ecological footprints

A guide for local authorities

By Stuart Bond

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introduction

"The problem with land is that they stopped making it some time ago." **Mark Twain**

Sustainable development has come a long way since the Rio 'Earth Summit' in 1992, and although many positive initiatives have come to fruition, we are still increasing our collective burden upon the planet. There are now six billion people, but there is still only one earth. Many individuals, groups and communities now regularly consider the issue of sustainable development in their everyday lives. However, the institutions and the institutional systems that drive most of our work relations and our civil and economic interactions, both locally and globally, are lagging a long way behind.

The maxim of 'think global, act local', is well understood – but does your office, your organisation really put these principles into action? The rationale behind this guide is to turn such talk into institutional practice.

Many have seen the sustainable development agenda as a melting pot that is all things to all people – a nebulous concept that is impossible to define and even harder to measure. Nothing could be further from the truth.

Most governments, organisations, local councils and community groups have tended to adopt the definition of sustainable development set out in the Brundtland Report of 1987:

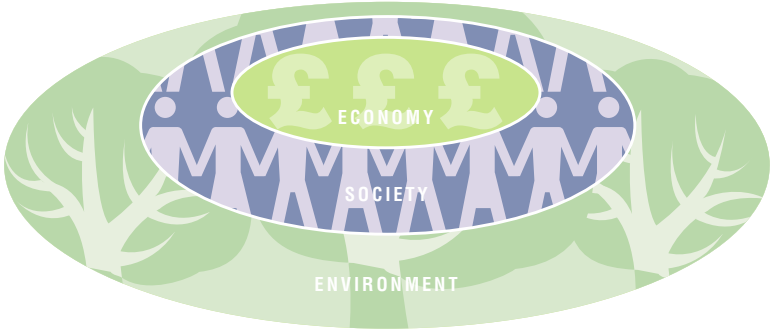
"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." **Gro Harlem Brundtland, 1987**

This definition (which does not capture the essence of all the Brundtland Commission's conclusions) has led to many interpretations of what sustainable development is, and has led many to believe that it is not a rigorous, measurable concept. On the contrary, progress towards sustainability can be planned for, monitored and evaluated. And whereas the Bruntland definition acknowledges the social and economic dimensions of sustainable development, it was the 'carrying capacity' of the earth's ecosystems and the 'natural capital' they provide us which were at the core of concerns that development should be environmentally sustainable.

The classic three-legged stool is a start to understanding the dynamics of sustainable development, but as a model it denies us the simple truth that nature is the basis for all of our social, cultural and economic capital. Perhaps sustainable development is easier understood and more truthfully interpreted as a series of nesting systems.

The 'Russian Dolls' model of sustainability, as proposed by Levett (1998, cited in *Sharing Nature's Interest,* 2000), situates the economy as a subset of society, and society as a subset of the environment. Such a series of nesting systems redresses the balance of our mechanistic world-view, ensuring that social or economic objectives are achieved without damaging the environment.

Measuring our 'ecological bottom line' is the first link in the chain of defining and measuring sustainable development.



The 'Russian Dolls' model of sustainability

The global perspective

"At some time in the 1970s, humanity as a whole passed the point at which it lived within the global regenerative capacity of the earth, causing depletion of the earth's natural capital as a consequence."
WWF International, *Living Planet Report 2000*

According to the *Living Planet Report 2000*, while the size of our remaining natural ecosystems has declined by over 33% over the last 30 years, human demands on natural resources (natural capital) have increased by 50% in the same period, and now exceeds the biosphere's regeneration rate. To put it another way, as our population has increased, the demands that we place upon the services that nature provides are spiralling out of control. Each generation is demanding more from our stocks of natural capital than the last generation did. Current estimates suggest that we have overshot our global 'carrying capacity' by over 30%. Humanity is effectively destroying our very life-support system.

We therefore require carrying capacities in 'distant elsewheres' to sustain our lifestyles. By measuring consumption rather than pollution, footprint analysis brings sustainable development home, and implicates each of us by the individual and collective decisions we take.

"Each generation is entitled to the interest on the natural capital, but the principal should be handed on unimpaired."

Canadian Conservation Commission, 1915

'Nature' as natural capital

Ensuring that our natural capital is not liquidated demands that we only utilise the 'interest' on that capital. We can sustainably manage forest ecosystems (for instance), by only harvesting a small amount from the crop each year – the 'interest' on the capital. Forestry is an example of what we may term 'renewable' natural capital in that the stocks are not finite and, given correct management procedures can, sustain both themselves, and ourselves, in perpetuity.

However, certain forms of natural capital are what we term as 'critical' – where the stocks are finite. Such stocks include coal, gas, oil, aggregates and so on. These stocks are technically renewable, but human consumption of these resource items is at a rate that is far greater than their slow re-formation in nature. Our addiction to fossil hydrocarbons, and the depletion of this critical resource, has enabled a rapid transformation of Western society, and a corresponding reduction in the health and wealth of global ecosystems, for now and in the future.

Sustainable development indicators

Instead of devising new indicators for sustainable development, governments at every level in the UK have simply added social and economic indicators to a list of existing environmental indicators. Sustainable development is not an aggregation of the existing social, economic and environmental policy fields, neither is it simply a recognition of the interdependency of the three. It should be viewed as a new way of providing for economic and social welfare, while staying within the carrying capacity of supporting ecosystems. It therefore does not include all aspects of environmental protection and management, any more than it includes all aspects of social policy. (For more information on ecological footprinting as an indicator, please see Appendix 2.)

So how do we do it?

The most rigorous and useful way of measuring and interpreting our 'ecological bottom line' is through *ecological footprint analysis.*

The ecological footprint is a measure of the mark that we leave behind upon the natural environment that sustains us.

Demands for natural resources are rising, leading to unsustainable resource depletion and dramatic increases in pollution and carbon dioxide emissions. WWF's *Living Planet Index 2000* indicates that since the 1972 Stockholm Conference on the Human Environment, one-third of the earth's natural wealth has been destroyed, including freshwater systems, marine ecosystems and forest cover. Over the same period, WWF's *World Ecological Footprint* indicates

that human ecological pressure on the earth has increased by over 50%, exceeding the biosphere's regeneration rate.

Figure 1 shows our decline in biodiversity over the last 30 years. Figure 2 shows our increasing global ecological footprint. If we are serious about reversing negative ecological trends, then we need to engage with the key drivers for those trends: the profligate consumption of resources associated with human activity, and the way society deals with 'waste'.

