1998/99.

Water Supply	Ml per year
Local (IoW)	7,738
Imported	3,925
Total	**11,663**

Table 21: Water supply.
Sources: Southern Water Services.

Water Consumption	Ml per year
Domestic	6,001
Other	3,581
Leakage	2,081
Total	**11,663**

Table 22: Water consumption.
Source: Southern Water Services.

Sewage

During the period under study, 1998/99, most of the domestic effluent was discharged to tidal waters. There were two sewage treatment plants on the Island. The major plant is located in Newport, with a smaller plant at Sandown.

Although the consented flows of the sewage treatment works and outfalls are available, no data was available on the actual outputs. It is known that some sewage sludge is spread on land as a soil conditioner.

Summary Resource Flows

Figure 3 summarises the resource flows outlined earlier in this section. Material and energy flows are illustrated separately.

Materials

Drawing together the materials consumption and waste data it is possible to estimate the size of the flows (in tonnes) through the economy and track these material streams to their destinations (landfill, construction, recycling and so on). To facilitate this, some assumptions have been made:

- Construction materials not finding their way into the waste streams are assumed to have been retained within the economy as 'built capital' (housing, roads or other infrastructure); and
- Food stuffs not finding their way into the recorded waste streams as compost or putrescibles are assumed to have been consumed and turned into the products of digestion (energy and sewage).

In the simple breakdown of material inputs locally produced goods (agricultural products and aggregates) are distinguished from 'imported' materials.

Also shown in the material inputs are the tonnages for liquid fuels (petrol and diesel). These are also duplicated in the lower illustration showing energy flows.

Tracking of material outputs would indicate that the bulk of the materials would appear to be used in construction – this includes timber and aggregates. These would seem to have a long lifetime within the economy as only a small percentage of the construction material inputs into the Island are returned as waste in any one year.

The ‘unspecified’ category includes goods retained within the economy – the Island’s growing population would lend support to the notion that more materials are retained than discarded each year.

Indicated in the outputs are those materials that are known to be recycled or reused including the materials used for energy recovery. The energy thus recovered forms one of the energy inputs in the lower illustration.

An unknown portion of the Island’s treated sewage sludge is returned as soil conditioner.

Another output shown is the carbon arising from the combustion of the liquid fuels. Note that only the carbon emissions are shown.

Energy

Energy and fuels have been grouped together as energy inputs – a category which includes imported liquid fuels, coal and oil as well as energy in the form of gas and electricity. Note that the figures for gas and electricity refer to delivered energy. The other estimates are based on the energy content of the fuels.

All fossil fuel use results in carbon dioxide (greenhouse gas) emissions. As with the carbon emissions in the material flow illustration, these have been calculated using CarbonCalc™, a software package produced by Best Foot Forward which uses standard Department of the Environment, Transport and the Regions (DETR 1999d) conversion factors to estimate pollution. CarbonCalc takes into account both generation and distribution efficiencies.

Note that the inputs include energy recovered from waste on-Island and sold back to the grid.

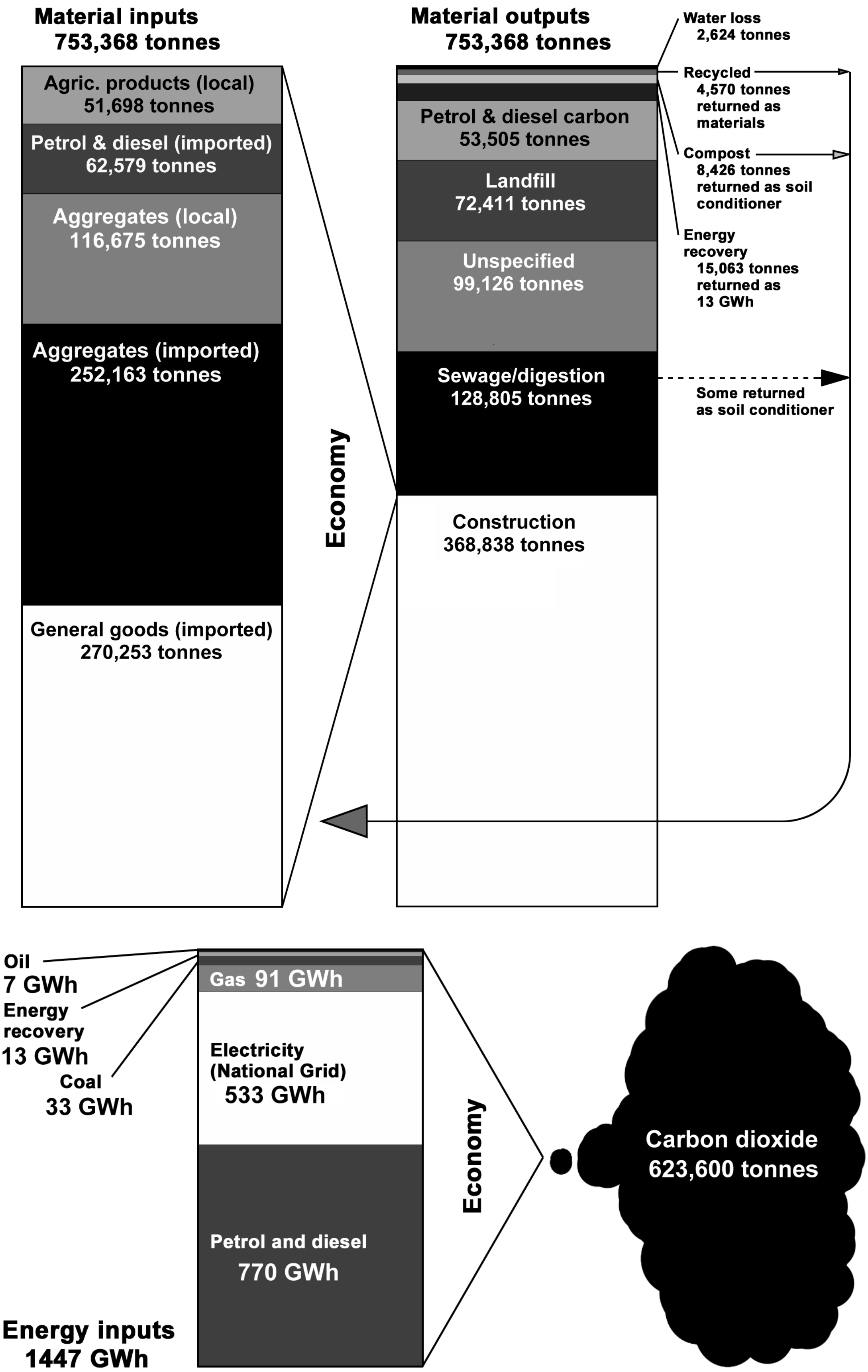


Figure 3: Summary Resource Flows through the Island's Economy

Notes: Materials and energy flows are presented separately. Input categories are mutually exclusive except 'Petrol and Diesel' which appears as both a material and energy source. Materials sent for energy recovery also appear as energy input. A small proportion of the electricity supply mix is made up of renewable energy. The carbon dioxide reported includes all the energy inputs listed plus an estimate of car petrol and diesel purchased off-island. Some freight transport is also captured although any emissions arising from freight fuel purchased off-island are not included. Carbon dioxide from energy recovery has been omitted.

Ecological Footprint Analysis

Ecological Footprint Analysis (EFA) is a means of measuring and communicating human-induced environmental impacts upon the planet (Wackernagel and Rees 1996; Chambers, Simmons and Wackernagel 2000).

An Ecological Footprint Analysis has been applied to the Isle of Wight to measure the ecological sustainability of its economy. The following sections describe the methodology and illustrate step by step the procedure used to perform the analysis.

"Imagine a glass dome over the Isle of Wight - what area would this dome have to cover to ensure that the population could maintain their current lifestyles using only the productive area enclosed within the dome?"

By using land (and sea) areas to indicate environmental impact, the Ecological Footprint is able to:

- Communicate environmental issues effectively with many people who can visualise, and are familiar with, land;
- Link personal impacts with global sustainability issues;
- Allow comparisons between different countries, regions and the world by using a common measurement unit and method;
- Re-introduce a 'link to nature' which is felt to have been lost in recent times.

Best Foot Forward's adaptation of the Ecological Footprint concept, the EcoIndex™ Methodology, allows the concept to be used to assess activities, services and regions (Simmons, Lewis and Barrett 2000).

The Ecological Footprint Analysis of the Isle of Wight presented here utilises the EcoIndex™ Methodology using the material and energy data described in the previous Resource Flow Analysis section; these are:

- Materials and Waste
- Direct Energy Use
- Passenger Transport
- Freight Transport
- Water
- Built (degraded) Land

The EcoIndex™ Methodology adds all these sector, or component, Ecological Footprints together to gain a total Ecological Footprint.

However, simply summing all available data introduces the possibility of double counting impacts (for example, counting transport impacts both through food miles and freight data). Various adjustments are therefore made to the figures to avoid this (see Double Counting; page 30). Other adjustments are also necessary to account for resources leaving the Island (see Exports; page 30) and resources consumed by non-Island residents (see Tourism; page 30).

To enable ecological sustainability assessments, the Ecological Footprint Analysis compares the Ecological Footprint (demand) against the Ecological Capacity (supply), measured in 'global average' hectares (see page 36). This enables fair comparisons between different regions or countries and, more importantly, a comparison with the global availability of bioproductive resources.

What is Footprint Analysis?

Although Ecological Footprint Analysis only gained widespread publicity in 1995, it has rapidly taken hold and is now in common use in many countries at the national and local levels; for example, Mexico, US, Canada, Holland, Denmark, Sweden, Australia and now the Isle of Wight. The Ecological Footprint of a region or community can be said to be the area (land and/or sea) that would be required to sustainably maintain current consumption, using prevailing technology.

Imagine a glass dome over the Isle of Wight - what area would this dome have to cover to ensure that the population could maintain their current lifestyles using only the productive area enclosed within the dome?

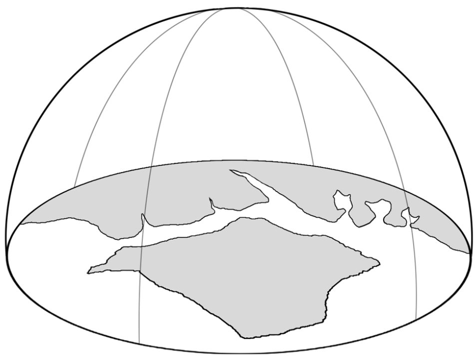


Figure 4: Isle of Wight under a glass dome

For the purposes of the Ecological Footprint calculation, land and sea area is divided into four basic types; bioproductive land, bioproductive sea, energy land (forested land required for the absorption of carbon emissions) and built land (buildings, roads etc.). A fifth land type, biodiversity land, refers to the area of land that would need to be set-aside to preserve biodiversity.

Example 1: A cooked meal of fish and rice would require bioproductive land for the rice, bioproductive sea for the fish, and forested 'energy' land to re-absorb the carbon emitted during the processing and cooking.

Example 2: Driving a car requires built land for roads, parking, and so on, as well as a large amount of forested 'energy' land to re-absorb the carbon emissions from petrol use. In addition, energy and materials are used for construction and maintenance.

Once a total Ecological Footprint for a region is calculated, this figure can be divided (normalised) in different ways, or used to investigate future scenarios (see page 37). For example, by comparing the use of bioproductive area by an 'average' Isle of Wight resident with the available average ‘earthshare’, we can estimate ecological sustainability. The earthshare is calculated by dividing the total amount of productive land on the planet by the global population. The most recent studies (Wackernagel *et al.* 1999) estimate the average 'earthshare' to be about 1.9 hectares[3]. This earthshare can be considered as the maximum Ecological Footprint allowance without depriving either future generations or those now living in other regions of the world.

An annual Footprint of Nations report, now funded by leading Swiss bank Union Bancaire Privée (UBP), provides a national context for considering regional Ecological Footprints. The first of these reports (Sturm, Wackernagel and Müller 2000), based on 1995 data, gives an Ecological Footprint for the UK of 4.6 hectares per person compared with a bioproductive capacity of just 1.5 hectares – a deficit of around 3 hectares. Other industrialised nations have even larger Ecological Footprints[4].

Globally, the average Ecological Footprint was 2.2 hectares in 1995 – as opposed to an available capacity of 1.9 hectares - suggesting that humanity is using more natural resources than can be sustained in the longer term.

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[3] The actual figures given by Wackernagel et al (1999) are 2.23 hectares for an average earthshare which reduces to 1.87 hectares when 12% provision for biodiversity protection. Figures are rounded in this report.

[4] Comparing the Isle of Wight average per capita Ecological Footprint to the average earthshare addresses the question: Is the average Isle of Wight resident living ecologically sustainably? Comparing the figure with the UK average answers the question: How is the Isle of Wight performing ecologically compared to the UK as a whole?

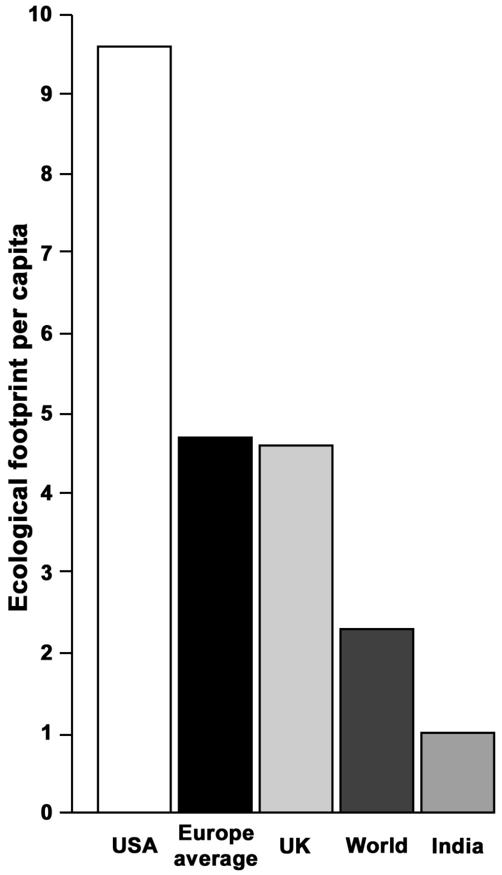


Figure 5: Comparison of the ecological footprints of various countries and regions

The EcoIndex™ Methodology

The Component Approach

The EcoIndex™ Methodology (Chambers, Simmons and Wackernagel 2000) uses a component approach to perform Ecological Footprint Analysis. This is different, but wholly compatible with, the compound approach taken by Wackernagel *et al.* (1999) in the Footprint of Nations study which uses national consumption data as a starting point.

