

An ecological footprint analysis of

Essex

- East England -



Commissioned by
Essex County Council

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Executive Summary

The main aim of the Essex Ecological Footprint project was to estimate the environmental sustainability of the lifestyle of Essex residents using the ecological footprint as the indicator of consumption. In tandem with this, the region's current ecological capacity was also calculated in order to compare demand with available supply.

These are the first calculations of the region's ecological footprint and biocapacity, and used the most recent official published sources, typically 2001/02 data, supplementing these with information from Kevin Jones (Essex County Council Environmental Services) and from a variety of other government departments.

Data availability was good but incomplete. Where consumption data was not available for Essex, regional data from the East of England was used.

Consumption data used to calculate the ecological footprint and biocapacity of the region is set out in full in this report and presented under the following components:

- Materials and waste
- Food
- Direct Energy use
- Personal transport
- Water, and
- Land use

The ecological footprint is broken down into its constituent components and compared with United Kingdom (UK) figures. The total ecological footprint of Essex was found to be 5.57 gha per capita. This is slightly higher than the UK figure of 5.45 gha. This difference is primarily due to transport in Essex, and more specifically to higher levels of car and rail travel.

As with all other UK regions that have been investigated, the footprint of the average Essex resident exceeds the average sustainable 'earthshare' of 1.9 gha per capita.

Thus, if everyone on the planet consumed as much as the average Essex resident, we would require 2.9 planets to sustainably support global resource consumption.

The per capita ecological footprint of Essex was also compared to the bioproductive capacity of the region. This illustrates the potential for regional sustainability. The high population density of Essex (377 people per km² as compared with a UK average of 245 people per km²) results in a low available biocapacity per person. The total biocapacity of Essex is 1.24 gha per capita compared with a UK figure of 1.6gha. This local 'supply' contrasts starkly with the local 'demand' of 5.57 gha per capita. Expressed another way, Essex would need to be 4.5 times larger in order to sustain local consumption patterns.

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Sustainable Development

National and International

The UK Government was one of 178 governments that adopted a declaration at the Earth Summit in Rio de Janeiro in 1992, committing them to making development sustainable. A number of initiatives have arisen out of this Rio Summit at both national and international levels.

The UK Government's strategy for achieving sustainable development is set out in *A better quality of life*¹. As a direct result, local authorities in the UK were given new powers in the Local Government Act 2000 to promote the social, economic and environmental well-being of their area and a new duty to work with local partners to prepare a community strategy. To support the exercising of these new powers, the Audit Commission recently published a local set of 38 *Quality of Life* indicators (Audit Commission, 2002). These form part of the reporting mechanism for Local Strategic Partnerships (LSPs). The intention is to adopt the ecological footprint as an aggregated indicator of environmental sustainability.

At the European level, the EU Commission has established a common set of 11 regional sustainability indicators. To date, these have been partly incorporated into the UK Audit Commission's set of indicators. They include the ecological footprint as an aggregated indicator of environmental impact.

The Regional Stepwise™ ecological footprint methodology, used in this report, is entirely compatible with the EU common indicators approach (see Appendix C). The underlying methodology has been adopted by the European Commission as part of their European Common Indicators Project and is likely to be adopted by the UK Audit Commission (2002) as part of their *Quality of Life Indicator* set.

¹ http://www.sustainable-development.gov.uk/uk_strategy

Sustainable Development in Essex

Following the Earth Summit in Rio de Janeiro, the UK Government signed up to Agenda 21, which was to be implemented at regional and local level. In response to this the Essex Environment Forum was established in March 1997, bringing together local authorities, education institutions and resource providers. This forum provided the administrative structure through which Essex's Local Agenda 21 could be developed (Essex County Council, 1999).

In 1999 *The Sustainability Report for Essex* (Essex County Council, 1999) was published highlighting a core set of sustainability indicators, which illustrate the current state of the environment in Essex. Although this report did not set out any policies or objectives, it did state what was expected from its sustainability indicators:

- They need to be in a form that the general public understands and relates to.
- They should simplify the link between any socio-economic activities and their respective environmental impacts as well as providing, where appropriate, an 'early warning system' for potential environmental problems .
- They need to be able to identify which policies are achieving their aims of sustainable development and to what extent.
- Finally, indicators need to have clarity so that there is no confusion between environmental and economic data.

Essex has identified 22 indicators covering three main sections of sustainable development: Economic development, community development and ecological development. The entire list of indicators is available in Appendix D.

In order to raise awareness on sustainability issues, the County Council released *Towards a Better Quality of Life for Essex: Into the Future with Local Agenda 21* (Essex County Council, 2000). This report effectively provides the strategic framework by which the County Council plans to facilitate sustainable development.