The main concerns continue to be not the consumption of natural resources themselves, but the rate of consumption, as well as inequities in access to natural resources. Industrialised countries in particular have a responsibility to reduce their consumption rates. The impact of economic globalisation on the world's ecosystems and natural resource base is also giving rise to concern.

Evolution of the issue since the Rio 'Earth Summit', 1992

Chapter 4 of Agenda 21 focuses specifically on the issue of consumption and sets out the following objectives:

- efficient production processes and less wasteful consumption, taking into account the needs of developing countries
- domestic policy frameworks that encourage a shift to more sustainable patterns of production and consumption
- policies that encourage the transfer of environmentally sound technologies to developing countries.

Figure 1: Living Planet Index, 1970-1999

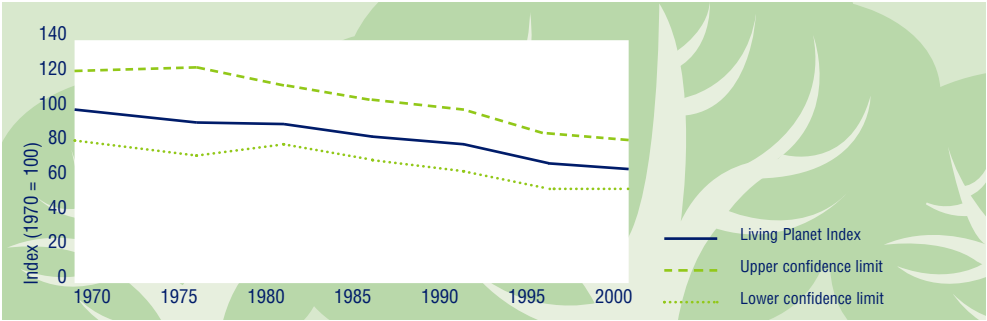
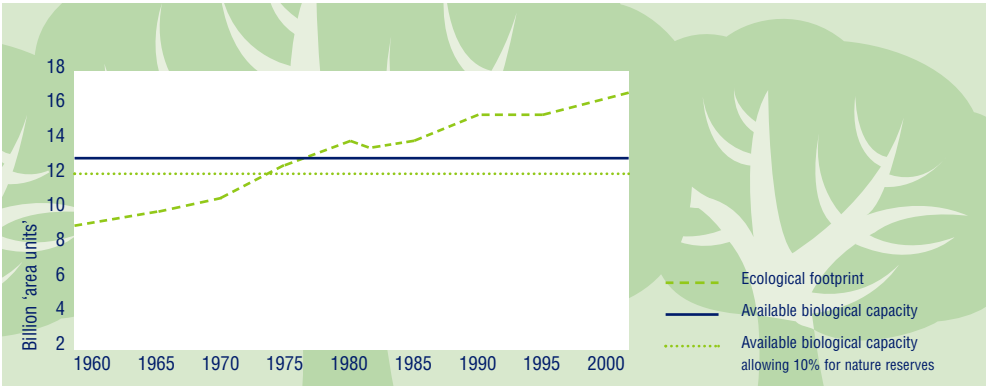


Figure 2: World Ecological Footprint, 1961-1997



what is the footprint?

The ecological footprint answers the most basic question for sustainable development:

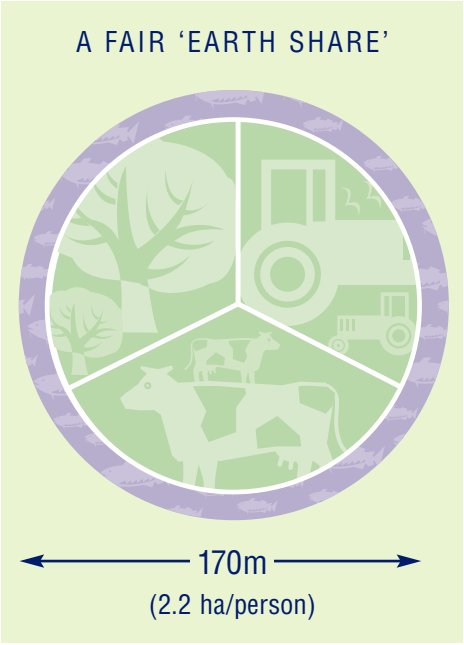
‘How much nature do we have, compared with how much we use?’

Visionary governments, regional assemblies and local authorities are now engaging with the ecological footprint to measure what is core and central to sustainable development. Engaging with the footprint helps them operationalise sustainable development in a way that has never before been possible.

“Uniquely, we have adopted the ecological footprint as one of the indicators of resource use within Wales.”
Rhodri Morgan, First Minister, Welsh Assembly Government, speaking at ‘Wales in the World’ conference, 17 April 2002

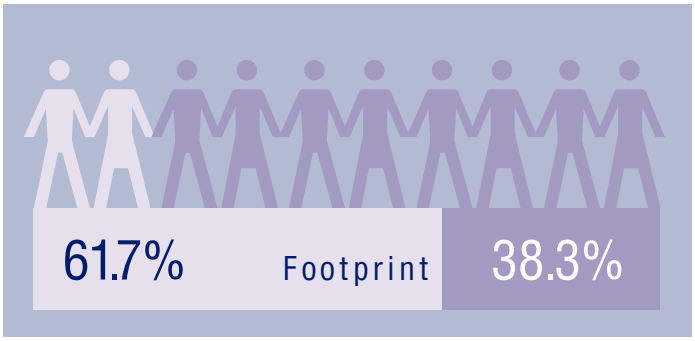
Ecological footprint analysis measures the impact of human activity upon nature. The footprint expresses the land area that is required to feed, provide resources, produce energy, assimilate waste, and to re-absorb its CO_2 output from fossil fuels through photosynthesis.

This approach uses land as its ‘currency’, and provides a notional figure for the land area required, wherever and however located on the planet, that is necessary to support an individual, a community or a nation’s population at its present standard of living. If all the biologically productive land and sea on the planet is divided by the number of people inhabiting it, the result is a statistical average of 2.2 hectares per person. However, the most recent studies (Wackernagel et al, 1999) estimate the average ‘earth share’ to be 1.87 hectares – allowing a 12% provision for other species.
This ‘earth share’ can be considered to be the maximum footprint allowance without depriving either future generations or those now living in other regions of the world.



On a national scale the UK has an average ecological footprint of 6.0 hectares (Wales has 5.25 hectares), while the average American requires 9.6 hectares to support their lifestyles. The footprint of Liverpool is 4.15 hectares per capita, while the footprint of the Isle of Wight is 5.15 hectares per capita. The footprint of London is 125 times its geographical area – the size of the UK itself! If all the world's population had consumption patterns like us in the UK, we would need three extra planets to sustain ourselves. If everyone in the world consumed like the average American, then we would need four extra planets. Of the world's population, 80.3% has an ecological footprint smaller than 4 hectares, and their total share of humanity's footprint is 38.3%. Their average footprint is 1.36 hectares.