In the EcoIndex™ methodology, wherever possible, full Life Cycle impact data is used to derive Ecological Footprint conversion factors for key activities or 'components'. For example, to calculate the Ecological Footprint of a car passenger-kilometre, fuel use, materials and energy for manufacture and maintenance of the vehicle, and the share of UK roadspace appropriated by the car are accounted for (Table 23). This conversion factor is then applied to the number of passenger-kilometres travelled.

Component	**Inputs**	**CO_2 Emissions**	**Built Land**	**Footprint**
Petrol	0.094 Litres/Km	0.22 Kg/km		0.000050[i] Ha/Car Km
Maintenance & Manufacture	0.0423 Litres/Km equivalent	0.10 Kg/km		0.000022[ii] Ha/Car Km
Road Space [a]	2,581,747 Ha		7,314,789Ha (Note 1)	
Car Road Share [b]	86%			
Car Kms [c]	362,400,000,000			
Car Occupancy [d]	1.6 persons			
Calculation			(a*b)/c	(i+ii+iii)/d
Footprint			**0.000017[iii] Ha/Car Km**	**0.000056 Ha/passenger-km**

Table 23: An example analysis for the Footprint of UK car travel (per passenger-km).

Note 1: This figure is the hectares of 'global average' land equivalent to the actual UK area built on by roads.

Sources: DETR 1997, Wackernagel & Rees 1996, BRF 1998, DETR 1999c.

A similar approach is used to derive a range of Ecological Footprint component values, representing the main categories of impact, before summing them to calculate a total Ecological Footprint for the Isle of Wight. The key components we have used in this study are:

- Materials consumption (including waste)
- Energy use

- Passenger transport
- Freight transport
- Water use
- Built (degraded) land

Each of these key components are made up of smaller sub-categories. For example Materials is made up of food, retail goods and bulk goods. Each of these sub-categories are then broken down further into individual materials or products. This approach reflects the data supplied by the resource flow analysis presented earlier.

Using this 'bottom up' approach enables the calculation of Ecological Footprints at any level – for a product, organisation, activity or region. In this study, Ecological Footprints for an organisation (a local school), a product stream (Island-grown tomatoes) and a typical individual, as well as the Isle of Wight as a whole are given.

Box 1: A Snapshot of the Island

It is important to note that Ecological Footprint Analysis is a 'snapshot' methodology. It tells us how much bioproductive area would be required based on a specific data set - it does not attempt to predict future or past impacts.

It is likely that, due to technology changes and variations in material flows into the economy, the Ecological Footprint will change over time.

In the period of data recording some of the input flow of materials will stay in the economy, as stock, and some will flow out as waste. In both cases these materials are considered to have been 'consumed'.

Exports, on the other hand, of agricultural products for example, are discounted. The analysis therefore uses net consumption, which is calculated by adding production to imports and then subtracting exports.

All data used relates to the Isle of Wight economy in 1998/99.

The Double Counting Demon

In this component approach it is important the impacts of consumption are not double counted. For example, the Ecological Footprints of materials inclusive of freight transport are given to show the true 'cost' of consumption. Freight transport as a separate component is also given in its own right to show the relative impacts of transporting goods. Similarly, the Ecological Footprint of water consumption includes the energy used to treat and supply the water, although this energy is also included in the energy component. In both these situations, the same impact is included in different categories, and therefore when all the Ecological Footprint components are added an allowance is made for any likely double counted impacts (see page 30).

Materials and Waste

Ecological Footprint values for materials are calculated by applying conversion factors to the estimates of net consumption presented in the Resource Analysis section. Although waste generation figures may be used to estimate net consumption, accounting for materials at the input stage is more accurate.

In order to derive accurate Ecological Footprint values, input materials are subdivided into material types including:

- Ferrous metals
- Non-ferrous metals
- Timber and timber products
- Glass
- Plastics
- Food (further sub-divided)

Each of these categories have their own conversion factors which take into account:

- productive area required to supply those materials;
- land degraded in the process of extraction, transportation and manufacturing; and
- embodied energy (the energy used in manufacturing goods).

Although the material aspects of waste are taken into account at the input stage, there are additional 'costs' when those materials become waste, such as:

- Freight transport of waste from consumer to disposal site;
- Degraded land from landfill operations; and
- Freight transport of recycling materials for reprocessing.

The Ecological Footprints of waste are presented in a separate section below.

By taking this approach, the total impact of consumption is taken into account on a life cycle basis, as far as data availability will allow. It is still likely however, that the Ecological Footprints of materials given are underestimates of the true cost of consumption.

Material Footprints

The total Ecological Footprint for Material consumption and production is 652,149 ha, or 5.18 ha per person. This can be attributed to 6 key categories (Figure 6).

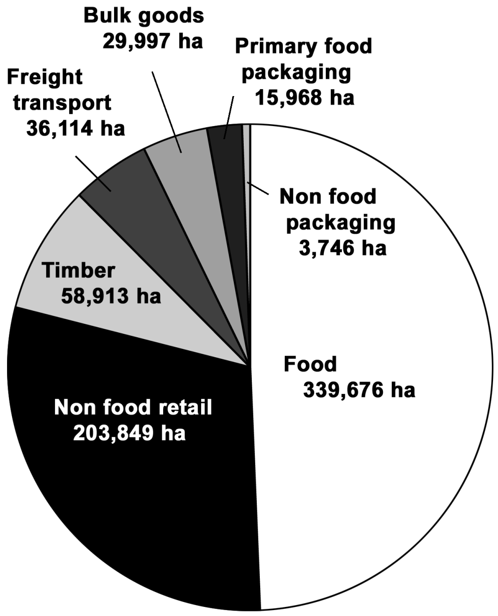


Figure 6: The Footprints of Materials Consumption on the Isle of Wight 1998/99

Figure 6 also shows the freight transport impacts associated with the consumption of these materials. This impact is presented here to complete the Ecological Footprint, although these particular impacts are accounted for in the Freight transport section. Similarly, production which is later exported is also included here, though deducted for the Ecological Footprint of the Isle of Wight as these products are not consumed by Islanders.

Bulk Goods

The Footprint for bulk materials is 88,910 ha, or 0.71 ha per capita. Bulk goods include building stone, timber, aggregates and agricultural products. We have assumed agricultural products to consist of 10% chemicals, 50% fertiliser, 25% animal fodder and 15% machinery.

Figure 7 also shows the freight transport impacts associated with the consumption of these materials. This impact is presented here to complete the Ecological Footprint, although these particular impacts are accounted for in the Freight transport section. Similarly, production which is later exported is also included here, though deducted for the Ecological Footprint of the Isle of Wight as these products are not consumed by Islanders.

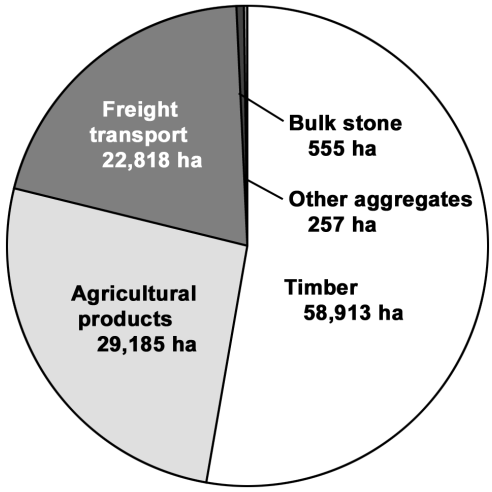


Figure 7: The Footprints of Bulk Material Consumption

Food Consumption

The Ecological Footprint of food consumption is 339,676 ha, or 2.70 ha per person. This is made up of the following components. The most significant identifiable contributors are cereals, meat and milk.

Figure 8 also shows the freight transport impacts associated with the consumption of these foods. This impact is presented here to complete the Ecological Footprint, although these particular impacts are accounted for in the Freight transport section. Similarly, production which is later exported is also included here, though deducted for the Ecological Footprint of the Isle of Wight as these foods are not consumed by Islanders.

Produce	Footprint (Ha)
Unspecified	37,570
Meat	66,179
Other cereals inc bread	124,982
Animal Fodder	15,534
Pet food	17,881
Fish	2,029
Soft drinks	3,394
Cheese	6,604
Milk	35,974
Confectionery	4,878
Fruit and Veg	6,070
Oils	7,419
Tea and Coffee	1,900
Eggs	5,428
Cocoa/drinking chocolate	1,551
Potatoes	1,494
Sugar and preserves	789
Total	**339,676**

Table 24: The Ecological Footprint of the Island's annual food consumption.

Box 2: Travelling Tomatoes

The Isle of Wight consumes in the region of 1,000 tonnes of tomatoes and tomato products, with an Ecological Footprint value of 1,738 hectares (incl. freight transport, bioproductive land and energy inputs for example). The Island exports 12,500 tonnes of tomatoes.

If the Island became self sufficient in tomatoes, the reduction in FP would be 65.6 hectares (representing the savings in freight transport).

There is also the opportunity of economic gain from producing added value tomato products for local use and for export.

It should be noted that a Combined Heat and Power plant will provide the energy for tomato growing on the Island from 2001. This is expected to further reduce the footprint of local production.

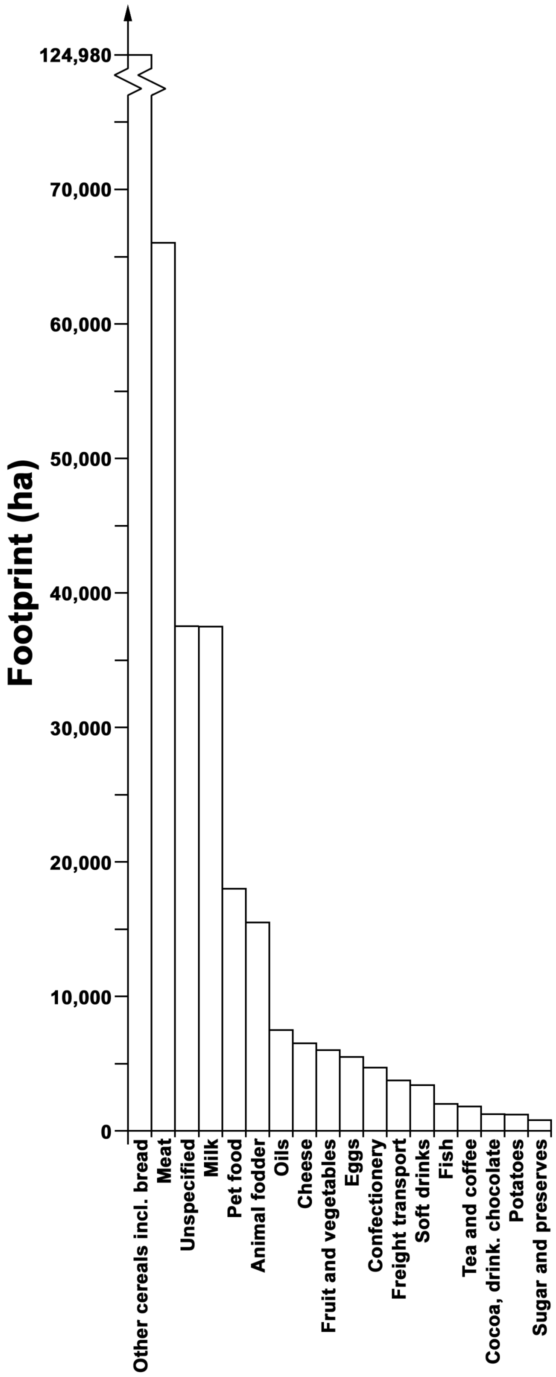


Figure 8: The Footprint of Food Produced on and Imported to the Isle of Wight

Non-Food Retail Goods

The Ecological Footprint for Non-Food Retail Goods is 223,563 ha, or 1.78 ha per person. This is made up of many items (see Table 25).

The Ecological Footprint conversions for these consumer items are based on their material components only and do not include assembly energy. They are therefore likely to be an underestimate. For example, the Footprint conversions used for 'large household appliances' are based upon the metals, plastic and glass used to make fridge freezers and washing machines etc. and does not include energy required for actual manufacturing of the final products.

Figure 9 also shows the freight transport impacts associated with the consumption of these foods. This impact is presented here to complete the Ecological Footprint, although

Consumption Category	Footprint (ha)
Unspecified Retail Goods	116,419
Clothing/textiles/footwear	27,561
Paper products	18,357
Food Packaging	15,968
Furniture and Carpets	9,892
Cars	9,076
Household Electrical Goods	5,521
Alcohol	5,074
Non-Food Packaging	3,746
Washing Powders	3,441
Car parts	2,074
Recreational Goods	1,856
Nappies	1,043
Paint	881
Tyres	680
Tobacco	655
Toiletries	592
Household Cleaning Products	567
Batteries	161
Total	**223,563**

Table 25: The Ecological Footprints of the Isle of Wight's material consumption.

these particular impacts are accounted for in the Freight transport section. Similarly, production which is later exported is also included here, though deducted for the Ecological Footprint of the Isle of Wight as these foods are not consumed by Islanders.