In February 2000, the County Council set out its policies and practice towards sustainability and referred to them as the *Essex Approach* (Essex County Council,

2000). Essex's commitment to sustainable development can be illustrated through its key policy goals, which have been approved through public and partner consultations:

1. *Making our communities safe, caring and healthy*
2. *Creating a thriving economy in a sustainable environment*
3. *Providing opportunities for lifelong learning and creative leisure*

(Essex County Council, 2000)

It is within this context that Best Foot Forward was asked to undertake the first ecological footprint analysis of Essex ².

² Further information about ecological footprint analysis is contained in Appendix A.

Aim of the Essex Ecological Footprint Project

Commissioned by Essex County Council, the aim of the Essex Ecological Footprint project was to undertake the first ever ecological footprint and biocapacity analyses of this region of England.

Specific study outputs were to:

1. Undertake secondary data research using official data sources
2. Utilise these to calculate the main components of the region's ecological footprint (the impact on the environment), and
3. Determine the locally available biocapacity (supply)

Outputs include:

1. A report which:
 - a. Describes the results of the component-based ecological footprint analysis
 - b. Describes both the resource 'demand' (the ecological footprint) and regional 'supply' (the biocapacity), and
 - c. Assesses the sustainability of Essex
2. An interactive spreadsheet tool which presents the component results

This project was completed by staff at Best Foot Forward Ltd, Oxford to budget and satisfies all the outputs above.

Profile of Essex

Essex County Council is one of 6 county councils that make up the East of England region. It is situated on the east coast of England and is bordered by Hertfordshire to the west, Cambridgeshire and Suffolk to the north and London to the southwest. Essex covers the unitary authority areas of Southend-on-sea and Thurrock. The county of Essex has the highest residential population in the East of England of 1,310,835 residents and 544,701 households (ONS, 2001).

The land area of Essex extends to over three thousand four hundred square kilometres (3,477 km²) with an estimated 29% of it being arable land, 60% pastureland, 4% woodland and 7% urban Essex also has over 300 km of coastline (Pers. Comm, 2003). The region is recognised for its combination of traditional seaside resorts and new urban settlements (EEDA, 2003). There are 2 sites designated as Special Areas of Conservation and Protection, 7 national nature reserves and 26 local nature reserves (English Nature, 2003). Essex has over 13,907 historic buildings that are designated as Listed Buildings and 764 scheduled monuments of which 34 are listed buildings.

Industry and business in Essex is mixed, however key employers are; Alba plc., Britvic Soft Drinks Ltd, Countryside Properties Plc., Ford Motors, KLM UK and Stansted Airport Ltd (EEDA, 2003).

The 'retail/wholesale trade, hotels & restaurants' industry employs the most people (26% of jobs) compared with 'public administration, education & health' (21%) and 'finance & business activities' (20%) (Essex County Council, 2002).

Resource Consumption

This section reviews and summarises the available data on the energy and materials consumption of Essex residents. Such data is required to perform the ecological footprint calculations. Data assumptions are presented in Appendix B.

Data Availability

This project relies on existing data obtained primarily from government departments, such as the Office of National Statistics (ONS) or via personal communications with Kevin Jones and other Essex County Council staff. Sources are referenced in the relevant data sections below.

Where local data was not available, regional data from the East of England was used as an alternative. It was agreed with the County Council that regional data does not vary significantly from Essex and that consumption patterns in the East are broadly representative.

The use of regional data does tend to mask any slight local differences in consumption and this should be borne in mind when considering the figures presented here. In future analyses it is hoped that the use of national and regional data could be reduced either by undertaking more primary research or by drawing on improved official data sources.

For the analyses, data for the year 2002 was used where possible. However, where this was not feasible, the most recent data was used. Resource data is presented below, under the following categories:

- Direct energy
- Materials & waste
- Food
- Personal transport
- Water
- Built land

Direct Energy

Available and estimated domestic and service sector energy data is presented in Table 1, and where available with fuel types. Essex's domestic energy consumption was assembled from one source, while service sector consumption was based on data for the East of England (See Appendix B for assumptions and notes).

Table 1: Essex energy consumption

Fuel type	Per capita consumption (kWh/yr)
Domestic energy	8,760
<i>of which...</i>	
Electricity (incl. renewables)	1,758
Natural gas & LPG	5,808
Heating oil, kerosene & gas oil, and coal.	1,194
Services energy	4,514
<i>of which...</i>	4,514
Hotels & restaurants	767
Health & education	1,226
Community, social & personal	801
Office & administration	882
Commerce	838
Total	13,274

Sources: ECI 2000, DEFRA 2001 and ONS 2001.