80.3% of the world's population occupy 38.3% of humanity's footprint. The other 19.7% of the population occupy 61.7%.



The other 19.7% of the population occupy 61.7% of humanity's footprint, which in itself is already at least 20% larger than the available capacity of the biosphere.

What can we do with it?

Once the data has been collected and the footprint has been calculated, it can be used as both an indicator to show trends over time (ie has the footprint increased or decreased since the last measurement?) and to compare between countries, regions, organisations and individuals (ie is your footprint bigger or smaller than mine?). The data sets can also be used to model differing scenarios and examine their impact on the footprint, eg waste management, local food production, sustainable transport measures, renewable energy production, etc. Strategies that reduce the footprint can then be prioritised. It is also the most valuable and effective visualising tool for educators, and can be used with children, young people and adults. With its ability to create simple mental images from complex statistics, it can also be used to train decision-makers to think about the 'big picture'.

If a local authority is to contribute to sustainable development at a global and local level, then the local authority needs both to recognise and take responsibility for its global impact. Every Local Authority Area imposes a giant 'footprint' of resource demands and waste assimilation over a vast area. The 'footprint' expresses the land area that is required to feed, provide resources, produce energy, assimilate waste, and to re-absorb its CO_2 output from fossil fuels through photosynthesis.

The ecological footprint therefore measures the *demand* upon our natural resources. Our available biocapacity (both globally and locally) indicates our available *supply.*

LAND TYPES USED FOR ECOLOGICAL FOOTPRINT ANALYSIS

Imagine a glass dome over your Local Authority Area. What area would this dome have to cover to ensure that the 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 below).

Source: WWF Cymru, adapted from *The Footprint of Wales: A Report to the Welsh Assembly Government*

How is an ecological footprint caused?

The following two examples illustrate how an ecological footprint is caused by human activity?

1. A cooked meal of rice and fish requires 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.

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

how do we measure it?

For a local authority seeking to undertake footprinting work, the first question it needs to ask is what is the study area under question? Are we seeking to measure the footprint of the Local Authority Area? Or the local authority itself? Or a particular community within that area?

There is more than one way to measure the size of your feet!

Currently there are three main potential 'off-the-peg' methodologies that can be used.

- The most widely used is the *compound* methodology, and this is certainly the most robust and easily repeated of them all.
- The *component* methodology uses a mixture of regionally available data and scaled-down nationally available trade data.
- The most reliable of all methodologies uses primary, rather than secondary sourced data, and involves the *direct measurement* (the bottom-up approach) of individuals, households or organisations.

There is a great deal of literature on the subject of ecological footprint methodologies, both in traditional and digital form: for example, see Wackernagel and Rees *(Our Ecological Footprint,* 1996; Chambers, Simmons, Wackernagel *(Sharing Nature's Interest,* 2000*),* or visit www.rprogress.org, www.bestfootforward.com and www.panda.org.

The 'compound' approach

The compound methodology, developed by Mathis Wackernagel, was created first, and has been the most widely applied. Using nationally available trade data, this is a way of measuring the ecological footprint of nations, and the results have been compiled into a 'league table of nations'. The table compares their calculated ecological footprint against both their 'fair earth share' and against their own individual available capacities. The full table can be viewed on Mathis' Californian based 'think tank' website, 'Redefining Progress' at www.rprogress.org.

THE 'GEOGRAPHICAL' OR 'RESPONSIBILITY' PRINCIPLE

A fundamental question is whether the aim of the study is to footprint the SGA (Sub Geographical Area) or the consumption of the population (the community) within that SGA. The two can give very different answers. As an example let us imagine that a small region has an airport within it. Do we include the full impact of this airport as part of the footprint or estimate only that part of the impact that is attributable to the population within the region? The first approach has been termed the 'geographical principle', the latter the 'responsibility principle'.

Source: Cited in Simmons and Lewan, *The Use of Ecological Footprint and Biocapacity Analyses as Sustainability Indicators for Sub-national Geographic Areas: A Recommended Way Forward*

The compound approach is certainly the more reliable of these first two methodologies currently developed. (Both use secondary sources of data.)

The 'component' approach

Developed contemporaneously to the 'compound' approach is this method of ecological footprint analysis which measures the ecological footprint of a region. The methodology was first used to measure the ecological footprint of Oxfordshire and working with CAG consultants, Best Foot Forward (BFF) developed a set of algorithms to translate the data into 'footprint' equivalents. (For further information, see Simmons and Lewis (1997) *Two Feet – Two Approaches: A component-based model of ecological footprinting* or visit www.bestfootforward.com/articles/twofeet.htm). The model was then tested on Guernsey and compared against the 'compound' approach by Dr John Barrett from Stockholm Environment Institute (SEI). Both SEI and BFF are the leading 'number-crunchers' for ecological footprint analysis in the UK.

More recently, this approach has been used and slightly modified and refined, to measure the ecological footprint of the Isle of Wight, in the *Island State Report*. Due to financial and logistical necessity, the work was undertaken through a partnership between the Isle of Wight County Council, BFF and Imperial College London; and received support from the Isle of Wight County Council and Biffa Waste Services. Other areas that have also received the same treatment include Liverpool, in partnership with SEI, Northwest Development Agency, the Government Office for the North West, North West Water Ltd, Environment Agency and Liverpool City Council. (See 'Case studies' for further details of these projects.) Forthcoming studies include London, the South East, Scotland and a new Wales study with a local authority focus on Cardiff and Gwynedd. All are partnership projects utilising landfill tax credits for the majority of their funding.

Of the two methodologies that use secondary sources of data, this is probably statistically less robust than the 'compound' approach – although it is certainly robust and sophisticated enough to be used as a headline indicator. For more information see Chambers, Simmons and Wackernagel (*Sharing Nature's Interest,* 2000).

Direct or 'bottom up' measurement

This third method can be used for individuals, households, companies or organisations. Of all the methodologies, the data collected in this manner is certainly the best quality. Due to the aggregated nature of the data, there are tools now available on the web, which simplify direct measurement to a dozen or so components (www.rprogress.org), as well as more comprehensive spreadsheets (www.usb.texas.edu).

The beauty of this method is in its structure as a reflexive, or self-learning tool for 'those who are being measured'. This format could be used for a league table of companies or organisations, enabling them to be ranked, compared and contrasted, and begin to travel the road of sustainable and self-learning organisations.