Waste Ecological Footprints

Although using material inputs and consumption to derive Ecological Footprint values is a more holistic and accurate approach, the Ecological Footprints of waste can illustrate the magnitude of the loss of useful materials from the economy, thus highlighting the benefits of closing the materials loop and reducing materials intensity. For this reason waste and recyclate footprints are given here. The Footprint

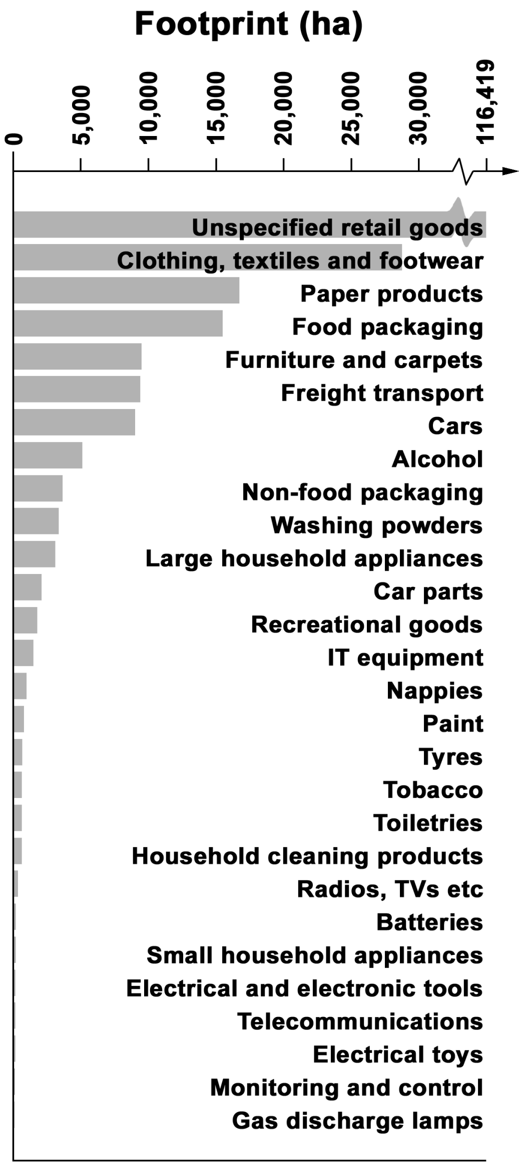


Figure 9: The Footprint for Non-Food Retail Goods (including Freight transport)

conversion factors take account of:

- Life cycle impacts (incl. energy, land use and transport used to supply the materials) of the waste materials
- Freight transport of waste materials from collection to final disposal.
- Freight transport of recyclates from collection to reprocessing. This is included to show the true ‘cost’ of recyclate disposal, and to highlight how local recovery and reprocessing could reduce the Ecological Footprint.
- Degraded land and energy used by landfill disposal, the refuse derived fuel (RDF) plant and the compost plant.

Waste type & destination	Waste EF (ha)	Transport EF (ha)
Domestic mixed waste to landfill	66,570	2.14
Domestic recyclables to recycler	2,596	2.12
Domestic waste to energy recovery	42,582	4.83
Domestic waste composted	7,678	0.21
Commercial waste to landfill	69,060	2.16
Commercial recyclables to recycler	1,149	0.94
Commercial waste to energy recovery	5,724	0.65
Commercial waste composted	516	0.01
Total	**195,876**	**13.00**

Table 26: Waste Management Footprints.

Note: The figure for commercial waste to landfill includes 66,403 tonnes of inert waste re-used for landfill cover and restoration. Data for commercial waste transportation was estimated have been made based on the domestic calculations.

Therefore the total Ecological Footprint associated with the loss of materials from the Island's economy is 195,889 ha, or 1.56 ha per capita.

This type of analysis enables identification of areas for holistic improvements in materials efficiency. See the Scenarios section of this report.

Energy

Ecological Footprint conversion factors for fossil fuels and renewable energies are based on their direct land use and the land required to reabsorb any carbon emitted, either directly from combustion or indirectly to construct the generating device (solar panel, wind generator and so on). Ecological Footprints for gas, oil and coal were calculated using national Department of Trade and Industry CO_2 emissions data (DUKES 1999). The Scottish and Southern supply mix was used to calculate the Ecological Footprint of electricity (Scottish and Southern Electric 1999), which, due mainly to their use of gas and some renewables, is slightly less than the national mix.

Energy Footprints

The total Ecological Footprint of energy for the Isle of Wight is 56,296 ha or 0.45 ha per capita (Figure 10). This is less than the UK national average, which is about 1.2 ha per capita. A comparison of energy Ecological Footprints between the UK, Oxfordshire and the Isle of Wight is shown in Figure 11. This reduced Ecological Footprint for the Island is due mainly to the low consumption of electricity by industrial and 'other' users (see page 12). It should also be noted that raw data on Island gas and oil consumption was believed to be incomplete – see page 12 of the Resource Flow Analysis.

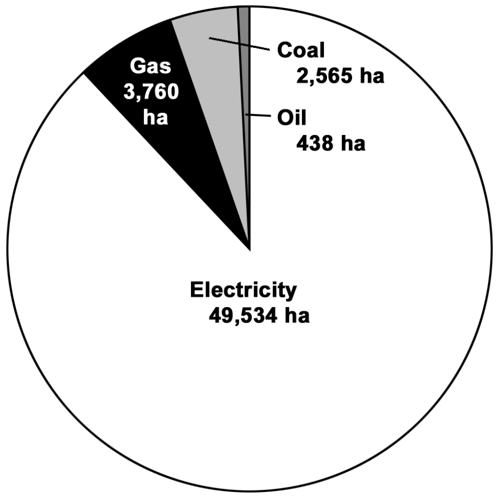


Figure 10 Total Energy Footprint by Energy Type – Electricity, gas, oil and coal

Electricity

Electricity supplied by Scottish and Southern has a lower than national average carbon intensity due to above average use of gas and renewables, and lower than average use of coal. This lower than average carbon intensity electricity reduces the per capita Ecological Footprint by 0.02 ha (4.5%) compared with national average energy mix.

The Ecological Footprint of electricity is by far the largest component of the Ecological Footprint for all energy use. Of the electricity used on the Island, the domestic sector is the largest consumer (51%), followed by Industry (37%) and finally other users (12%).

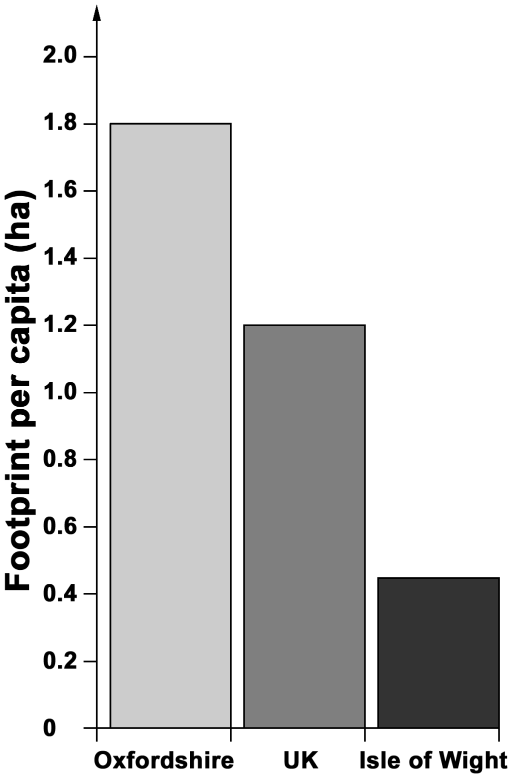


Figure 11 Comparison of energy footprints within the UK.

Passenger Transport

The Ecological Footprint conversion factors for passenger transport are derived using:

- Fuel consumption data and estimates
- Energy and materials used in manufacture and maintenance of vehicles
- Passenger–km data and estimates
- Occupancy and loading data and estimates
- Road length and average 'roadshares' of vehicle types

The majority of the Ecological Footprint associated with passenger transport is from the energy required to fuel, manufacture and maintain vehicles.

Passenger Transport Footprints

The total Ecological Footprint of passenger transport for the Isle of Wight is 89,554 ha equivalent to 0.71 ha per capita. The total Ecological Footprint is broken down by mode in Figure 12.

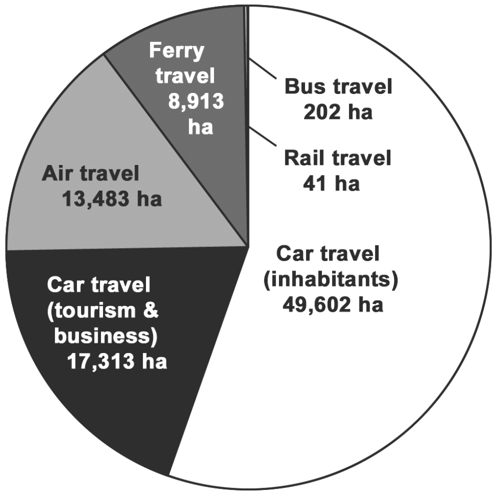


Figure 12: Passenger transport Footprints by mode.

Ferry Transport

The Ecological Footprint conversion factor for ferry travel was derived specifically for this project based on data provided by WightLink for the Portsmouth – Fishbourne route. It is worth pointing out that the per passenger-km Ecological Footprint of ferry travel is surprisingly high. From Wightlink's data and other studies it seems this may be as a result of low occupancies. Figure 13 shows a comparison of the Ecological Footprints for a single passenger-km by different transport modes.

Freight Transport

Ecological Footprint values are derived by applying conversion factors to freight tonne-km estimates. The Ecological Footprint conversion factors take account of:

- Road, rail, sea and air freight
- Vehicle fuel consumption data
- Energy and materials used in manufacture and maintenance of vehicles
- Degraded land for roads, railways, airports etc

Freight Transport Footprints

The Ecological Footprint of freight transport for the Isle of Wight is 36,129 ha or 0.29 ha per capita. This is made up of road, rail, sea and air freighted goods.

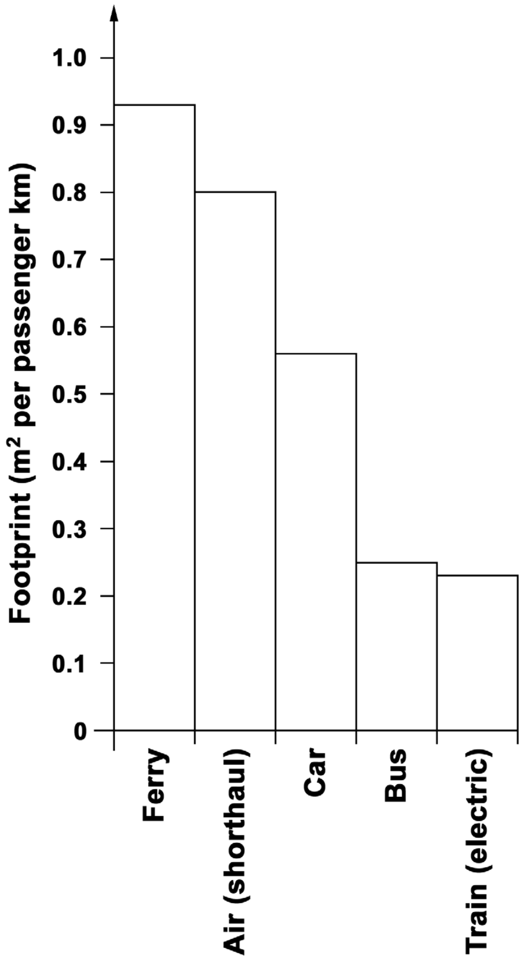


Figure 13: Comparative passenger-km Footprints by mode.

The freight transport accounted for from Island data has been assumed to be transport from the retailer's UK distribution centre to the consumer on the island. To represent the transport of goods which occur from the 'rest of the world' to the distribution centre we have used UK data scaled to the Isle of Wight population.

The Ecological Footprints of freight transport are presented in Table 27 and Figure 14.

Water

Ecological Footprint conversion factors for water usage are based on the energy required to extract, treat and supply water to Island consumers. Although consumption of water on the Island is not exceedingly high, water is still required to be imported from the mainland. In 1998, water imported from the mainland and water collected locally was treated on the island (since 1998 this has changed - all water is now treated on the mainland). The energy used for this is therefore already included in the overall energy usage reported above (see page 26).

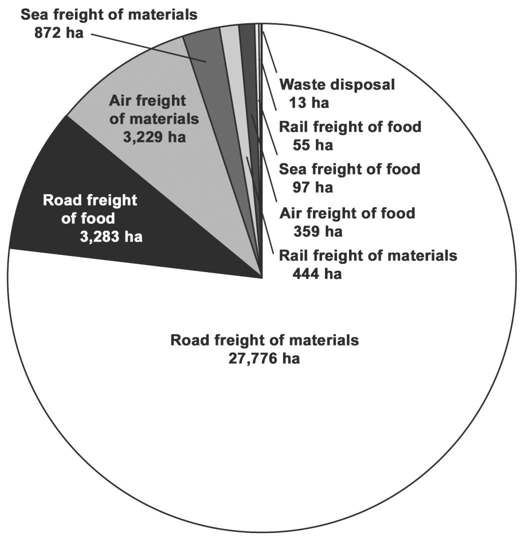


Figure 14: Freight Transport Footprints for the Isle of Wight

Freight and Waste Transport	Footprint (ha)
Road freight of food - total	3,283
… source to distribution centre	2,088
… distribution centre to consumer	1,195
Road freight of materials – total	27,776
… source to distribution centre	18,487
… distribution centre to consumer	9,289
Rail freight of food - total	55
Rail freight of materials – total	444
Sea freight of food - total	97
Sea freight of materials - total	872
Air freight of food – total	359
Air freight of materials – total	3,229
Waste – producer to disposal site	10
Waste – producer to recycler/reprocessor	3
Total	**36,129**

Table 27: Freight Transport Footprints for the Isle of Wight.