Materials & Waste

Personal contacts within the county council were able to provide Essex-specific waste data. The data on domestic waste arisings and management, which was utilised in this report, is set out in Table 2. (See Appendix B for assumptions and notes).

Table 2: Essex's domestic waste, by management type

Waste management	%	Per capita weight (kg/yr)
Domestic waste	100%	518
<i>of which...</i>		
Landfilled & incinerated	77%	399
Composted	9%	48
Recycled	14%	72

Source: Essex County Council 2003a and Essex County Council 2003b.

Food

Food consumption data for Essex was not available. Instead data for the East of England was used as an alternative. Data is shown in Table 3. (See Appendix B for assumptions and notes).

Table 3: Essex's domestic food consumption

Food type	Per capita consumption (kg/yr)
Domestic food	928
<i>of which...</i>	
Animal-based	339
Plant-based	589

Sources: DEFRA 2000 and Eurostat 2001

Personal Transport

Personal transport data for Essex residents was not available and regional data for the East of England had to be used for the following transport modes; car, rail, bus and coach travel. UK averages were used for waterborne travel, air travel and motorbike use since this information was not available regionally.

A breakdown of personal transport data is shown in Table 4. (See Appendix B for assumptions and notes).

Table 4: Essex's personal transport, by mode

Transport mode	Per capita travel (pass-km/yr)
Personal transport	13,840
<i>of which...</i>	
Car	11,577
Bus & coach	158
Rail, tram & metro	1,214
Waterborne	77
Air	731
Motorbikes or scooters	84

Sources: Eurostat 2001 and ONS 2001.

Land Use

Accurate land use data broken down by agricultural land classification (ALC) grades was available for Essex, covering a region of 3,477 km² (Essex County Council, 2002). Land type and area are given in Table 5 below. (See Appendix B for assumptions and notes).

Table 5: Essex's land use, by type

Land type	(%)	Land area (km²)
Arable	29	1,023
Pasture	60	2,095
Built land	7	234
Woodland	4	125
Total land area	100	3,477

Source: Pers. Comm., 2003.

Essex Ecological Footprint Results

The ecological footprint of Essex is

7,295,281 gha

or 5.57 gha per capita

Table 7 and Figure 1 summarise the ecological footprint of Essex by component. Figure 2 shows the same data aggregated into fewer categories reflecting the European Common Indicator Programme (ECIP)³ component definitions – this is useful for comparative purposes. ECIP figures for the EU-15 countries are compared with the Essex results in Figure 3.

Table 7 also provides comparative data against national figures, which illustrate that based on available data, the average Essex ecological footprint is higher than the UK average. This difference is primarily due to transport in Essex, and more specifically to car and rail travel. The average Essex resident travels (by car) approximately 21% more than the average UK resident, and about 58% more by rail. This is probably due to a large proportion of the population commuting to London for work. If Essex reduced its car and rail travel down to the average UK level, Essex's overall ecological footprint would be 5.45 gha per capita (equal to the UK per capita average).

The service energy footprint for Essex (0.35 gha per capita) is slightly higher than the UK (0.32 gha per capita) because Essex's expenditure on goods and services is 16% higher than the UK average. On the other hand, the materials & waste footprint for Essex (2.06 gha per capita) is lower than the UK average (2.09 gha per capita). Although the County generates more waste per capita than the UK, its combined recycling and composting rate (23%) is significantly higher. Other Essex component values are broadly similar, or only slightly higher, than the national average.

³ See Appendix C for more information about ECIP.

Table 7: The ecological footprint of Essex, by component

Component	Total Essex footprint (gha)	Per capita Essex footprint (gha)	Per capita UK footprint (gha)
Ecological footprint	7,295,281	5.57	5.45
<i>Of which...</i>			
Domestic energy	791,119	0.60	0.60
Services energy	463,473	0.35	0.32
Materials & waste*	2,697,619	2.06	2.09
Food	2,045,836	1.56	1.55
Personal transport	866,638	0.66	0.57
Built land	430,596	0.33	0.32

Notes: * This section includes all construction, while in the Regional Stepwise spreadsheet model the footprint of construction sector is separated by component.