Which foot do I put the boot on?

The component methodology is the best methodology available for measuring the ecological footprint of either a region or a Local Authority Area. The methodology is built up from a more bottom-up approach and is built around activities that people can relate to (ie we all produce wastes and consume electricity). It considers the effects of energy, transport, waste, food and materials and then converts these into equivalent land areas.

The construction of the component methodology comprises two stages: a material flow analysis, and construction of the footprint.

A material flow analysis provides a measure of the tonnage of materials flowing through the economy (within the study boundary) for that given year. From this initial study interesting results (and conclusions) can be obtained.

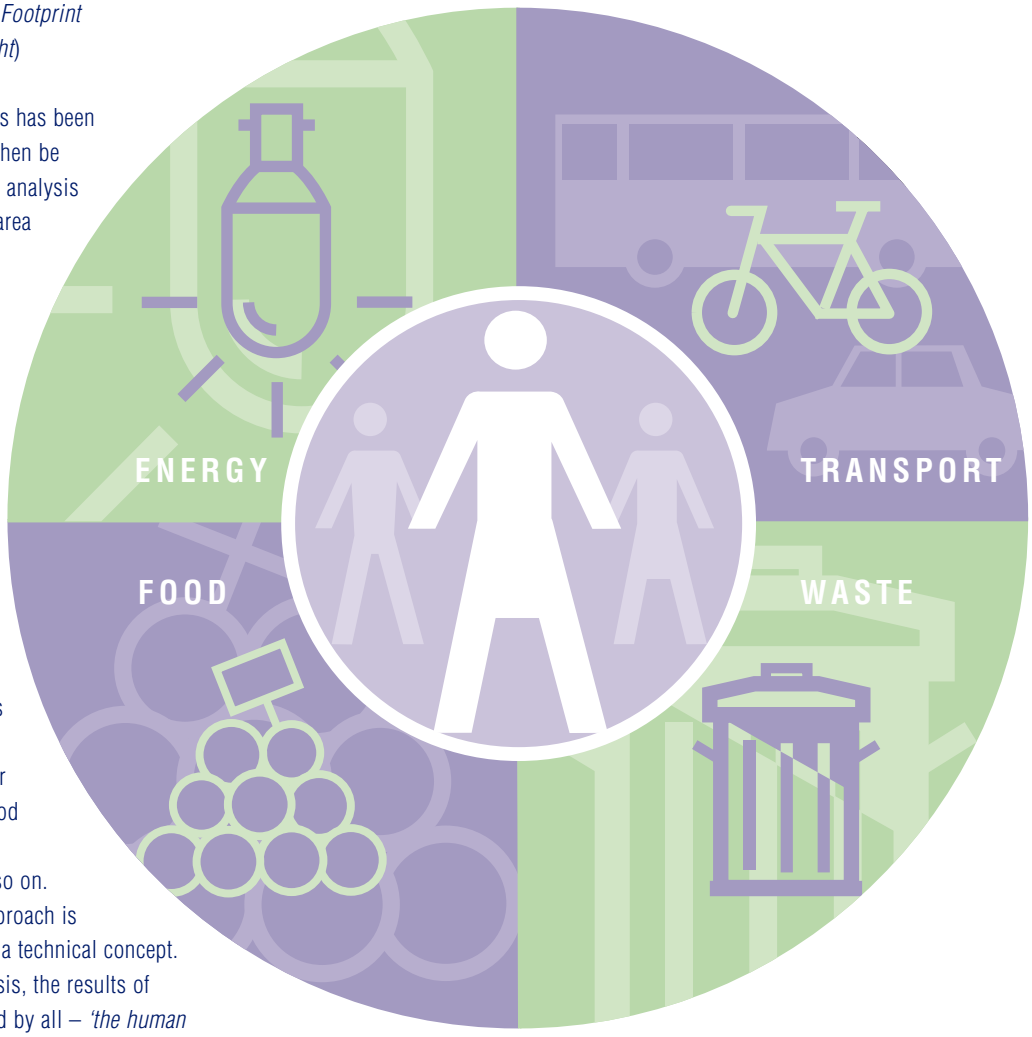
- Within Wales the total accounted material consumption is around 2.9 tonnes per resident

All the studies to date in the UK have concentrated on measuring the ecological footprint of either a Regional Development Area or a Local Authority Area.

(excluding agricultural wastes, water and fuel). Carbon dioxide emissions arising from electricity, gas and heating-oil consumption were also estimated at around 5 tonnes per resident. (Source: WWF Cymru, *The Footprint of Wales: A Report to the Welsh Assembly Government*)

- Within the Isle of Wight the figures were a little higher with total material consumption being about 5.8 tonnes per resident. (Source: *Island State: An Ecological Footprint Analysis for the Isle of Wight*)

Once the material flow analysis has been undertaken, the footprint can then be constructed. The material flow analysis data is then transformed into area units (standardised global hectares) by a series of algorithms. Both SEI and BFF have their own approaches to this, although the BFF method (EcoIndex™) is less transparent and accountable than the SEI approach. Again, like the material flow analysis, this is broken down into broad policy areas – food, energy, transport, waste – which identify with a local authority's activities and impacts. These can be abstracted down further to look at the food miles of food items, the types of household materials sent to landfill and so on. The beauty of the footprint approach is that it is both a metaphor and a technical concept. Unlike the material flow analysis, the results of the footprint can be interpreted by all – *'the human footprint cannot exceed the area able to support it'.* It is easy to grasp the metaphor, and once the *metaphor* is understood, the *mechanics* of the method of calculation can also be more easily understood. And because the footprint puts consumption and waste assimilation in a global context, it provides a true benchmark for sustainable development that no other similar tool is able to do.



what can we do with it?