Note: Total distances refer to transportation from source to consumer. A further breakdown of this was available for road freight. The distances used for food distribution are based on data from Somerfield. They use 3 depots regularly which have an average delivery distance of 136 km. Road freighted materials are assumed to have travelled 171 km from distribution centre to consumer. This is based on Currys and Dixons data.

Water Footprints

The Ecological Footprint of water consumption for the Isle of Wight is 933 ha, or 0.01 ha per capita. This figure includes water supplied to the island but lost through leakage. The main use of water is by the domestic sector (51%). The Ecological Footprint results are presented in Table 28 and Figure 15.

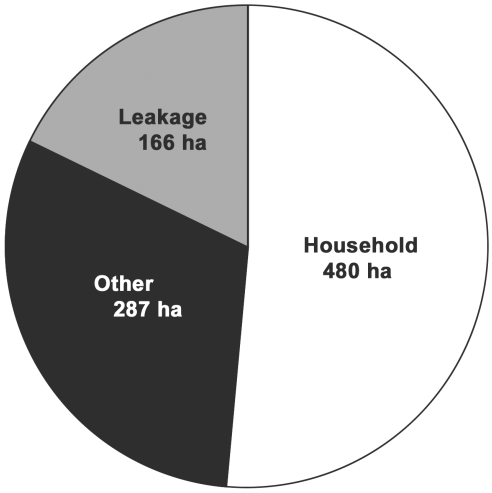


Figure 15: The Water Footprints for the Isle of Wight

Consumption Sector	Ecological Footprint (ha)
Household	480
Other	287
Leakage	166
Total	**933**

Table 28: The Water Footprints for the Isle of Wight

Built Land

Information regarding land use on the Isle of Wight was collated from a number of sources including:

- Isle of Wight Council
- Isle of Wight National Farmers Union (NFU)
- Ministry of Agriculture, Fisheries and Food (MAFF)
- Social Audit: Constraints on Economic Development arising from Conservation Designations on the Isle of Wight
- Isle of Wight Council. Island Wide Retail Study, December 1995

Information and advice was also provided by the Environment Agency on the Isle of Wight.

Built land includes any land which has reduced or no bioproductivity as a result of building, paving or contamination. On the Isle of Wight most built land is attributable to housing and other urban development. This study estimates that the amount of built land on the Isle of Wight is 10,074 ha.

For the purposes of Ecological Footprint Analysis, land appropriation is compared to the land available to a region or nation on a global scale to allow for ecological sustainability assessments. The Ecological Footprints reported here and above are expressed in 'global average' hectares[5] and built land needs to be expressed in the same units.

Land productivity on the Isle of Wight is generally high, with Grade 2 arable land, and most built land on the Island was formerly of this grade. Due to this high bioproductivity, the built land expressed in 'global average' hectares is higher than the built land hectares in reality. Assuming that built land occupies arable land, the Isle of Wight hectares are multiplied by almost 3 times to translate them to 'global average' hectares.

Therefore, the total amount of built land becomes 28,509 ha, or 0.23 ha per capita, when expressed in 'global average' hectares.

The Total Ecological Demand of the Isle Of Wight

The sum of the component Ecological Footprints described above gives an overall total Ecological Footprint for the Isle of Wight economy of 863,570ha.

However, this figure includes some double counting (water for example) and exported production (agricultural goods for example)

[5] To compare the Island with other regions and assess sustainability in a global context, all of the Island's bioproductive resources are translated into 'global average' hectares.

which are not consumed by Islanders. Adjustments are made as follows.

Double Counting

Recovery of energy from waste

Energy recovery from imported materials, part of the waste management process on the island, consists of energy recovery by means of the Refuse Derived Fuel plant (RDF). During a year, the RDF plant generates 13.26 GWh which is then sold (exported) to the UK National Grid. As the embodied energy in the materials going to the RDF have already been accounted for under materials consumption, the Ecological Footprint for energy use is reduced by 1,233 ha.

Water treatment

In 1998, all the Island's water was treated on island. The energy used for this is already accounted for under energy use and therefore this Ecological Footprint is reduced by a further 933 ha.

Export	Footprint (ha)
Cattle	18,475
Sheep	60,943
Animal Fodder	5,437
Cereals	100,752
Milk	19,829
Glass	669
Aluminium	331
Steel	1,010
Paper/Card	847
Whites/Pressings	4,064
Batteries	61
Total	**212,418**

Table 29: Accounted Exports

Exports

To determine actual consumption on the island, exports such as agricultural products and recyclate need to be discounted. This is calculated by adding production and imports and subtracting exports. Significant net exports are shown in see Table 29.

The Ecological Footprint of the Isle of Wight

Taking the above into account gives a final overall Ecological Footprint of 648,808[6] ha, or 5.15 ha per capita. The component breakdown of this Ecological Footprint is shown in Figure 16.

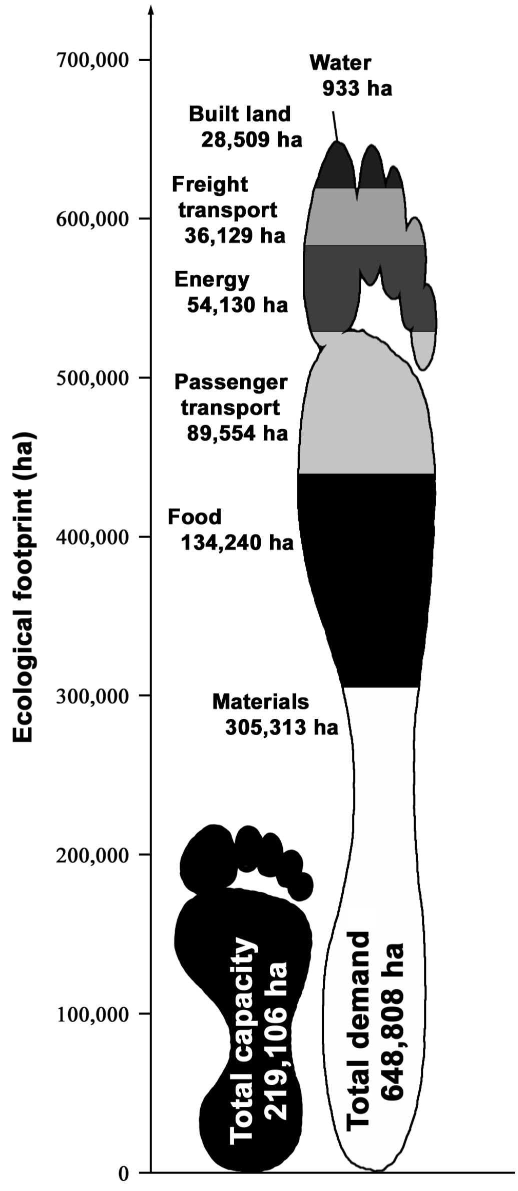


Figure 16: Component Composition of the 1998/99 Isle of Wight Ecological Footprint

Tourism and the Isle of Wight

The numbers of tourist visitors to the Isle of Wight is significant with 7 million bed nights in 1999 (no data was available for 1998).

[6] This figure is corrected for rounding errors accounting for a 178 hectares difference.

Some of the Ecological Footprint of the Island will be attributable to those tourists. It was not possible to specifically analyse tourism from a component Footprinting approach in this study but an estimate has been derived using bednight figures. Essentially, it has been assumed that resident nights and tourist nights are equivalent with the footprint apportioned between residents and visitors accordingly. This gives the tourism sector 13% of the total Ecological Footprint.

The per capita Ecological Footprint for residents can then be expressed as inclusive or exclusive of tourism (Table 30).

	Total Ecological Footprint (ha)	**Footprint (ha/capita)**
Footprint including tourism	648,808	5.15
Footprint excluding tourism	563,039	4.47

Table 30: The Impact of Tourism on the Isle of Wight

The Ecological Capacity of the Isle of Wight

The actual geographical size of the Isle of Wight is 38,100 hectares. The Ecological Capacity of the Island derives from the bioproductivity of this land and the surrounding sea. This bioproductivity needs to be expressed in 'global average' hectares to be comparable with the Ecological Footprint. To enable this, a number of 'factors' are applied to the actual Isle of Wight hectares to convert them into 'global average' hectares.

Firstly, yield factors are applied to translate local bioproductivity into 'global average' bioproductivity. As the Island has high bioproductivity, this increases its Ecological Capacity on a global scale. For example, on the Island 0.025 hectares of arable land are used to grow one tonne of potatoes. To produce a tonne of potatoes on 'global average' arable land would require 0.073 hectares.

Therefore, the first stage of translation is to convert Isle of Wight bioproductivity into 'global average' bioproductivity.

Land and sea categories	Equivalence Factors	Yield Factors - UK	Yield Factors - IoW
built-up area	2.83	2.5	2.9
arable land	2.83	2.5	2.9
pasture	0.44	6.0	10.2
forest	1.17	2.2	2.2
Sea	0.06	1.0	1.0

Table 31: Equivalence and Yield Factors.
Note: The yield factors shown here are in relation to global average yields. The global average yield is 1 for each category.

Secondly, 'equivalence' factors, developed by Wackernagel *et al.* (1997, 1999), are applied to convert different land (and sea) types into 'global average' land (and sea). For example, 'global average' arable land is almost 3 times more biologically productive than 'global average' land. Therefore, the second stage is to convert 'global average' arable, pasture, forest and built land into 'global average' land.

To finalise the potatoes example, 0.073 * 2.83 = 0.21 hectares of 'global average' land to produce one tonne of potatoes.

The yield and equivalence factors used in this study are shown in Table 31. Island yields for arable and pasture land were calculated to be consistently higher than the UK average (see Figure 18). Forest yield data was not available so the UK figure was used.

Sea

To account for bioproductive sea, this report uses the area within the UK's Economic Exclusive Zone (up to 200 nautical miles offshore). If this is allocated according to the Isle of Wight population then the amount of sea theoretically 'available' to the Island is 8,044 hectares.

Box 3: The Ecological Footprint of Ryde School

Ryde School occupies 7.3 hectares of grounds and has a total population, including teachers, pupils and service staff of 815 people. As part of the overall project, the school provided us with detailed data on their consumption including; direct energy use, transport, material consumption, waste production and water use.

Data was also provided on the purchase of 'long life' goods such as equipment and machinery. As these items have a lifespan of longer than a year, they are treated as 'capital goods' and their impacts are discounted over their expected lifespan. This type of organisational Footprint should also take into account the materials used in buildings, discounted over the expected lifespan. Unfortunately data on this was unavailable.

The Ecological Footprint of the school was derived by applying 'global average' Ecological Footprint conversion factors as in the rest of the study.

The total Ecological Footprint of the School was 150 ha which is equivalent to 0.22 ha per full time pupil. This footprint can be accounted for as in figure 17.

The total Ecological Footprint of the School is equivalent to 0.02% of the total Ecological Footprint of the Isle of Wight. The Ecological Footprint of an Isle of Wight resident is 4.47ha (adjusted for tourism), the contribution of the school therefore amounts to 5% of this.

A similar exercise in Footprinting a school was carried out by Best Foot Forward, Lloyd Lewis Power, Southampton Environment Centre and funded by Biffaward. This showed that when equivalent activities were taken into account the Ecological Footprint of each pupil at school was 0.31 ha.

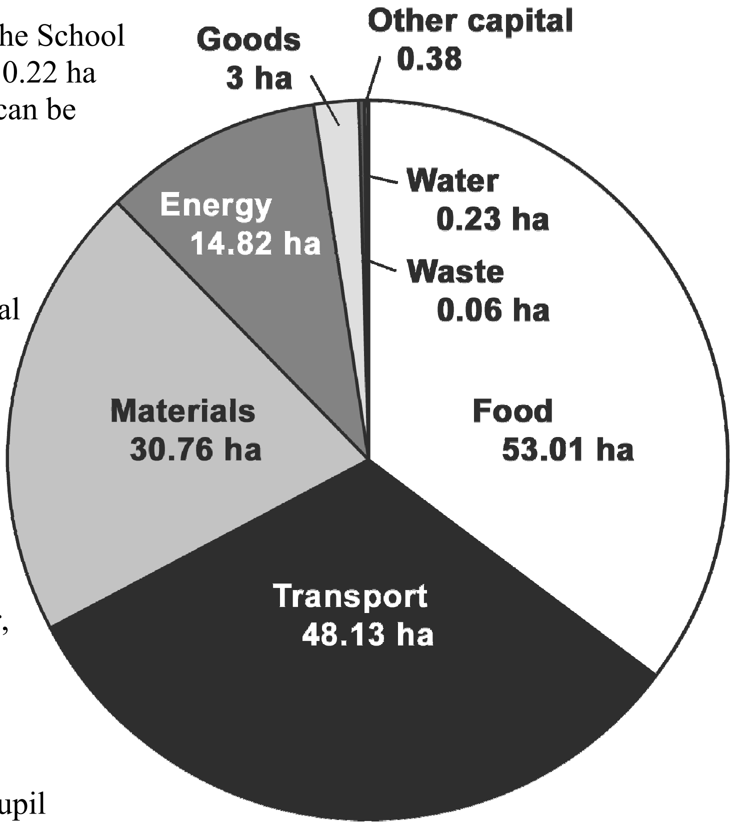


Figure 17: Breakdown of Ryde School's Footprint

This is 41% higher than Ryde School's Footprint. This may reflect differences in data collection but is probably also indicative of the considerable efforts made by Ryde School to reduce energy usage and waste.