Figure 1: The ecological footprint of Essex, by component

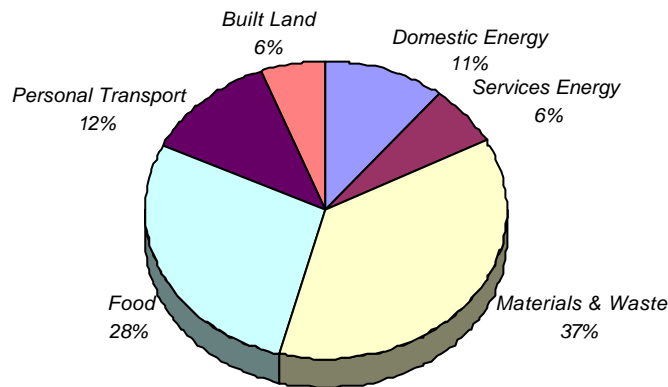


Figure 2: The ecological footprint of Essex, by ECIP components

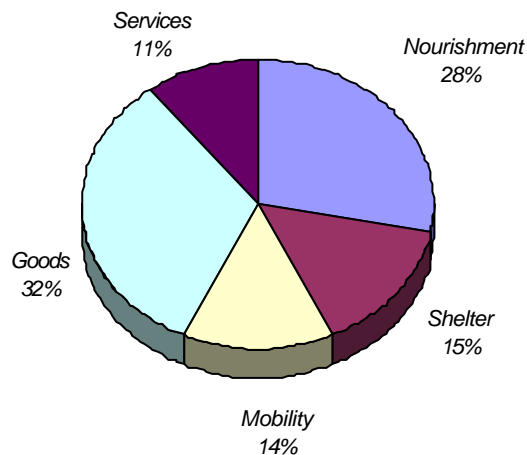
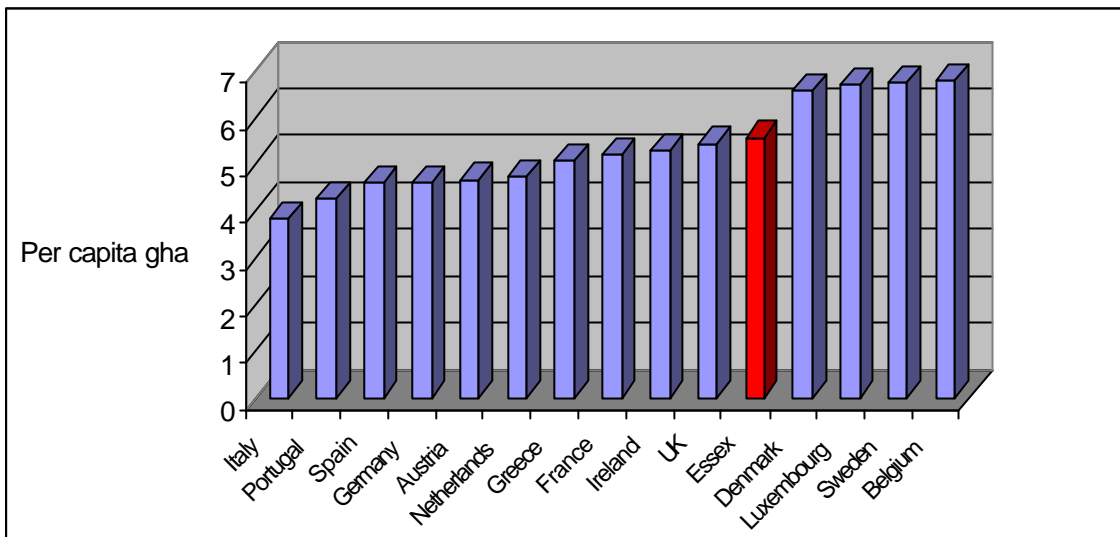


Figure 3: Essex per capita footprint compared with EU-15 countries



Direct Energy

Direct energy use by households and services amounted to 17 % of the total Essex footprint, with domestic energy being the larger component of the two. Looking at the domestic supply, natural gas & LPG produced the largest footprint followed by Electricity. Table 8 provides a breakdown of the direct energy footprint by fuel type (see Appendix B for assumptions and notes).

Table 8: Essex’s direct energy ecological footprint

Fuel type	Total footprint (gha)	Per capita footprint (gha)
Domestic energy	791,119	0.60
<i>of which...</i>		
Electricity	296,739	0.23
Natural gas & LPG	373,219	0.28
Heating oil, kerosene & gas oil	121,161	0.09
Services energy	463,473	0.35
<i>of which...</i>		
Hotels & restaurants	70,647	0.05
Health & education	101,459	0.08
Community, social & personal	89,152	0.07
Office & administration	91,809	0.07
Commerce	110,406	0.08
Total	1,254,592	0.96

Materials & Waste

The total footprint of materials and waste for Essex was 2.06 gha. This is 37 % of the total Essex footprint and therefore the largest component (environmental impact). Using UK trade proportions, this equates to 750,103 gha attributable to net traded goods and 966,225 gha attributable to UK-produced goods (here referred to as nationally-produced goods).

Wood products (such as paper and timber) are also significant, with a footprint of 180,033 gha. Less significant are other plant-based and animal-based goods (for example, clothing), which have a relatively low impact. See Table 9 for a breakdown of the materials and waste ecological footprint. Given the limited data on waste content it was not possible to provide a more detailed breakdown of disposed materials (see Appendix B for assumptions and notes).