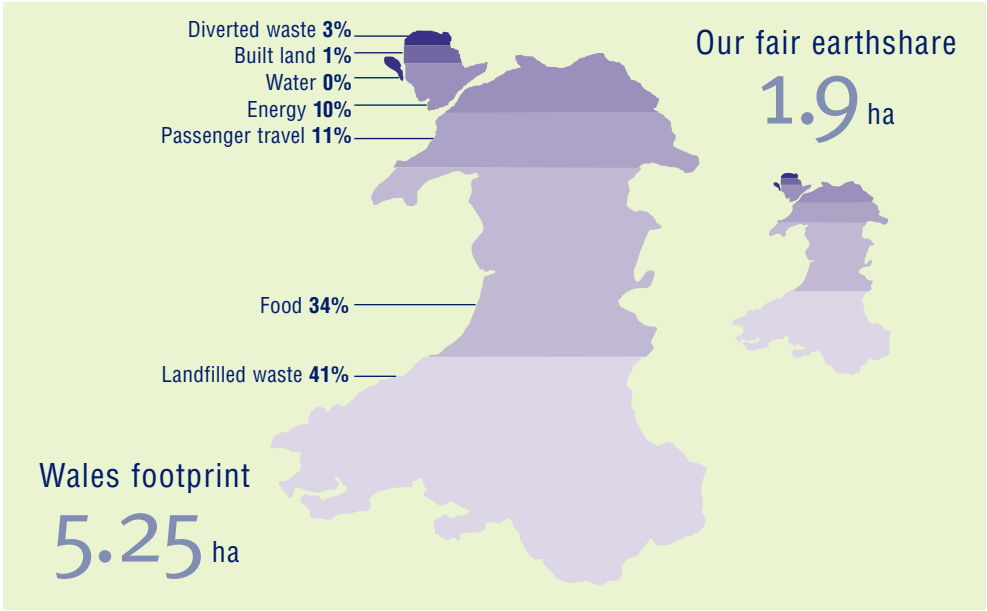
Ecological footprinting is a highly flexible tool, with relevance to many local government duties and initiatives, including Local Agenda 21, Community Strategies, procurement and institutional management. It also has considerable potential as an educational and awareness-raising tool.

Integrating the ecological footprint into local authority sustainable development strategies

Ecological footprint is a good way of integrating the various components of an overarching sustainable development strategy because it enables a direct comparison between environmental 'apples and pears'. We can thus determine a range of policy options that formulate a comprehensive sustainable development strategy. It also provides a good measure of whether we are moving towards a more sustainable world or not.

The Welsh Assembly is the first administration in the world to use ecological footprinting as an indicator of 'real progress'. Other local authorities such as Cardiff and Gwynedd are also soon to follow suit. The Liverpool study enabled both the local council and local people to understand their global to local impacts and provides them with the means to do something about them: strategies that reduce the footprint can then be prioritised.

The diagram shows the footprint for Wales by component. It shows their demand (5.25 hectares, on the left) against their fair earth share (1.9 hectares, on the right). Interestingly, Wales' available biocapacity (local supply) is a little over their fair earth share at 2.02 hectares per person. This shows that Wales could be bioregionally sustainable.



Ecological footprint and Local Agenda 21

The ecological footprint resonates with many of the concerns that helped formulate the Local Agenda 21 (LA21) process, as it concerns itself with core issues such as carrying capacity of the earth, as well as a fair distribution of those resources – be that between nations or between generations. We each have a 'fair earth share' of around 1.9 hectares – which is the maximum allowance for our footprint if we are to conserve global natural capital and ensure an equitable distribution.

Many LA21 strategies have, effectively, been revamped environmental strategies, often ignoring the global dimension; many would see this as outside of the remit of a local authority. But perhaps it is, in any case, a contradiction in terms to talk of a sustainable Local Authority Area given that we exist in an unsustainable world. LA21 strategies therefore need a way of measuring targets and performance that puts local concerns within the larger global picture. And the ecological footprint approach helps us to do just that.

The footprint can be used as a single indicator, and it can also be broken down into its constituent parts (landfilled waste, diverted waste, energy, transport, food, travel, water, etc). Each one of these components can be used as an individual indicator too.

Traditional indicators are given an equal weighting. Is it really fair to say that we are achieving sustainability if 70% of our indicators show a positive trend? Key documents like *A Quality of Life* certainly think so, but this sort of reasoning only serves to blur the sustainable development debate and mask the real challenge: to increase the quality of life for all, while staying within the means of nature.

Ecological footprint and Community Strategies

With local authorities now duty-bound to produce Community Strategies, many will view the production of their LA21 strategy as the cornerstone of this new duty. However, many more will also seek to ignore the hard work that has been achieved in the LA21 sphere. Some even see the new duty to produce Community Strategies as being the 'nail in the coffin' for the LA21 process.

The ecological footprint provides a way of linking the local to the global, while also providing a unique 'visioning tool' that can help both local people, and the authorities themselves, to think about the challenges of sustainable development. The footprint of a local community could easily be measured and used as an indicator for this strategy too. Some of the 'new wave' community-generated indicators could use the ecological footprint as a baseline measurement to tackle key questions such as 'Where are we now?', 'Where do we want to be?' and 'How do we get there?'.

Ecological footprint and procurement

Ecological footprinting works at the 'front end' of environmental management strategies. Looking at the megatonnes of resource use, rather than the nanogrammes of pollution (Weizacker, Lovins and Lovins, 1998) is a first step in our realisation of a sustainable world.

A procurement strategy ties in neatly with the ecological footprint, and many who have collected data from a procurement point of view have often (unwittingly) collected data for an internal ecological footprint assessment.