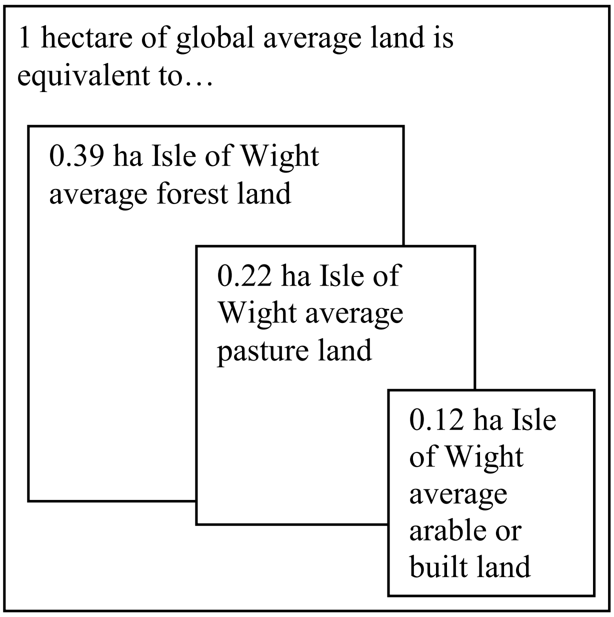


Figure 18: A comparison between global average bioproductive space and the average Isle of Wight equivalents

Note: Isle of Wight land is consistently more productive than the global average. Hence less Isle of Wight land would be needed to produce the same biomass.

Biodiversity Land

An additional land category is biodiversity land. This represents the area required to be set aside for the preservation of non-human species. There are many different estimates of how much this should be – ranging from 12% to 75% of the Earth's surface for example[7].

60% of the Isle of Wight is currently designated as having varying conservation importance which tends to argue for a high set aside for biodiversity. However, for consistency with other analyses this report uses the conservative estimate of 12% of the adjusted land supply (suggested by the Brundtland Commission in 1986) to determine the bioproductive hectares available to service human consumption.

The Isle of Wight's Ecological Capacity

The total Ecological Capacity of the Isle of Wight is 240,940 hectares of land, plus 8,044 hectares of sea. If this capacity is then divided equally among the Island's population, each person is allocated 1.98 hectares. If the residents of the Isle of Wight then chose to set aside 12% for biodiversity conservation, the allocated Ecological Capacity per person becomes 1.74 hectares.

[7] The World Commission on Environment and Development (The 'Brundtland Commission') in 1986 stated that 12% of the Earth's surface should be set-aside for biodiversity. In 1970, the ecologist Eugene Odum proposed that this figure should be 40%. Further estimates from Reed Noss and Allen Cooperrider in 1994 state that this figure should be a minimum of 25% with a potential maximum of 75%.

Ecological Sustainability Assessments

This section of the report assesses the ecological sustainability of the Isle of Wight comparing consumption with both the local and global capacity.

To facilitate Ecological Footprint comparisons between regions and nations this report focuses on the use of 'global average' hectares. These present the Ecological Footprints in a common unit, independent on the actual productivity of the area appropriated or where this area is located on the planet.

> "…if everyone on the planet consumed the same as the average Islander we would need around 1½ additional Earths to support global demand."

However, for some audiences it may be of more practical benefit to present results in actual, local hectares, i.e. the actual hectares which exist on the Isle of Wight.

The Ecological Footprints presented in this way reveal value for other sectors, such as land use planning, local decision-making and educational purposes. For example, this analysis presents the land 'budget' of the Island and the ecological 'costs' of certain activities and consumption items. The Ecological Footprint Analysis can then be used to assess land use and land supply, through the Council's Structure Plan for example.

Later this report returns to the use of 'global average' hectares to answer questions such as 'How does the 'average' Isle of Wight resident compare to other 'average' residents in different regions and countries?'; and 'Is the 'average' Isle of Wight resident living in an ecologically sustainable manner?'

Regional Ecological Sustainability

'How many Isle of Wights do we need to sustain the current consumption patterns of the Island's population?'

To answer this question, Ecological Demand and Supply figures are presented here as actual Isle of Wight hectares. As the Island is of above 'global average' bioproductivity, the Ecological Footprint as expressed in Isle of Wight hectares is smaller than the Ecological Footprint presented in the previous section.

This presentation in Isle of Wight hectares allows direct comparison of the footprint with locally available land, making it useful for land use planning, local decision-making and educational purposes. For example, local planning issues regarding the placement of new housing can be assessed by comparing the Ecological Footprints of the different options. This may show that, for example, the placement of new housing on degraded, or brownfield sites with increased passenger transport use may be a more sustainable option than degrading areas of bioproductive land.

The calculations show that we would need three 'Isle of Wight's' to sustain the current consumption patterns of the Island's population. The demand is 3.45 hectares as opposed to a supply of 1.15 hectares per capita.

The full results are shown in Table 32, Table 33 and Figure 19.

Component	Total Footprint (ha)	Total Footprint (ha per capita)
Energy	46,517	0.37
Passenger Transport	71,734	0.57
Freight Transport	29,370	0.23
Food	36,477	0.29
Materials	238,849	1.90
Built Land	10,074	0.08
Water	816	0.01
Total	**433,838**	**3.45**

Table 32: The Ecological Footprint for the Island 1998/99 presented in local, Isle of Wight, hectares

Component	Total supply (ha)	Total supply (ha per capita)
Built Land	10,074	0.08
Arable Land	8,776	0.07
Pasture Land	18,202	0.14
Forest Land	1,048	0.01
Sea	126,682	1.01
Biodiversity Land (12%)	-20,143	-0.16
Total	**144,639**	**1.15**

Table 33: The Ecological Capacity of the Island 1998/99 presented in local, Isle of Wight, hectares

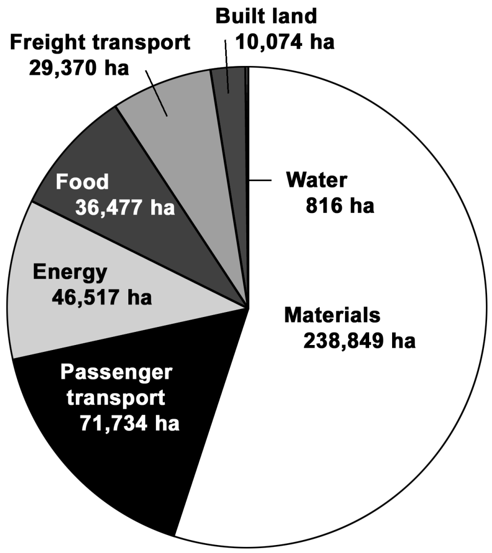


Figure 19: Component Breakdown of the Local Land Ecological Footprint for the Island 1998/99.

Ecological Sustainability Compared

Another question to be addressed is how does the Isle of Wight compare with other regions and countries? To answer this, the Ecological Footprint presented in 'global average' hectares is required. This allows the 'average' Isle of Wight resident's Ecological Footprint to be compared with the Ecological Footprints of a range of other residents in other regions and countries.

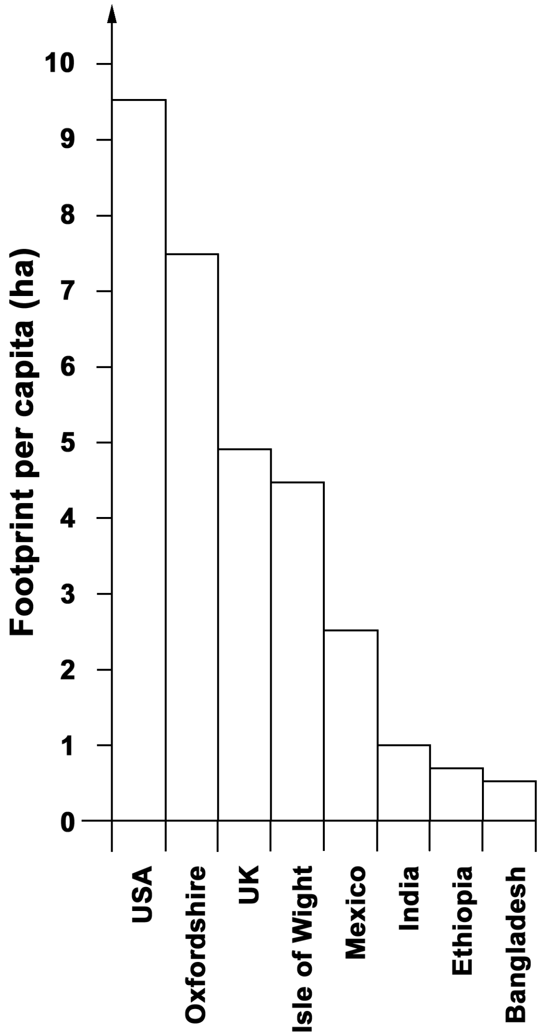


Figure 20: Comparing Ecological Footprints *per person* across the world

Global Ecological Sustainability

Perhaps the most illuminating question is:

'If everyone lived like the population of the Isle of Wight how many planets would we need to sustain current lifestyles?'.

To answer this, the Ecological Footprint presented in 'global average' hectares is required. This enables the Ecological Footprint Analysis to measure ecological sustainability by comparing the 'average' Isle of Wight resident's Ecological Footprint with the bioproductive hectares available globally, per person - the average earthshare.

The average earthshare is derived by dividing the planet's bioproductive land by the global population. In 1998 (the data collection year) the average earthshare was estimated to be 2.12 hectares, which becomes 1.87 hectares when 12% is set aside for biodiversity conservation.

Table 34 compares this 'supply' with the calculated ecological footprint, the 'demand'.

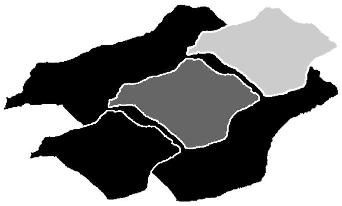
Average earthshare (ha per capita)	Current ecological footprint (ha per capita)
1.87	4.47

Table 34: The Isle of Wight's Ecological Sustainability Status

This assessment indicates that the 'average' Isle of Wight resident is using almost 2½ times (240%) the average earthshare. This is slightly less than the UK 'average' resident who uses just over 2½ times the earthshare (263%), as calculated from National data from Wackernagel *et al*. (1999), but much less than the figure derived for the relatively wealthy 'average' Oxfordshire resident who uses almost 4 times the earthshare (393%); derived using Best Foot Forward's same basic EcoIndex^{TM} Methodology (see Figure 20).

To look at this finding in another way, if everyone on the planet consumed the same as the average Islander we would need around 1½ additional Earths to support global demand.

Interestingly, the total Ecological Capacity of the Isle of Wight (240,940 hectares of land, plus 8,044 hectares of sea) is equivalent to 1.98 'global average' hectares per person. This is close to the average earthshare suggesting that if the Island were to become self-sustaining with its current resident population then it would be substantially closer to achieving ecological sustainability within the global context.



Improvement Scenarios

As the Ecological Footprint Analysis and subsequent sustainability assessment demonstrated, current consumption patterns on the Isle of Wight are unsustainable, as they demand the bioproductive space of three Isle of Wights, and the 'average' Island resident is using almost 2½ times the average earthshare.

In this, the Island is a typical example of an affluent region in an industrialised country. This does not mean, however, that it is not possible to greatly reduce the environmental impact of the Island. In order to make productive land available for all citizens, and to ensure that natural capital is not being depleted at the expense of future generations (Wackernagel and Silverstein 2000), the impact of consumption patterns on the Island needs to be reduced and made more sustainable.

The Use of Scenarios

In this Section, the data and analysis above are used to suggest practical ways to reduce the Ecological Footprint of consumption on the Isle of Wight, whilst maintaining or enhancing the quality of life for residents and visitors. In some cases, simple measures could significantly reduce impacts, whilst, in other cases, more social or financial investment would be needed. This initial assessment of selected improvement scenarios does not attempt to assign costs to the measures considered or to assess all of their social impacts. This would be necessary in order to assess the most cost-effective and socially beneficial ways of reducing environmental impacts, and thus to plan in detail a programme of action based on the measures suggested.

The scenarios are used to highlight the effects of changes to current consumption patterns. These scenarios are not predictions of the future, but rather ways of seeing *what* could happen *if* certain actions are taken. The scenarios will each focus on one of the main categories of material and energy flows for the Island. In each case, the effect that a change in the pattern of consumption could have on that material or energy flow on the Island will be assessed. In addition, where possible the effect of such changes on other sectors will be considered, for example, the effect of more local food production and consumption on freight transport.

For each sector, both measures on the *supply* side, focussing on alternative ways of meeting people's demand with lower impact or Ecological Footprint, and on the *demand* side, focussing on ways of reducing the level of consumption through efficiency or minimisation methods, will be considered. These types of measures are not mutually exclusive, but represent complementary approaches, both of which are likely to be needed to significantly reduce the environmental impact of consumption on the Island.

For each scenario, the reduction in the Ecological Footprint resulting from the suggested measures has been estimated. For consistency with the main analysis in this report, changes to the Ecological Footprint are calculated using average global bioproductive hectares, and the same 1998-99 data. This is also consistent with Rees' (2000) discussion of the use of Ecological Footprint Analysis to test alternative scenarios. For a more detailed analysis, the change in the Ecological Footprint over time resulting from proposed measures could be compared to the projected Ecological Footprint under 'business-as-usual' assumptions.

The scenarios presented here illustrate some key measures within the sectors which make the largest contributions to the Ecological Footprint of the Island; namely materials and waste, food production and consumption, and energy use. These sectors make significant contributions both to the Island's environmental impact on a global scale and to the local environmental impact. For example, waste sent to landfill on the Island and carbon dioxide released to the atmosphere. Other sectors, such as local land use and transport issues, which are not covered in detail in these scenarios, are equally important, especially to the local environmental impact and quality of life on the Island. These should also be addressed in detailed future planning for the Island.