Table 9: Essex's materials & waste ecological footprint

Categories	Total footprint (gha)	Per capita footprint (gha)
Materials & waste	2,697,619	2.06
<i>of which...</i>		
Construction (incl. related wood products)	689,192	0.53
Net traded goods (energy only)	750,103	0.57
Nationally-produced goods (energy only)	966,225	0.74
Plant-based (excl. wood products)*	95,522	0.07
Animal-based**	16,544	0.01
Wood products (excl. construction-related)	180,033	0.14

Notes: *includes crop land ** includes pasture and fishing

Food

The estimated ecological footprint for foodstuffs consumed by Essex residents was 2,045,836 gha (or 1.56 gha per capita). At a little over 28 %, food was the second largest component of the total Essex footprint. Table 10 shows the breakdown of the food ecological footprint. The largest component in the food ecological footprint was animal-based food (see Appendix B for assumptions and notes).

Table 9: Essex's domestic food ecological footprint⁴

Food category	Total footprint (gha)	Per capita footprint (gha)
Food	2,045,836	1.56
<i>of which...</i>		
Animal-based	1,566,088	1.19
Plant-based	479,748	0.37

Personal Transport

The ecological footprint of personal transport in Essex was 866,638 gha (0.66 gha per capita). Personal travel constituted 12 % of the Essex footprint. Table 11 shows the breakdown of the personal transport ecological footprint. The largest component was car travel (0.50 gha per capita), followed by air travel (0.12 gha per capita). It should be noted that apart from car, bus and rail transport, the remaining transport modes were based on UK national averages, since data for Essex and the East region of England data was unavailable (see Appendix B assumptions and notes).

Table 11: Essex's personal transport ecological footprint

Transport mode	Total footprint (gha)	Per capita footprint (gha)
Personal transport	866,368	0.66
<i>of which...</i>		
Car	659,211	0.50
Bus & coach	3,846	< 0.00
Rail, tram & metro	35,032	0.03
Waterborne	10,957	0.01
Air	153,322	0.12
Motorbikes or scooters	4,269	< 0.00

⁴ The ecological footprint is a combination of consumption and impact per consumption unit. Because meat products are higher up the food chain and thus embody many more resources than plant-based products, their impact per consumption unit is vastly higher. For example, the UN Population Fund (2001) states that it takes 4-5kg of feed to produce 1kg of meat. Therefore, even though meat consumption is lower (see Table 3), the impact of that consumption is greater than that for plant-based products.

Built Land

The footprint of built, or degraded land, was 430,596 gha (0.33 gha per capita) or 6 % of the total Essex footprint (see Appendix B Land Use assumptions for more detail).

Table 12 below provides an estimated ecological footprint of built land use for Essex in more detail.

Table 12: Essex's built land ecological footprint

Land type	Total footprint (gha)	Per capita footprint (gha)
Built land	430,596	0.33
<i>of which...</i>		
Housing land	125,754	0.10
Transported-related land (roads, ports etc)	70,167	0.05
Commercial/industrial land (incl. hydro)	234,675	0.18

The Biocapacity of Essex

Biodiversity

Up until this point, the calculations presented in this report have been very anthropocentric estimating only the demands and requirements of the human population. In an attempt to account for the requirements of non-human species it is necessary to 'set aside' area to protect and maintain biodiversity.

Ecologists estimate that non-human species may require between 10% (Loh, 2002) and 75% (Noss & Cooperrider, 1994) of the bioproductive resources of the planet. The Brundtland Commission (WCED, 1987) estimated that this requirement was 12%. This conservative estimate has been adopted here.

The biodiversity 'responsibility' of each Essex resident is therefore 0.67gha (12% of the average footprint).

Biocapacity

The actual geographical size of Essex is 347,663 hectares (3,477km²)(Essex County Council, 2003). The biocapacity of Essex is derived from the bioproductivity of this land and the surrounding sea. Bioproductivity is expressed here in global hectares for comparability with the ecological footprint. 'Actual' hectares are converted to global hectares by adjusting for land type and quality.

The biocapacity of Essex is

1,625,488gha

or 1.24 gha per capita

Given that land in Essex is much more productive than the global average, the biocapacity of Essex – expressed in global hectares – is over 4 1/2 times that of the

actual land area (347,663 ha⁵). Sea area is assumed to be of average UK size (per capita) and average UK productivity. This gives a sea biocapacity of 468,956 gha.

Sustainability Assessment

Comparing the ecological footprint of Essex’s resident population with the biocapacity of the region it is possible to theoretically estimate the potential for regional sustainability. Looking at the bigger picture, one can also compare the footprint and the globally available average biocapacity or ‘earth share’.