PURCHASING POWER

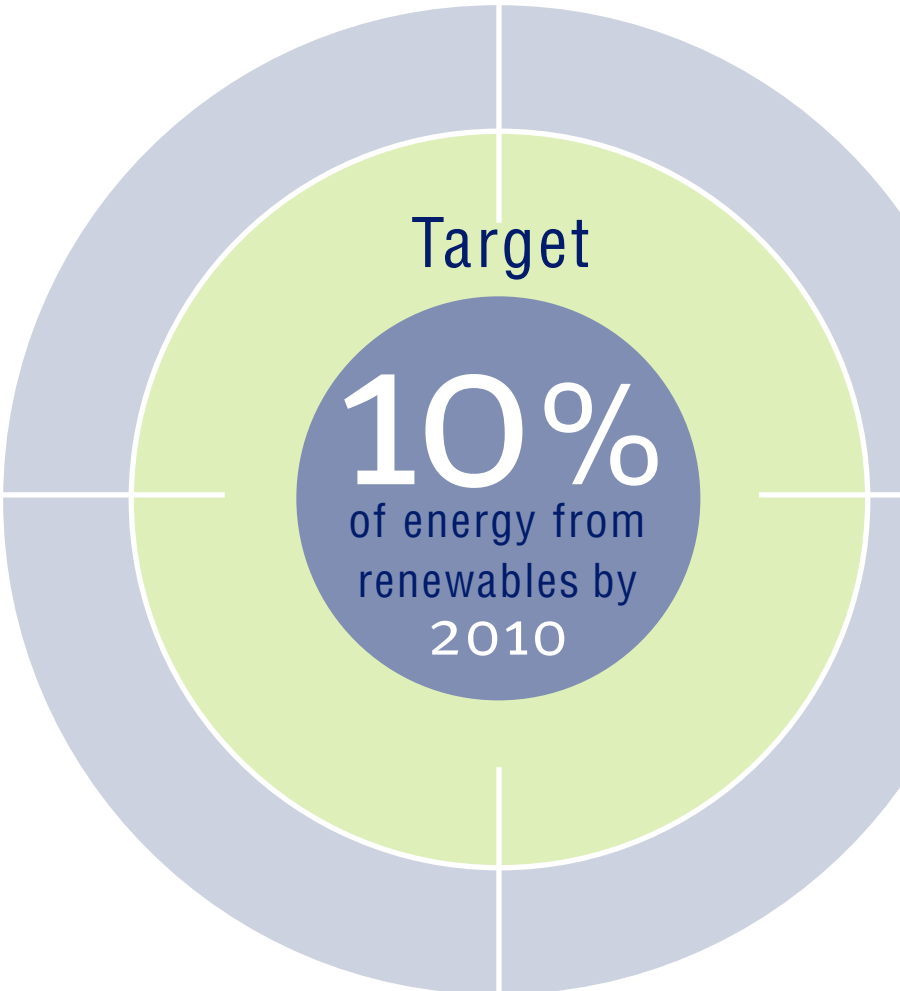
Kevin Lyons made a saving of 2.4% on the annual turnover of Rutgers University through adopting a sustainable procurement strategy. Pioneering an approach that has found favour with other procurement specialists, Kevin collected data in key areas of consumption and waste. This data helped him to draw up contractual arrangements, reducing not only the waste produced through procurement, but also the ecological impact of those items. Quantifying environmental and ethical benefits was the catalyst to the production of an environmental and ethical default procurement computer system. These key data sets could also help in understanding the footprint of the organisation. As sustainability moves up the corporate agenda, gaining such key baseline information is a critical step in the move towards sustainable business practises.

Ecological footprint as a strategic institutional management tool

The footprint enables us to make comparisons between mutually exclusive environmental 'apples and pears' in a way that no other indicator can. Once the data has been collected we can then generate meaningful scenarios for strategies that seek to reduce the footprint.

Scenarios are a most effective way of deciding upon future policy and action. For example, within Wales, the most effective strategy would be to introduce a waste minimisation and recycling scheme – especially for households. The embodied energy that is lost by throwing materials into landfill means that landfilled waste makes up nearly half of the footprint of Wales.

Scenarios cannot only help set targets (eg 10% of energy from renewables by 2010) but can also show by how much the footprint would be reducedby if that strategy were put in place. If such a target within Wales were to be met, then our decrease in the footprint would be about 4%, even though electricity consumption is expected to rise by 5% over the same period.



ecological footprinting:

an environmental education and awareness-raising tool

The ecological footprint is an unrivalled educational tool through its easily understood metaphor – the human footprint cannot exceed the area able to support it. It can be used to show the effects of our impacts upon the planet in a visual way that no other tool can.

So what is sustainable development?

A recent study into public perceptions of sustainable development (Barrett and Scott, 2001) found that people were generally aware of environmental problems (mainly through the media) but little was known or understood of the concept of sustainable development.

"I've heard of it but I don't know what it means."
(Group 2 participant)

In fact, many members of the focus groups were taken aback by the immense burden that humans place upon the environment. One group participant stated:

"I was quite shocked that we needed three more planets."
(Group 3 participant)

A fairer world

With the aid of the ecological footprint, many people were able to understand and identify with the notion of global equity and an even distribution of the resources of nature. Links were also made between human activity, poor health and environmental degradation. For example, on the issue of transport, one participant blamed traffic congestion for causing ill health, whilst others put the blame on inadequate public transport for the increase in car use.

"But we've also got to look at the state of public transport, the buses and how they've gone down, some are really grotty."
"Especially in Liverpool where they buy 30 year-old West-Midlands buses. I'd like to see the older dirty buses taken off the road."
"Yeah."
"I've been on the bus once when the fumes were inside the bus."
(Group 7 participants)

Doing it for themselves

It was also realised that by doing something for themselves, people could actually help the environment. Group 5 participants gave just such an example, where their actions to improve their quality of life also benefited the environment.

"When you talked about putting new windows in your houses, you would reduce your footprint and improve your quality of life?"
"Yeah, we will. So maybe you can do both together."
"We didn't think of that. If we save on our bills we're not using so much energy and helping stop global warming."
(Group 5 participants)
"It's made a difference in my life because my bills have gone down and my house is warm."
(Group 1 participant)

Throw-away society

From the resulting discussions, a discernible pattern emerged – many of the older participants recalled that the recycling of materials was common practice in the past; practically nothing was ever wasted. Today, however, a throw-away society has become apparent. Younger participants (teenagers) view the notion of

Source: Barrett and Scott (2001) *An Ecological Footprint of Liverpool: Developing Sustainable Scenarios. A Detailed Examination of Ecological Sustainability*

protecting the environment as abstract and far removed from their daily lives and needs. In effect, there was the sense that they had been left out, and that there was little they could do to change the situation because teenagers were rarely asked their opinion. Despite this negative response, there was a genuine concern for future generations. A concurrent theme throughout the discussions was the need for education.

"I think it would be important to educate because I have never considered any of this having any effect on the way I live or anyone else throughout the world."

"They should educate everyone then it wouldn't be a waste, because everyone would know."

"If we knew, we wouldn't be sitting here and you wouldn't be explaining; we'd be saying to you, oh yeah, oh yeah, but we don't know."

(Group 3 participants)

Education, education, education!

The groups promoted education on many occasions and for the younger participants, environmental education was seen as an essential requirement for schoolchildren. Aaland and Caplan (1999) suggest that educating children about their environment through lessons in school is an effective way of making sure that the message about sustainability reaches them. To demonstrate that the ecological footprint can be used as an educational tool, a study was undertaken to measure the amount of CO_2 that was released into the atmosphere as a result of taking children to school by car. In addition, the ecological footprint required for the 'school run' was also measured.

The study class (Primary school level) consisted of 23 children, of whom 16 were pedestrians and seven were passengers in cars. The aggregate annual journey to school for all children in the study class was 10,133 km – 3,567 km apportioned to walkers and 6,566 km for car passengers. The modal split was 70/30% for pedestrians and passengers respectively. On average, a car emits 0.2012 kg of CO_2 per kilometre. Therefore the annual emission of CO_2 for seven passengers/children was 1.32 tonnes. However, it is difficult to expect children to visualise a tonne of carbon dioxide, so data for the distances walked or driven to school were converted into the equivalent distances to cities around the UK and Europe and into an ecological footprint, which was more easily understood. For example, in a school year, three children were driven the equivalent distances to Madrid, Bari and Warsaw in Europe, whilst some children walked as far as Inverness, Exeter and London in order to get to school.