Materials and Waste

The Ecological Footprint due to production, use and disposal of materials forms the largest contribution to the Island's total Ecological Footprint. In order to reduce this contribution, it is necessary to consider measures at all points along the supply-consumption-disposal chain which reduce the flow of materials needed to meet end-use demands. Such measures effectively increase the efficiency with which resources are used to deliver the goods and services that people want. The UK Government's strategy for sustainable development (DETR 1999) has identified continual improvements in resource efficiency as a key action.

Food Production and Consumption

In this section, scenarios for more local production and consumption of food are investigated. Currently, around 200,000 tonnes of cereals, meat, milk, fruit and vegetables and other food stuffs and fodder are produced on the Island, and 128,800 tonnes of food and animal fodder are consumed on the Island. Of this, only 13,000 tonnes of milk, 2,500 tonnes of meat and 39,000 tonnes of fodder are both produced and consumed on the Island; though the meat is exported for slaughter and then re-imported. Thus, the majority of the Island's agricultural produce is exported, whilst at the same time the majority of food consumed is imported.

Local production scenario

In this scenario for increased local consumption of Island-produced food, the environmental impact of food consumption is reduced because of the reduction of transport to and from the Island. In addition, there can be health and social benefits in providing high quality, non-processed food to the Islanders and reliable markets for farmers to sell their produce. In purely environmental terms, however, local production and consumption has a minimal impact in reducing the footprint, because the production inputs and land use are the largest contributions to the food footprint. Only dramatically reducing energy inputs (see Organic food scenario below) or a change to a diet that involves less meat, would significantly reduce this footprint.

Milk

Already, 13,000 of the 34,000 tonnes of milk produced are consumed locally on the Island. There is an additional 5,000 tonnes of local demand. This could be satisfied by Island-produced milk rather than being imported, thus reducing the environmental impact of transporting this amount. This would reduce the Island's Ecological Footprint by 100 ha, or 0.001 ha per capita.

Fruit and vegetables

Currently, 6,000 tonnes of potatoes and 16,500 tonnes of other fruit and vegetables, including 1,000 tonnes of tomatoes and tomato products, are consumed on the Island. At the same time, 13,500 tonnes of fruit and vegetables, mainly tomatoes and cucumbers, are exported from the Island. Assuming half of the Island's demand could be met by local produce, this would reduce the environmental impact of transporting 8,000 tonnes of fruit and vegetables off and onto the Island. This would reduce the Island's Ecological Footprint by 160 ha or 0.001 ha per capita.

Bread

Currently, 2,200 tonnes of bread are consumed on the Island. At the same time, 37,000 tonnes of wheat are exported from the Island. Local baking of bread would reduce the Island's Footprint by 44 ha or 0.0005 ha per capita.

Farmer's markets

A likely mechanism for increasing the amount of local produce consumed on the Island is through increased use of Farmer's markets, at which farmers can sell their produce directly to the consumer. These have been tried out at Newport with some success, and could be extended to other locations. They have been shown to be popular with both Islanders and visitors. If they were to be held regularly, the potential demand for locally produced food could increase, bringing further environmental and social benefits. Other mechanisms could include steps for encouragement of local supermarkets to take local produce, and for hotels to support local growers. As well as the environmental benefits, this would help to show the Island as an ecologically-friendly tourist destination.

Organic food

Approximately 250 tonnes of organic labelled food are consumed on the Island. Although this is only 1/3 of one percent of total food consumption, it does indicate a core of potential demand for organic produce, which could be grown locally.

Organic and integrated farming methods are both receiving attention regarding future agricultural production methods. However, it is still unclear how these methods, if adopted, would affect the Ecological Footprint. Proponents of these methods assert the energy and material inputs are greatly reduced, but critics argue that yields are lower as a result and thus more productive land is required. Moreover, there are other aspects besides direct environmental impact which are also relevant to the choice of farming practices, such as public confidence, purchasing behaviour and impacts on human health and biodiversity.

Waste Management

In May 2000, the UK government produced a new strategy covering waste management and reduction issues for England and Wales, entitled 'Waste Strategy 2000' (DETR 2000). The Strategy promotes the need for partnerships to be developed between central government, businesses, local authorities, community groups and the public, and emphasises the importance of waste minimisation. It sets national targets for the increase of household recycling and composting, which will be converted to local targets following consultation. The Strategy differs significantly from the draft strategy (DETR 1999b) published in July 1999, following criticism by environmental groups and waste management companies, including Biffa (1999), of the levels of waste incineration implied in the draft strategy. In order to determine the Best Practicable Environmental Option (BPEO) for waste management in particular cases, 'Waste Strategy 2000' sets out three guiding principles: the waste hierarchy, the proximity principle and self-sufficiency. The waste hierarchy sets out the order in which options should be considered:

- **reduction** - reduction of waste at source;
- **re-use** - products and materials to be used again, either for the same or a different purpose;
- **recycling, composting or energy recovery** - opportunities for recycling and composting to be explored before incineration with energy recovery is considered;
- **disposal** - only if none of the above offer an appropriate solution should waste be disposed of.

The proximity principle requires waste to be disposed of as close to the point of production as possible. This is in order to avoid passing the environmental costs of waste management to communities which are not responsible for its generation, and to reduce the environmental costs of transporting waste. Self-sufficiency implies that Waste Planning Authorities and the waste management industry should aim, wherever practicable, for regional self-sufficiency in managing waste.

The Strategy contains a number of targets for the UK, aiming to move management of particular wastes up the waste hierarchy, as follows:

- To reduce industrial and commercial waste sent to landfill to 85% of 1998 levels by 2005;

- To recover value from 40% of municipal waste by 2005; from 45% of municipal waste by 2010; and from 67% of municipal waste by 2015.
- To recycle or compost at least 25% of household waste by 2005; at least 30% of household waste by 2010; and at least 33% of household waste by 2015. (The previous administration had set a target of 25% by 2000, but the 1998/99 UK average figure was just 9%.)

Biffa (1999) has promoted the Isle of Wight as a model for working towards an integrated waste management strategy. The results of the Footprint Analysis show that, despite the progress already made on the Island, there remains potential for further reducing environmental impact by reduction, re-use, recycling and recovery measures. This potential is investigated in the scenarios developed here.

Waste Recovery scenario

In this section, scenarios are investigated for alternative ways of managing waste in order to recover more of its value.

Around 60,000 tonnes of domestic waste, 66,000 tonnes of commercial inert waste and 42,000 tonnes of commercial mixed waste are currently produced annually on the Island. As described in Table 35, this waste is managed as follows.

This scenario looks at the potential for increasing the proportion of waste which is currently recycled or composted by diverting some of the materials which currently go to landfill.

	Domestic	Commercial inert	Commercial mixed
Re-used (for landfill cover)		61.3%	
Recycled	6.8%		0.6%
Composted	13.5%		0.5%
Energy Recovery	22.7%		1.6%
Landfill	57.0%		36.0%

Table 35: Current Waste Management Options used on the Isle of Wight 1998/99

Note: these percentages are based on disposal of waste, not on waste collected, the difference being moisture lost in processing.

Of the domestic waste, around 13,000 tonnes of civic amenity waste and 1,765 tonnes of mixed waste is landfilled directly, together with around 17,000 tonnes of fine and heavy material generated by the Refuse Derived Fuel (RDF) plant in the course of processing waste into fuel for incineration. As described on page 9, the civic amenity waste consists of a majority of processed goods, of which insufficient data exists to enable detailed consideration here. However, Island Waste Services are investigating recycling opportunities for the waste electronic and electrical (WEE) goods which form part of this waste. The RDF heavy material consists of mixed material, screenings, nappies, organics and some textiles, plastics, paper, metals and glass. About half of the fine material is organic waste. Subsequent to the data collection period, this fine organic waste is now composted and used for landfill cover.

There is less data available on the specific content of the 39,000 tonnes of commercial mixed waste which goes to landfill, and there would be great benefit to be gained from improved data collection on the composition and sources of this waste. However, the estimates given in the resource analysis suggest that this waste could contain significant quantities of organics, metals, plastics, paper and glass which could be suitable for composting, recycling or energy recovery.

The Isle of Wight has a level of recycling and composting of household waste significantly higher than the national average at 20.3%. The Government's Waste Strategy 2000 recommends that Authorities with recycling/composting rates over 15% in 1998/99 should aim to reach 33% by 2003. This would mean that a further 8,000 tonnes would need to be recycled or composted rather than landfilled. Further growth in the amount of waste generated (which nationally is growing at 3% per year) would obviously increase this amount. The increase in recycling or composting could be achieved by a combination of a number of measures, which would aim to encourage wider participation in existing collection schemes, and to increase the range of materials collected, as follows.

Organic waste

Currently, significant amounts, around 8,000 tonnes, of green waste are collected from garden waste deposited at civic amenity sites, and organic kitchen waste from kerbside collection, together with 500 tonnes of organic waste from commercial sources. This green waste goes to Island Waste's new Composting Plant, which processes the waste in 14 days to produce compost for re-sale. The capacity of this existing plant is 15,000 tonnes, so it may be possible to process up to another 6,500 tonnes of organic waste. By expanding the existing kerbside collection scheme to include a wider range of domestic sources and commercial businesses, such as hotels and public houses, this amount of organic waste could be collected and composted.

This would affect material flows, and so environmental impact, in two main ways. The extra organic waste collected and composted would be diverted from going to landfill (for commercial waste), so that the embodied energy would be recovered rather than being lost. The second is by offsetting that amount of compost or artificial fertiliser which would otherwise be imported. This would result in a reduction of the Ecological Footprint by 6,300 ha or 0.05 ha per capita.

Paper and card

Paper and card from both domestic and commercial sources which is collected from kerbside, civic amenity and recycling centres goes directly into the waste incineration plant because of its high calorific value. Where the distance to a paper recycling facility is large, the extra energy that would be involved in transporting the wastepaper for processing can make local incineration with energy recovery the best practicable environmental option. However, if markets for recycled paper could be further developed, then the environmental and economic case for recycling would be greatly strengthened. Subsequent to the data collection period, Island Waste Services now send the collected paper for recycling off the Island, when the market price is sufficient to cover the transport costs. The relative environmental merits of different schemes to manage wastepaper depend strongly on the details of the case under study, and so quantification of the effect on the footprint of an increase in paper recycling has not been attempted here.

Glass

Currently, around 1,250 tonnes of glass from domestic sources are collected at civic amenity and recycling centres, and sent to Yorkshire for recycling, together with 80 tonnes from commercial sources. An unknown amount of glass goes to landfill, though Island Waste Services speculate that there may be significant quantities in the commercial mixed waste, arising from hotels and public houses. Thus, the first step to increase the potential for recycling of glass is for such institutions to undertake audits of the amount of glass waste that they produce. There may be economic as well as environmental benefits for the business, as materials collected for recycling or energy recovery avoid the cost of the landfill tax, currently £11 per tonne for active waste.

An increase in the amount of glass recycled would affect material flows and environmental impact as follows. Additional glass would be exported from the Island to the recycling plant, and some additional energy for transport and the recycling process would be used. However, there would be a reduction in the environmental impact on a life-cycle basis, because the embodied energy in a bottle made from recycled materials is less than the embodied energy in a bottle made from virgin materials. This is reflected in a net reduction of the Ecological Footprint related to consumption and disposal of glass bottles, because the footprint is calculated on the basis of life-cycle impacts. The reduction in the Ecological Footprint if an extra 200 tonnes of glass were recycled and the recycled bottles replaced the use of bottles from virgin materials would be 22 ha or 0.0002 ha per capita.

Aluminium and Ferrous metals

Both aluminium and ferrous metals (iron and steel) are potentially suitable for recycling.

Around 40 tonnes of aluminium and 850 tonnes of other metals are currently collected at recycling centres or separated out from the mixed waste at the RDF plant. The aluminium is sent 140km for recycling at Swindon, and the ferrous metals are sent 330km for recycling at Llanelli.

It is believed that significant amounts of these metals still currently end up in landfill. Around 100 tonnes of aluminium and 130 tonnes of steel are estimated to be in the heavy waste from domestic and commercial sources at the RDF plant. Significantly larger quantities are estimated to be in the commercial mixed waste sent direct to landfill.

In order to increase the rates of recycling of these metals, it would be necessary either to expand the sorting of waste or separation at source. Again, it may be economically as well as environmentally favourable for small commercial businesses to separate and send for recycling their aluminium and ferrous metals, in order to avoid the cost of the landfill tax.

An increase in recycling by an estimated amount of 400 tonnes of aluminium and 1,000 tonnes of ferrous metals would affect material flows and environmental impact as follows. Additional aluminium and ferrous metals would be exported from the Island for recycling, and additional energy for transport and the recycling process would be used. Again, there would be a reduction in the environmental impact on a life-cycle basis, because the embodied energy in recycled materials is less than the embodied energy in virgin materials. For aluminium and steel, material and energy savings over the life cycle of up to 90% can result from recycling.

This results in a net reduction of the Ecological Footprint related to consumption and disposal of aluminium by 3616 ha or 0.03 ha per capita and of steel by 1260 ha or 0.01 ha per capita, because the footprint is calculated on the basis of life-cycle impacts.

Other factors

Several other factors influence the development of recycling on the Island. Firstly, any increase in recycling of domestic waste will divert material from the current mixed waste stream away from the Refuse Derived Fuel (RDF) plant.

However, it is likely that this could be substituted by material of the same or higher calorific value from the commercial waste stream.

A second key factor is the development of markets for recycled goods. This is vital to ensure that recycling makes economic as well as environmental sense (Murray 1999).

Schemes to encourage the use of recycled glass and cans on the Island form the other side of the coin to efforts to increase recycling rates.

The sorting of household waste into separate waste streams for paper, glass, aluminium cans and compostible material is another key factor, which is important for both economic and environmental reasons. Later sorting of mixed waste into its components is unpleasant, labour-intensive work, and can greatly add to the economic costs of recycling.