As can be seen in Table 13, the consumption (ecological footprint) of Essex residents exceeds both local and global average sustainable supply.

Table 13: Essex’s ecological footprint, excluding biodiversity, shown against local biocapacity and the global earthshare

Average earthshare (gha)	Biocapacity of Essex (gha)	Ecological footprint of Essex (gha)
1.90	1.24	5.57

**If everyone in the world lived like the average
Essex resident we would require 2.9 planets
to sustainably support consumption**

This assessment indicates that the 'average' Essex resident is using 293 % of the average earthshare, compared to the UK figure of 287 %.

A biocapacity of 1.24 gha for Essex reflects the high population density, despite the high bioproductivity of the region.

⁵ Numbers do not add up to the total (347,663 ha) due to rounding.

Appendix A: Ecological Footprint Analysis

What is Ecological Footprint Analysis?

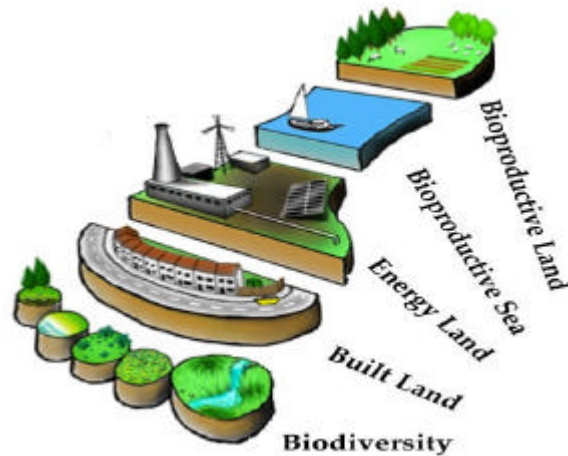
Co-originated in the early 1990's by Professor William Rees and Dr. Mathis Wackernagel, ecological footprint analysis⁶ has rapidly taken hold and is now in common use in many countries at national and local levels; for example, the UK, Mexico, the United States, Canada, Holland, Denmark, Sweden, Norway, Italy, Spain and Australia. The ecological footprint of a region or community can be said to be the bioproductive area (land and sea) that would be required to sustainably maintain current consumption, using prevailing technology.

Imagine a glass dome over Essex, what area would this dome have to cover to ensure that the Essex population could maintain their current lifestyles using only the bioproductive space within the 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 and sea area required for the absorption of carbon emissions) and built land (buildings, roads etc.). A fifth type refers to the area of land and water that would need to be set-aside to preserve biodiversity (see Figure 4).

⁶ Those wishing to go beyond the outline given in this report are recommended to read *Sharing Nature's Interest* by Chambers, Simmons and Wackernagel, 2000, www.ecologicalfootprint.com

Figure 4: Land types used for ecological footprint analysis



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 used in certain ways. For example, by comparing the use of bioproductive area by an 'average' Essex resident with the available average 'earthshare', one can estimate ecological sustainability. The earthshare is calculated by dividing the total amount of productive land on the planet by the population. Loh (2002) estimates the average 'earthshare' to be 1.9 gha. This earthshare can be considered as the maximum, equitable footprint allowance, without depriving either future generations or those alive today.

The *National Footprint Accounts* (Redefining Progress 2002) summarised in the *Living Planet Report* (Loh, 2002), provides a national context for considering regional ecological footprints (see also Wackernagel *et al.*, 2000 and Lewan & Simmons, 2001). Based on 1999 data, the ecological footprint of the UK was 5.45 gha per person compared with a bioproductive capacity of just 1.5 gha – a deficit of almost 4 gha.

Globally, the average ecological footprint was 2.3 gha in 1999, excluding biodiversity – as opposed to an available capacity of 1.9 gha - suggesting that the human population is using over time, more natural resources than can be sustained.

The Regional Stepwise™ Methodology

The ecological footprint calculations in this report follow the Regional Stepwise™ Methodology. This is compatible with the method used by the European Common Indicators Programme (ECIP) to allow for benchmarking of cities and regions across Europe. The ECIP method is described in more detail in Appendix C (see also Lewan and Simmons, 2001).

The Regional Stepwise™ Methodology, developed by Best Foot Forward (see Chambers *et al*, 2000), uses a ‘component’ approach, which integrates local consumption data and national average data to derive a standardised ecological footprint. Though different data sources are used, the calculation method is wholly compatible with, the ‘compound’ approach used by Wackernagel *et al.* in the *Footprint of Nations* studies (1997, 1999, 2000 and 2002), which uses international trade statistics as a starting point.