The ecological footprint required for removing the CO_2 emitted by seven passengers/children amounts to 236.37 hectares (33.76 hectares per passenger/child). The ecological footprint for each child that was driven to school would provide for almost 20 football pitches.

The same methodology was also applied to the total number attending the school (599 children) using the modal split above and the mean distance travelled by car of the study class (938 km). In total, 168,746 km are driven to (am) and from (pm) the school annually. As a result, 33.9 tonnes of CO_2 are emitted. The ecological footprint for the school-run amounted to 6,075.5 hectares. However, if the drivers return directly home then the figures above could conceivably be doubled. Such evidence could be promoted alongside other issues concerned with the school-run, such as health, safety and congestion (London and Romieu, 2000, DETR, 2000).

It was found that for educational purposes and for raising awareness of the problems associated with the 'school-run', the ecological footprint proved more than useful.

case studies

Case study 1:
Island State – Isle of Wight

The *Island State Report* was the first study to utilise the power of the ecological footprinting approach, and as such provides a benchmark for all other future studies.

The project
Conceived by Best Foot Forward (BFF), the project ran under a partnership arrangement between Isle of Wight Council, Imperial College London and BFF. Funding was provided by Biffaward and the Isle of Wight Council. The process began in February 1999, with the report being published in late 2000.

Expectations
Isle of Wight (IofW) wanted community study surveys to be part of the data-collection process, as well as positive linkages to the LA21 strategy. The study was to conduct a Mass Balance Analysis (MBA) for the Island from which an ecological footprint could be constructed. It was hoped that the ecological footprint could be used as an indicator, updated on a time-incremental basis. The project also aimed to build capacity within the LA, developing an understanding of the methodology and assumptions underpinning ecological footprint.

Key areas were local food production and consumption (including milk, fruit and vegetables, farmers' markets and organic food), waste management and energy use

The process
A MBA and ecological footprint were constructed for the report, together with a sustainability assessment and scenario work. IofW undertook a significant amount of the data collection, which took place over one year. Data collection was a problem – especially regarding issues of data confidentiality (eg only one supermarket chain agreed to provide consumption data; others were uncooperative.) Data from imports and exports via the major ferry companies was also not forthcoming. Data went to BFF, and the resulting complete data sets have not yet been accessed by the IofW.

Outputs
The project was launched on the Island, generating good PR and helping to embed the ecological footprint approach in some of the consciousness of the Island. The *Island State Report* received an award from Biffa – presented by Michael Meacher – for best practice and innovation. However, sadly no community study surveys were undertaken, and the report itself was not as integrated into the local authorities' work (LA21, waste strategy, etc) as would have been liked. Due to the commercial sensitivities involved in the BFF methodology, IofW was not in a position to answer questions associated with this or to fully explain data sources and assumptions. There was no exit strategy to enable IofW to update the ecological footprint on a time-incremental basis.

Scenarios
Scenario work was undertaken by Imperial College London. Although basic and sometimes verging on the naive (ie walk more!), they show how the Island could become more sustainable. Key areas were local food production and consumption (including milk, fruit and vegetables, farmers' markets and organic food), waste management (including glass recycling, organic waste, paper and card and aluminium) and energy use (looking at the production of wind and biomass energy potential).

The linkages
IofW made good linkages to the LA21 strategy, but this received only the briefest of mentions in the Island's

strategy document itself. The *Island State Report* makes no such connections. Linkages were also made to the renewable energy strategy, the local transport plan and to the tourism strategy. However, the ecological footprint was not used as a sustainable development indicator: these were formed using the 'Best Value' framework. Members latched on to it well, as did key officers in the energy and planning departments. Sadly, the waste officer took no notice of the report. No educational work was undertaken nor further communications work done around the report.

The future

If IofW was to undertake the project again they would:

- have two or three key officers taken through the methodology and assumptions employed
- have a standardised data validation process, together with 'top down' pressure to release difficult to access data sets (supermarkets, trade, energy)
- secure university involvement for greater transparency and openness
- hold regular briefings for members and officers – enabling capacity to be built within the LA to understand the methodology, data sources and assumptions employed
- promote the concept to a range of audiences (public, internal, commercial, etc) as part of a sound communications strategy
- use the ecological footprint as a composite indicator broken down by component, so that it could relate to more resonant indicators (transport, energy, waste, etc)
- update the ecological footprint on a time-incremental basis to ' keep it alive'.

Conclusion

The *Island State Report* was ground-breaking in its use of both MBA and ecological footprint. However, the use of BFF's opaque methodology (EcoIndex™) means that it is difficult to build the capacity within local authorities to undertake further work on a time-incremental basis.

Case study 2: Liverpool

The project

The Liverpool study was conducted by Stockholm Environment Institute (SEI) under a partnership arrangement between Liverpool City Council, the North West Development Agency, North West Water, the Government Office for the North West and the Environment Agency. The process began in 2000 with the report published in 2001.

The process

A MBA and ecological footprint were constructed for the report, together with a sustainability assessment and scenario work. SEI did most of the data collection, which took one year. The report is more transparent than the *Island State Report* and highlights areas of data availability and sources, as well as underpinning assumptions and algorithms.

Outputs

The report was presented to the Council, generating good PR, and widely publicity throughout the city. Focus groups were used not only to examine the metaphorical qualities of the tool but also to look at positive scenario generation.

Scenarios

The scenarios are detailed and cover CO_2 emissions, energy consumption, combined heat and power schemes, solar panels, energy conservation in the home, waste management (kerbside collection, organics, plastics, glass, steel and aluminium), and water management.

The linkages

The report made good linkages to both global and local aspects of the sustainable development agenda, but has yet to be fully realised as a strategic management tool by Liverpool City Council.

Conclusion

The *Liverpool Report*, while riding on the back of *Island State,* achieves more in terms of transparency and awareness-raising, but has yet to be fully realised as a serious management tool within the local authority.

footprinting

–what it can and cannot do?

What the footprint can do...

The footprint can tell us about our impacts upon the natural world that sustains us.

The footprint can provide us with a 'time-bound' snapshot of our demand upon nature.

Our 'fair earth share', as well as our local biocapacity tell us about our available supply.

The footprint can tell us whether we are meeting the minimum requirements for sustainability.

...And cannot do

The footprint cannot tell us what to do!

The footprint tells us nothing about our quality of life – although it can indicate what conditions may be like in the future if we continue on our 'business as usual' trajectory.