Ecological Footprinting

The Ecological Footprint can now be used to estimate the reduction in the environmental impact due to consumption on the Island if a combination of the above actions were taken (see Table 36).

The footprint calculations include the life cycle impacts (including embodied energy and transport) of the waste materials. As described above, the compost footprint calculation includes contributions from both the recovery of embodied energy and the offset of imported compost or artificial fertiliser.

The footprints for additional recycling of glass, aluminium and ferrous metals are calculated on the basis of the net reduction in embodied energy over the life cycle for a glass bottle or an aluminium or steel can made from recycled rather than virgin materials.

Measure taken	Reduction of impact due to…	Reduction of per capita footprint (ha)
Extra 6,500 tonnes of waste composted	…recovery of embodied energy and offsetting imports	0.05
Extra 200 tonnes of glass recycled at present location	…reduced embodied energy over life-cycle	0.0002
Extra 400 tonnes of aluminium recycled at present location	…reduced …embodied energy over life-cycle	0.03
Extra 1,000 tonnes of ferrous metals recycled at present location	…reduced embodied energy over life-cycle	0.01
Total (all measures)		**0.09**

Table 36: Summary of impact reduction options

Waste Minimisation scenario

In this section, scenarios for reducing levels of consumption, thereby reducing material inputs and waste arisings, are investigated.

The previous section looked at the potential for different ways of dealing with the current amount of waste, in order to recover at least some of its value. However, as reflected in the 'waste hierarchy' described above, it is even more important to try to reduce the amount of waste created in the first place. Again, the first step in reducing the amount of waste created is to have an accurate inventory of current waste levels. As shown above, the total levels of different domestic waste categories are reasonably well known, but the composition of commercial mixed waste is still uncertain.

Under the Best Value initiative, local authorities in England and Wales must set themselves a series of targets for performance on waste management, and prepare an action plan for their delivery. The Waste Strategy 2000 (DETR 2000) requires that, in addition to the targets for recovery, recycling and composting above, local authorities should set targets for household waste reduction. The Strategy asserts that authorities should set targets to reduce significantly the growth in household waste per head and, where possible, to halt or reverse that growth. This scenario looks at the potential for meeting such targets through waste minimisation, i.e. the reduction of the amount of waste produced by households and businesses.

Businesses

The first step in waste reduction for businesses is to assess the waste that is produced and look for straightforward ways to reduce this. Though this can be done on an individual business basis, it is often more constructive for businesses to do this using a partnership approach. Already, an Energy and Waste Management Club is running on the Island to facilitate the sharing of information and good practice. The Club is affiliated to the Government's Environmental Technology Best Practice Programme (ETBPP 2000), which aims to demonstrate the benefits of managing resource use and reducing environmental impact to companies across the UK, building on experience being built up throughout the country.

A 'Building Better Business' initiative has also been undertaken on the Island, in association with the local Business Link. This initiative, aimed at smaller and medium sized firms, has produced a set of 10 booklets, entitled 'Green Tips for Profit', which outline simple and practical ideas on how to reduce costs and raise business profile, while helping to protect the environment. This covers a wide range of areas, including energy and water use, reducing waste, the working environment and environmentally-friendly purchasing. As waste is, by definition, anything which does not contribute to the final value of the product or service being delivered, an assessment of value added and wastes produced is the first step. Setting environmental goals and priorities, for example annual targets for reduction of particular wastes, is the next step. This should be communicated to staff and customers, for example by producing an environmental policy statement. A monitoring process should be put in place to assess the environmental and economic savings made.

Packaging

One particular area in which waste reductions can be achieved is that of packaging. As described on page 25, both food packaging, at 15,968 ha, and non-food packaging, at 3,746 ha, make significant contributions to the Island's Ecological Footprint. From supermarket plastic bags to bubble-wrapped consumer goods, packaging is now ubiquitous in modern society. However, it frequently becomes waste as soon as the product inside is unwrapped. Simple measures such as using re-usable shopping bags or asking producers or retailers to take back unwanted packaging can greatly reduce unnecessary waste.

This last step is likely to become more widespread in the future with steps to make producers retain responsibility for the eventual disposal of materials they produce. The UK Government has already implemented such 'Producer Responsibility Obligations' for Packaging Waste. These obligations require larger producers to be responsible for recovering specified tonnages of packaging waste. The aim of these obligations is to stimulate measures to reduce the amount of packaging produced in the first place. Under further EU proposals, similar rules will soon apply to the makers of cars, electrical and electronic goods and batteries. These measures will create strong incentives for producers to reduce the amount of their product which ends up as waste, as well as to greatly increase the recycling and re-use of waste that is created. This will require the creation of partnerships between businesses, householders and local communities, such as waste management and reduction clubs.

Households

There are other steps that householders can take to reduce the amount of waste that they produce, for example, by choosing more durable products. If a product lasts longer, then the natural resources from which the product is made are being used in a more efficient way to deliver the services that people want. This is one example of the general principle that we need to use natural resources more efficiently, in order to reduce the environmental impacts associated with their extraction, use and disposal (DETR 1999a). The key idea is that consumers want services, such as lighting, cleaning or computing power, rather than physical products, and that opportunities exist for service companies to meet these needs more efficiently using fewer material resources (von Weizsäcker et al. 1997). For example, a service contract for the leasing of computing equipment allows the customer to update the equipment as needed and requires the company to take back old parts or machines, which it can then recycle or repair and re-use. Another example is the creation of car pools, whereby the ownership of a small number of cars is shared between a larger number of people who can then make use of a car when required, on an agreed basis.

There are a number of other simple measures that householders can take to reduce waste and increase resource efficiency. These include buying re-usable or recyclable products and packaging, and saving water by preventing leaks and installing water meters and low-flow devices where appropriate (e.g. a 'Hippo' bag in the WC cistern).

The Government plans to pilot a number of possible schemes to create further incentives for householders to reduce the amount of waste they produce, including:

- performance rewards (cash or vouchers),
- supermarket reward schemes (loyalty card points or vouchers in exchange for recycling materials in bring back schemes),
- prizes for recycling, and
- intensive education programmes.
- The Island could benefit greatly by bidding to host one of these pilot schemes.

These waste minimisation and resource efficiency measures reduce environmental impact by reducing the flow of materials and resources needed to satisfy end-use services.

Ecological Footprinting

The impact of individual measures is difficult to quantify, due to the lack of detailed data available on consumption patterns Nevertheless, the reduction in the environmental impact of consumption on the Island can be estimated if a combination of the above waste reduction measures by businesses and householders were taken. This assumes that current waste management practices are maintained under the reduced flow of waste.

The reduction of the Footprint is calculated on the basis of a reduction in the total waste Footprint due to a reduction in the embodied energy of materials going to waste. It would be expected that these measures would result in a similar reduction in the Footprint of materials coming on to the Island. This is because the measures described aim to provide the same level of service provision to customers using fewer material inputs.

Table 37 illustrates the effect on the Footprint of a range of scenarios related to various targets which could be set for waste reduction, ranging from a relatively modest 5% reduction to a more challenging 20% reduction.

These calculations assume an equivalent percentage reduction in all domestic and commercial waste streams. If reductions were focussed on materials with high Footprints, based on life cycle impacts, such as metals and plastic, then the reduction in the Footprint would be higher.

Measure taken	Reduction of impact due to…	Reduction of per capita footprint (ha)
5% reduction in domestic & commercial waste produced	…reduction in embodied energy of materials	0.08
10% reduction in domestic & commercial waste produced	…reduction in embodied energy of materials	0.16
20% reduction in domestic & commercial waste produced	…reduction in embodied energy of materials	0.31

Table 37: Footprint reductions obtained through waste minimisation measures

The most challenging scenario, a 20% reduction in waste produced, would thus reduce the Island's Ecological Footprint by around 7%, indicating a significant reduction in environmental impact of production and consumption on the Island.

Energy Use

The direct land use and land required to reabsorb carbon emissions resulting from energy use on the Island make a significant contribution to the Island's Ecological Footprint. In this section, scenarios are investigated for reducing this contribution to the footprint, both on the supply side by increasing the proportion of energy generated from renewable sources, and on the demand side by applying energy efficiency measures.

Renewable energy generation scenario

This scenario looks at the potential for the generation of electricity from renewable sources on the Island. The current generation mix of sources for Scottish and Southern Electric is shown in Table 38.

Source	Share
Natural gas	52%
Nuclear	19%
Coal	17%
Renewables	9%
Oil	2%
Other fuels	1%

Table 38: The current mix of energy sources for Scottish and Southern Electric
Source: Scottish and Southern 2000

The main renewable sources on the Island with the greatest near-term potential are likely to be generation of electricity from wind and biomass energy crops. In the medium term, there would also be potential for solar thermal water heating and solar photo-voltaic electricity generation, as the cost of these technologies reduces.

Wind energy

The coastal location of the Isle of Wight makes it an ideal location for wind generation, though the availability of land and potential visual intrusion may present problems. Nevertheless, wind turbines can be integrated with other types of land use, particularly agricultural uses. In order to estimate the potential, consider a wind farm consisting of 18 wind turbines of 500 kW capacity each. This is a typical medium-sized modern wind turbine, standing 41.5 m high. Assuming these turbines were placed in two rows 600 m apart, with a spacing of 200 m between each turbine, this would require around 100 ha of land, equivalent to 300 ha of average global bioproductive land. However, the wind turbines only occupy 5-10% of the total land area, and the remainder can still be used for agricultural or other purposes. Based on typical average wind speeds on the Island of around 6.5 m/s, such a wind farm would produce an annual output of 19.8 GWh. This would represent 3.7% of the total annual electricity demand on the Island. Schleisner (2000) has estimated that such a wind farm would require 13 GWh of embodied energy for the material production and eventual disposal of the turbines, using a life cycle assessment model.

If the wind farm displaced an equivalent amount of electricity generated from the current mix of sources, this would reduce environmental impact by displacing the CO_2 emissions produced in the generation of 19.8 GWh of fossil-based electricity. This would reduce the Ecological Footprint by 1,840 ha. The wind farm itself would have a Footprint of 120 ha due to the embodied energy (assuming fossil-based electricity) and 30 ha of land (10% of 300 ha) required to site the turbines. This gives a net reduction of the Ecological Footprint by 1,690 ha or 0.01 ha per capita.

Biomass energy crops

The relatively high proportion of arable and pasture land on the Island means that there is potential for growing and using biomass energy crops. These crops could also be grown on set-aside land, i.e. land which farmers are paid to leave fallow, in order to prevent over-production. The crop thought to be most suitable to the Southern England climate and soil conditions is short-rotation coppice. Short-rotation coppice consists of fast-growing trees, typically willow, grown in plantations and harvested every 3 to 4 years. For a typical modern plant, the wood is harvested, chipped, dried and gasified to fuel a combined cycle gas turbine to produce electricity. A typical 5 MW generator would produce an annual output of 37.5 GWh of electricity. Assuming a yield of 15 oven dried tonnes per hectare per year, and an output of 0.005 GWh/tonne (ETSU 1994), this would require 500 ha of planted land. This is equivalent to 1,275 ha of global average bioproductive land. If the planted coppice wood were supplemented by off-cuts from existing forests and woods, which are thought to be quite extensive on the Island, the area of plantation needed would be reduced. In addition, this would require an annual input of 0.5 GWh of non-renewable energy for collection and transportation.

The reduction of the Ecological Footprint by biomass energy generation will be due to the displacement of CO_2 emissions from the current generation mix, as short-rotation coppicing is CO_2 neutral over the life cycle (with the exception of non-renewable energy used in processing and transport). The displacement of CO_2 emissions reduces the Ecological Footprint by 3,490 ha, but the land area required for biomass production is 1,275 ha plus 30 ha for collection and transportation (assuming diesel fuel). This gives a net reduction of the Ecological Footprint by 2,185 ha or 0.02 ha per capita.

To site a coppice plantation and generating plant of this size on the Island would require consultation with local residents, as well as the farmers themselves. The wood fuel would provide a consistent income for the farmers involved, but this would clearly need to be equal to or higher than current incomes. Short-rotation coppicing may also have additional beneficial environmental impacts, compared to conventional cultivation, in terms of reduced soil erosion rates, enhanced biodiversity and increased landscape and amenity value.

Energy Efficiency scenario

In this scenario, the potential for increasing the efficiency with which energy services are provided to domestic and commercial users is investigated.

There are a number of ways of reducing the energy consumed and so the required Footprint, whilst maintaining the energy services provided. For domestic users, these include the installation of more energy efficient appliances, such as fridges or washing machines, increases in levels of insulation, such as double glazing or loft insulation, or using more energy-efficient compact fluorescent light-bulbs (CFLs). As an example, the case of CFLs is considered.

CFLs

A compact fluorescent light bulb (CFL) uses 60-75% less electricity than a traditional incandescent bulb, while lasting around ten times as long (Palmer and Boardman 1998). This means that they can deliver substantial savings in terms of both electricity and money. However, the high initial cost of CFLs, around 10-20 times the price of an incandescent bulb, means that they have not so far achieved a wide market penetration. Nevertheless, a typical CFL will pay back the initial investment in 2 to 3 years, depending on its usage and the electricity charges, with savings thereafter. An average UK household has less than one CFL, compared with 18 incandescents. If one 60 Watt incandescent bulb used for 3.5 hours a day were replaced, at the end of its life, by a 20 Watt CFL which would provide an equivalent light output, then this would save the householder 51 kilowatt-hours (kWh) per year. At a typical electricity cost of 7 p/kWh, this would save over £3 per year. A CFL costing £6 would thus pay back the initial investment within two years.