The Regional Stepwise™ Methodology, wherever possible, uses full life cycle impact data to derive ecological footprint conversion factors for components. For example, to calculate the ecological footprint of a car passenger travelling one kilometre, fuel use, materials and energy for manufacture and maintenance of the vehicle, and the share of UK road space appropriated by the car are accounted for (Table 13). This conversion factor is then applied to the number of passenger-kilometres travelled.

Table 13: An example analysis for the Footprint of UK car travel (per passenger-km)

Component	Inputs	CO ₂ emissions	Built land	Footprint
Petrol	0.094 litres	0.22 kg		0.000031 ⁱ area unit-yrs
Maintenance & Manufacture	0.0423 litres equivalent	0.10 kg		0.000014 ⁱⁱⁱ area unit-yrs
Road Space	258,175 ha		^a 817,043 area units (1)	
Car Road Share	^b 86%			
Car kms	^c 362,400,000,000			
Average Occupancy	^d 1.6 persons			
Calculation			(a+b)/c/d	i+ii+iii
Footprint			0.0000012 ⁱ area unit-yrs	0.000046 area unit-yrs/pass-km

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 Essex. The key components used in this study are:

- Direct energy (Domestic and Services)
- Materials & waste
- Food & drink
- Personal transport
- Built Land

Each of these key components is made up of smaller sub-categories. For example, Direct Energy is sub-divided into domestic and services energy. Each of these sub-categories can be broken down further, for example, electricity, gas and domestic heating oil.

Using this component approach enables the calculation of ecological footprints at any level – for a product, organisation, activity or region – and makes the identification of ‘big hitters’ simpler and more transparent. Such an approach also facilitates policy development through the application of consumption and technology scenarios.

Box 1: Take only pictures - leave only footprints

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 which data is recorded 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 were considered to have been 'consumed'.

Study Boundaries

Any study of resource consumption faces boundary issues - what to include and what to exclude. One approach is to include all consumption that takes place within certain geographical bounds. This is known as the 'geographical principle'. The other common approach is to consider only the consumption attributable to those living within a geographic area (the 'responsibility principle'). This latter approach is favoured by the *National Footprint Accounts* (Redefining Progress, 2002) and is the approach adopted in this report.

A further discussion of the geographical and responsibility principle can be found in Lewan and Simmons (2001).

Appendix B: Essex Data Assumptions

Domestic Energy

Energy consumption data for Essex and the East of England was unavailable, so UK average data was used as an alternative. This data was obtained from Country Pictures (ECI 2000) with carbon intensity figures derived from the UK Greenhouse Gas Reporting Guidelines (DEFRA 2001).

Services Energy

Energy consumption by service sector was not available for Essex. Therefore UK average data was used adjusted upwards by 16% reflecting the higher spending levels in the East of England (ONS, 2001)

The service sectors covered in this project are defined according to the Statistical Classification of Economic Activities in the EU (NACE Rev.1) (European Communities, 2002).

- Hotels & restaurants (NACE 55)
- Health & education (NACE 80, 85).
- Other community, social & personal service activities (NACE 90-93).
- Offices & administration (NACE 60-67, 70-75, 99).
- Commerce (NACE 50-52).

To apportion the impact of services, it was assumed that their usage is proportional to spending on services. Excluded from this calculation are those services that are normally provided from general taxation (education and health) and those that relate to other categories (food, goods and transport). Service use was assumed to be evenly distributed throughout the area's population.

Materials & Waste

Essex municipal waste data was used as a proxy for personal resource consumption. This necessitates a couple of key assumptions. Firstly, that personal material consumption is proportional to household waste arisings. Secondly, that the content of the waste can be assumed to be the same as the UK mix.

Tonnages of landfilled and incinerated household waste for Essex was obtained from the *Waste and Recycling Branch, Essex County Council* (Essex County Council, 2003a). Tonnages of recycled and composted materials were estimated to be 23% of Essex's total domestic waste (Essex County Council, 2003b).

It should be noted that the method used assumed that the proportion of stock (those materials retained within the economy) is the same across regions. Evidence suggests that the vast majority of retained materials are used for construction (roads, housing and so on) and have a long lifespan.

Food

Food consumption data specific to Essex was not available, so regional data was used instead. DEFRA's (2000) *National Food Survey* had detailed food consumption data (eating in and out) for all UK regions including the East of England. According to the *National Food Survey* the East of England's residents consumed 2.5% more than the UK. The UK figure of 906 kg of food consumed per capita (Eurostat, 2001) was adjusted to 928 kg per capita for Essex, assuming regional (East) consumption is similar.

Personal Transport

Personal transport data for Essex was not available. Regional data was used instead for car, bus and rail travel using DTLR's *National Travel Survey* (2001).

Unfortunately national statistics did not distinguish between air, waterborne and motorbikes travel combining them all into one figure (other transport). Using Eurostat (2001) statistics, UK averages were available for these modes, thus providing a better transport breakdown.

Land Use

Land use data for Essex was available according to Agricultural Land Classification (ALC) grades, ranging from 1 to 5, non-agricultural and urban (Pers. Comm. 2003). These ALC grades were converted to equivalent hectares of; arable, pasture, woodland, sea and urban land. For example 6,372 hectares of land in Essex was classified as ALC grade 1. Grade 1 land can be classified as *arable* land. Essex also had 150,079 hectares of ALC grade 2 land. Based on national averages, 40% of ALC grade 2 land is also classified as *arable*, equalling a total arable land 102,252 hectares.

The yield and equivalence factors used were those for the UK (Loh, 2002). Fishing grounds were assumed to be the UK per capita average.

Appendix C: European Common Indicators Programme (ECIP)

The European Common Indicators Programme (ECIP) is a monitoring initiative focused on sustainability at the local level. A partnership of different organisations and levels are working together, in a joint effort to find comparable data and a better understanding of sustainability in local communities across Europe. Eleven common local sustainability indicators were identified through a bottom-up process. Used in combination with other indicators and other evaluation methods, the European Common Indicators can contribute to a comprehensive local or regional monitoring strategy.

Over 100 local and regional authorities have so far signed the adoption agreement and are now testing the indicators, and refining the monitoring initiative based on practical experiences.

Support services are provided to participating authorities during the testing phase: technical support (scientific expertise, helpdesk, workshops, etc.), methodological development, pilot activities on the Ecological Footprint, good practice collection and exchange, dissemination activities, and evaluation, reporting, recommendations and guidelines.

For further information on the ECIP programme visit www.sustainable-cities.org/ or see Lewan and Simmons (2001).

Appendix D: Essex Sustainability Indicators

According to *The Sustainability Report for Essex* (Essex County Council, 1999)

22 indicators of sustainability were chosen for Essex.

ESSEX SUSTAINABILITY INDICATORS	
Air quality	Work destinations
River quality	Employment
Beach quality	Unemployment
Water consumption	Access to a car
Waste production	Crime
Historic buildings	Health
Parishes with no key services	Local democracy
Energy efficiency	School leavers exam results
Area of woodland	Travel to work
Underprivileged areas	Traffic casualties
Free school meals	Areas of developed land

Glossary

Biological capacity refers to the total of the biologically productive areas. See also 'biologically productive areas'.

Biologically productive areas are those areas of a country or region with quantitatively significant plant and animal productivity. Biologically productive areas of a country or region comprise its biological capacity. Arable land is potentially the most productive area.

Carbon Dioxide (CO₂) is a gas, which is naturally emitted by living organisms as well as during the combustion of fossil fuels. The latter is problematic since it leads to increased concentrations in the atmosphere.

Ecological footprint is the land and sea area that is required to support indefinitely the material standard of living of a given human population, using prevailing technology. (Measured in global hectares).

Embodied energy of a commodity is the energy used during its entire life cycle for manufacturing, transporting, using and disposing.

Fossil fuels are coal, natural gas and fuels derived from crude oil (for example, petrol and diesel).

Global hectares (gha) One global hectare is equivalent to one hectare of biologically productive space with world average productivity.

Gross Domestic Product (GDP) is a measure of the total flow of goods and services produced over a specified time period. It is obtained by valuing outputs of goods and services at market prices.

Hectare one hectare (ha) is 10,000 square metres (100 x 100 metres). One hectare is equivalent to 2.47 acres.

Inert waste is chemically inert, non-combustible, non-biodegradable and non-polluting waste.

Natural capital refers to the stock of natural assets that yield goods and services continuously. Main functions include resource production (such as fish, timber or cereals), waste assimilation (such as CO₂ absorption, sewage decomposition) and life support services (UV protection, biodiversity, water cleansing and climate stability).

Net traded goods are net imports of goods, i.e. imports of goods minus exports of goods = net imports of goods. Net traded and nationally produced goods are products that do not embody (include) bioproductive land or sea resources. Energy and non-bioproductive landed are accounted for in the goods. However, only energy impacts are aligned in component-based ecological footprinting methodology.

Per capita is a measure per person within a specific population.

Productivity is measured in biological production per annum and hectare. A typical indicator of biological productivity is the biomass accumulation of an ecosystem.

Proxy is normally used to compensate for a lack of raw data. It is an estimation derived from an existing data set using a statistical modifier. For example, deriving local water consumption data by using average per capita consumption of a region in which the locality is part.

Recycling is the process of collecting, sorting, cleansing, treating and reconstituting materials that would otherwise become waste, and returning them to the economic stream as raw materials for new, reused or reconstituted products.

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