If this were done in each of the 51,000 households on the Isle of Wight, this simple measure would provide an annual saving of 2.6 GWh of energy. This would reduce the Ecological Footprint of the Island by 242 hectares, or 0.002 ha/capita. More widespread adoption of CFLs would reduce the Footprint by proportionally larger amounts.

Of course, there are a number of barriers to the take up of CFLs. The main ones are that they are considered too expensive or that the consumer is unaware of the potential savings, and is not being provided with this information. To overcome this, the Isle of Wight Council could work with the main supplier, Scottish and Southern Electricity, to provide each household with a CFL free of charge or at a reduced rate, accompanied by an explanatory leaflet. Such a scheme could contribute to the company's commitment under the DTI 'Standards of Performance' programme. Once a customer has one CFL appropriately installed, they are more likely to buy more.

Insulation and efficient appliances

Investment in household infrastructure improvements, such as insulation and double glazing, together with buying energy efficient appliances, can improve the efficiency with which energy services are delivered and save householders money. As well as producing environmental benefits, this can have a large social benefit, in helping to reduce fuel poverty. Fuel poverty occurs when poorer households can not afford to heat their homes to a reasonable standard, because large amounts of the energy used are lost due to poor insulation. The Energy Saving Trust (2000) estimates that an average three-bedroom semi-detached house could save 40% of the energy currently purchased, and so 40% of its energy bill, while maintaining or improving the level of energy services delivered. These measures can be supported by the local authority providing free household energy audits under the Home Energy Conservation Act 1995 (HECA) scheme.

If such measures were implemented in half of the households on the Island, i.e. 25,000 households, this would provide an annual saving of 54 GWh of energy. This would reduce the Ecological Footprint of the Island by 5,022 hectares, or 0.04 ha/capita.

Summary

The above scenarios illustrate the potential of a range of options for reducing the Ecological Footprint of production and consumption on the Isle of Wight. They represent only a selected set of options, but they aim to include some of the most feasible in the short and medium term. Other options could be suggested by the material flow and Footprint analyses. For example, looking at passenger transport, the switch of some journeys from car to bus or train would reduce the impact per passenger-kilometre. This could be stimulated by incentives for the use of current bus and train routes, or extensions to current routes.

The scenarios illustrate the need for a collaborative approach between the many different actors involved in supply and consumption chains. For example, to implement the options in the renewable energy generation scenario would require co-operation between electricity generators, current land-owners and users, and regulatory and planning authorities, including the Environment Agency and the Isle of Wight Council. Similarly, the waste recovery and waste minimisation scenarios would require partnerships between the waste operator, Island Waste Services, the Council and local producers, retailers and consumers. Work is already underway to create such partnerships and to share information and good practice, for example through the Island's Energy and Waste Management Club. The Isle of Wight Council has a key role to play, representing the wishes and aspirations of Islanders, to support and facilitate such collaborations and partnerships, wherever possible.

The scenarios also illustrate the use of Ecological Footprinting as a tool, not only to quantify the environmental impact of current consumption patterns, but also to estimate the potential for the reduction of that impact resulting from a range of possible options. Whilst these estimates must be treated with care, they do allow a first comparison of the environmental benefits of different options. Of course, as noted, many of the options would also have other social and economic benefits which are not captured in the Footprint calculations. Nevertheless, the calculations show that, even though individual measures may only have relatively small benefits, a combination of a range of measures could bring a significant reduction in the Island's overall Ecological Footprint.

As described earlier, in order for the Isle of Wight to be sustainable, i.e. for the Islanders to only appropriate the share of global average bioproductive space proportional to their share of global population, would require a dramatic reduction from the Island's current Ecological Footprint of 4.47 hectares per capita to the average earthshare of almost 1.9 hectares per capita. This would require widespread action to increase the efficiency with which resources are used to provide the goods and services that people want and to reduce global social and financial inequalities. The box at the end of this Report illustrates what a sustainable pattern of consumption for the Island may look like, incorporating a range of measures including some of the scenario options described above.

The natural beauty of the Isle of Wight helps to make it such a pleasant place to live for the Islanders and to visit for the many tourists who keep returning. The above scenarios describe some of the ways that the impact of consumption on the Island's local environment and on the wider global environment could be reduced, whilst maintaining or enhancing the quality of life for all who live on or visit the Island.

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Sustainable Resource Programme

Details of current projects in the Sustainable Resource Programme, funded by Biffaward, are listed below.

For updates to this project listing visit www.biffa.co.uk or www.biffaward.org.uk.

	Project Title	Organisation	Contact details	Address	10% Contributors
B/1119	4sight *This project will analyse the growing body of data on resource flows.*	National Centre for Business & Sustainability (NCBS)	Dr Mary Parkinson Project Manager 0161 295 5276 m.parkinson@thencbs.co.uk	The Peel Building, University of Salford, Manchester M5 4WT	The Co-operative Bank
B/1170	Waste reduction, reuse and recycling in construction – demonstration projects	CIRIA	Sophie Mason Researcher 0207 222 8891 sophie.mason@ciria.uk.org	6 Storey's Gate, Westminster, London SW1P 3AU	AMEC Civil Engineering Ltd
B/1190	Zero Emissions Leicestershire	Environ Trust Ltd	Dave Corbett Business Development Director 0116 222 0222 info@environ.org.uk	Parkfield Western Park Leicester LE3 6HX	Leicestershire Training & Enterprise Council Ltd
B/1195	Sustainable Tourism – Measuring Progress	WWF-UK	Joss Tantram Business & Education Manager 01483 412487 jtantram@wwfnet.org	Panda House Weyside Park Catteshall Lane Godalming Surrey GU7 1XR	The Rufford Foundation
B/1204	Evaluation of waste production, utilisation and brokerage potential within the UK furniture industry	Furniture Industry Environment Trust (FIET)	Craig Bartlett Project Coordinator 01438 777606 cbartlett@fira.co.uk	Maxwell Road Stevenage Herts SG1 2EW	The Symphony Group plc Hadfield Wood Recyclers Talbotts' Heating Ltd Hands of Wycombe Biffa Waste Services Ltd
B/1224	Waste Management Project for Schools	Southampton Environment Centre	Mark Goldthorpe Environment in Business Manager 02380 336199 eib@sec.gn.apc.org	Gracechurch House 25-35 Castle Way Southampton SO14 7SJ	Siemens Building Technologies Ltd Hampshire TEC Conservation Engineering Ltd

B/1228	Education for Sustainability 'e4s'	Head, Teachers & Industry Ltd (HTI)	Anne Evans Chief Executive 02476 410104 a.evans@hti.org.uk	Vanguard Centre University of Warwick Science Park Coventry CV4 7EZ	Salvation Army Trading Company Biffa Waste Services Ltd
B/1265	Developing the foundations of a national strategy for agricultural waste management	Westcountry Rivers Trust	Arlin Rickard Director 01395 277755	Bradford Lodge Blisland Bodmin Cornwall PL30 4LF	Environment Agency
B/1271	Analysis of UK packaging waste flows	University of Leeds Environmental Trust	Kathy Brownridge Senior Assistant Registrar 0113 233 6050	University of Leeds Leeds LS2 9JT	Valpak Ltd, Difpak Ltd, Incpen, SmithKline Beecham plc, Recycle UK, Biffa Waste Services Ltd
B/1352	More sustainable waste management practices for vehicle tyres using a mass balance approach	Viridis	Mike Head Managing Director 01344 770044 mhead@trl.co.uk	Crowthorne Business Estate Old Wokingham Road Crowthorne Berkshire RG45 6AU	Highways Agency, The National Tyre Distributors Assoc., British Tyre Industry Federation, Department of Trade and Industry, REG UK Tyre & Automotive Recycling, Waste Tyre Solutions Ltd
B/1355	Landfill sites carbon balance evaluation scheme	Industrial Sustainable Development Group (ISDG)	Dr Terence Dawson Research Fellow 01865 281189 terry.dawson@ecu.ox.ac.uk	Environmental Change Unit University of Oxford 1A Mansfield Rd Oxford OX1 3TB	TXU Europe Power
B/1406	Mass balance of the construction industry to improve sustainability	Viridis	Mike Head Managing Director 01344 770044 mhead@trl.co.uk	Crowthorne Business Estate, Old Wokingham Road, Crowthorne, Berks. RG45 6AU	Highways Agency, WS Atkins Consultants Ltd, Laing Technology Group

B/1410	Furniture packaging optimisation – research to reduce waste	Furniture Industry Environment Trust (FIET)	Craig Bartlett Project Coordinator 01438 777606 cbartlett@fira.co.uk	Maxwell Road Stevenage Herts SG1 2EW	Symphony Group Plc, Silentnight Holdings Plc, Fitted Furniture Centre Ltd
B/1411	Sustainable Timber Waste Management: Information Site	Timber Industry Environment Trust (TIET)	Stephen Riddiough TIET Projects Manager 01494 563091 sriddiough@trada.co.uk	Chiltern House Stocking Lane Hughenden Valley High Wycombe Bucks HP14 4ND	Timber Research & Development Association (TRADA)
B/1412	Mass Balance Study of the UK Paper and Board Sector	SWEET	Sally Campbell Executive Officer 0117 904 5858 s.campbell@lyonsdavidson.co.uk	Bridge House 48-52 Baldwin Street Bristol BS1 1QD	The Paper Federation of Great Britain Ltd
B/1424	Benchmarking solvent waste in the UK furniture manufacturing sector	British Furniture Manufacturers Ltd	Alastair Bromhead Environmental Consultant 01296 399059 info@bfm.org.uk	30 Harcourt Street London W1H 2AA	Granyte Surface Coatings Plc, Viatec, W M Bartlett & Son Ltd, Wood Bros (Furniture Ltd), Bevan Funnell Ltd
B/1448	Sustainable market for waste glass from fluorescent tubes and lamps	National Centre for Business & Sustainability	Dr Mary Parkinson Project Manager 0161 295 5276 m.parkinson@thencbs.co.uk	The Peel Building University of Salford Manchester M5 4WT	Mercury Recycling Limited

Forum for the Future are co-ordinating data collection and presentation for the series of Biffaward Sustainable Resource Use projects. Contact: c.linstead@forumforthefuture.org.uk.

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Transco
Wight Bus
Wightlink Ltd
Woolworths

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Best Foot Forward

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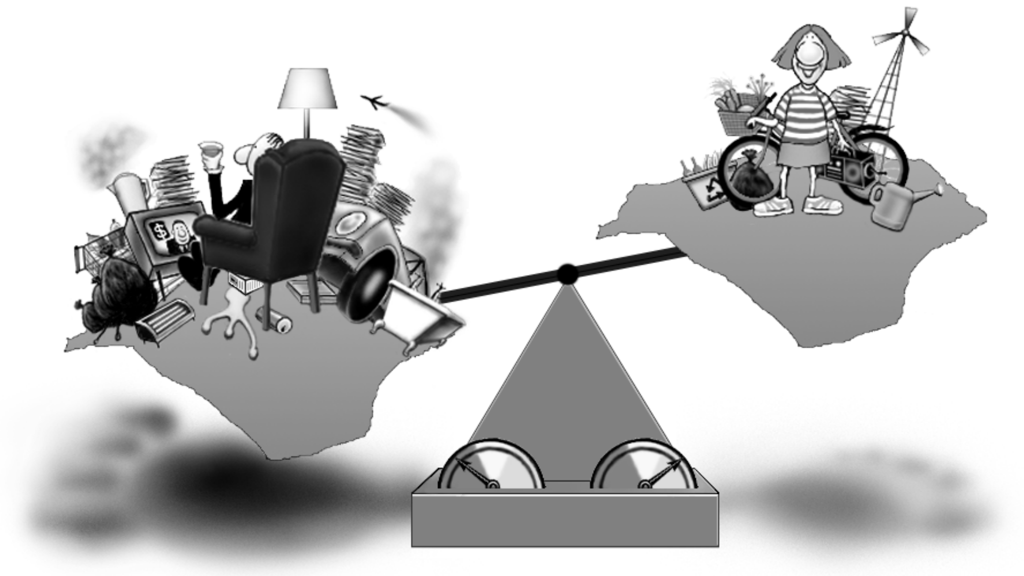
The Average Islander



The average Islander currently consumes almost 2½ times the sustainable average 'earthshare'.

They currently…

- Produce over 480kg of domestic waste, just over half of which is sent to landfill. (10,000 m^2)
- Use more than 2,000 kWh of electricity at home per year, most of which is supplied by fossil fuels. (5,000m^2)
- Waste food and pay little attention to where food is produced. (10,000 m^2)
- Travel mainly by car and take one holiday a year requiring travel by aeroplane. (7,500 m^2)
- Have a low domestic usage of gas. (1,000m^2)
- Are relatively frugal with their use of hot and cold water (100 m^2)

This results in the individual's contribution to the Island's Footprint of 3.36 ha or 33,600 m^2. The economy and public services on the Island add another 1.11 ha or 11,100 m^2 to the Islander's per capita footprint.

To be ecological sustainable an Islander would need to live within the 'average earthshare' (roughly 1.9 hectares in 1998).

Assuming current technologies prevailed, they would need to…

- Produce little or no waste and re-use and recycle wherever possible (3,500 m^2)
- Conserve energy and buy electricity from renewable sources (200 m^2)
- Eat locally grown, vegetarian food and compost food waste (3,200 m^2)
- Travel mostly by foot, bicycle or public transport and holiday closer to home (2,000 m^2)
- Use heating sparingly and have excellent home insulation (1,000 m^2)
- Be frugal with their use of hot and cold water (100 m^2)

This would give an individual's contribution to the Island's Footprint of 1 ha or 10,000 m^2. The remaining 10,000 m^2 could be used by public services and for the benefit of the wider Island economy.

Note: The bulleted lists above show approximate footprint values in brackets. These are derived from the Global Steps™ card game. See www.bestfootforward.com for further details including the assumptions used to derive the footprint figures.