The footprint cannot account for pollutants or 'externalities' such as nuclear power.

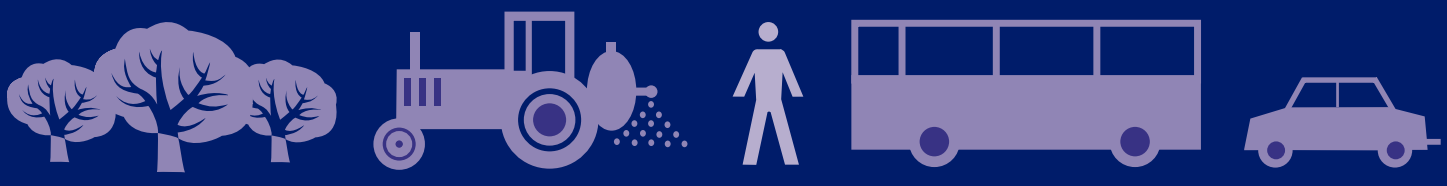
Conclusions

- The bottom line for sustainable development is that we live within the capacity of supporting ecosystems (ultimate means).
- Our goal is quality of life for all (ultimate ends).
- To progress from our ultimate means to our ultimate end, involves the recognition of other forms of capital. 'Nature' thus becomes natural capital.
- It is a contradiction in terms to claim that a given area is sustainable in the context of an unsustainable world, ie sustainable development can never be achieved for one region at the expense of others.
- Ecological footprinting is both a technical concept and a metaphor. With its intuitive meaning it says that the human footprint should not exceed the area able to support it. It also supports an equity perspective by showing that, in order sustainably to accommodate Northern large footprints, very little space would remain for Southern footprints.
- Ecological footprint analysis is a strategic management tool; strategies that reduce the footprint can then be prioritised.
- Ecological footprint analysis is a visioning tool that enables us to think about scenarios for the creation of a more sustainable future.
- Ecological footprint analysis is an awareness-raising and educational tool.
- Ecological footprint analysis can help to provide some of the missing glue that will 'join up' the other 30 or so strategic documents that the council must produce (UDP, Economic Strategy, Community Strategy, Anti-Poverty Strategy, Waste Strategy, Environmental Strategy, 'Best Value', etc).
- Ecological footprinting provides a resource and information base for all other plans.
- Ecological footprint analysis can help to bridge the gap between the larger global concerns of LA21, and the new duty to produce Community Strategies. This could be used in the 'visioning' process that is a requirement of this new duty.

Other uses of the footprint

The footprint can be used to measure any product, activity or impact, at all levels from self to planet. It is therefore possible to use the footprint in Environmental Management Systems (EMS) and as a planning tool. These applications are yet to be fully explored but highlight the overall usefulness of this tool for local authorities and their wider functions.

appendices



appendix 1 Footprinting myths

1 Footprint accounts are incomplete
Ecological footprint analysis does not claim to account for all human impacts on the environment. Instead it prefers to offer a conservative underestimate whilst acknowledging that other impacts exist. Most obviously, the accounts focus on resource consumption, with the exception of water, and underestimate the impacts of waste products. However, several footprint studies have addressed both of these shortfalls. Chambers et al (2000) demonstrate two methods of incorporating water consumption into footprint accounts. The same publication presents a study that includes footprint estimates for several pollutants.

Other studies have tackled the complex task of accounting for pollutants other than carbon dioxide – for example, Folke et al (1997), Wackernagel et al (1997) – though they remain excluded from national footprint calculations. The main hurdle to further integration of pollution accounting would seem to be a lack of reliable research data on the way in which pollutants interact and affect bioproductivity. Further discussion on this issue is contained within a paper by Holmberg, Lundqvist, Robért and Wackernagel (1999).

There is also some confusion amongst critics of the method as to what the footprint is intended to account. The footprint typically accounts only those resources which are part of the biosphere's cycles. It is implicitly assumed that the use of heavy metals and hazardous chemicals (those which are persistent, bio-accumulative or toxic) should either be eliminated or must be handled in totally closed loops which do not involve release into the natural environment. Studies have shown (Krotscheck and Narodoslawsky, 1996) that the impact on bioproductive capacity of, for example, heavy metals are massive and usually swamp other effects of consumption. The natural assimilation rate of copper, for example, is 42 mg per square metre per year. The footprint of a kilogram of copper would therefore be 2.38 ha-years. The footprint of a kilogram of PCBs is an impressive 2,000 ha-years.

2. Applying carrying capacity concepts to human populations is flawed. Evidence has shown that (a) humans, unlike other animals, can and do increase the carrying capacity of their environment to meet their needs and (b) certain regions and communities seem to be living beyond their local carrying capacity now with few ill effects.
Criticism (a) is based on a misunderstanding of how footprinting accounts for changes in biocapacity. As the footprint is a 'snapshot' measure, reflecting the supply and demand at the time of the analysis, future effects (such as increases or decrease in biocapacity) would only become apparent in subsequent analyses.

Criticism (b) ignores the fact that populations can exceed local carrying capacity either temporarily, by running down natural capital, or more permanently, by importing or appropriating capacity from elsewhere. Take the example of a fishing community dependent on a local lake for their food. They can over-fish the lake, temporarily increasing supply, by catching smaller and smaller fish. This will impact on the ability of the fish population to sustain itself leading to a decline in stocks. This is of course what has happened on a wider scale in European waters where arguments have raged over the gauge of fishing nets which will allow the immature females to escape. Another option for the fishing community is to simply import produce from elsewhere, either fish or another protein substitute, thus appropriating carrying capacity form elsewhere.

3. The very process of aggregating land types to calculate a footprint assumes substitution – yet this is not possible.
This is a complex point raised in different forms by various commentators. Basically, this comment is based on a misunderstanding about the nature of the footprint as a measure of impact based on current biocapacity calculations. Aggregating information into a single indicator need NOT imply that the elements being measured are interchangeable in any real sense. For example, MTOEs (Million Tonnes of Oil Equivalent) is a common unit used for aggregating the energy content of different fuel types to derive an overall indication of energy consumption. Aggregating in this way does not imply that the fuels are in any way interchangeable – natural gas cannot substitute for diesel, for example.

Source: WWF Cymru, *The Footprint of Wales: A Report to the Welsh Assembly Government*

4. Carrying capacity is irrelevant since resource yields can be increased in the case of renewable resources, and depletion profiles can be extended by technology in the case of non-renewable resources.
Indeed, carrying capacity can be altered: both eroded as in the case of desertification, and enhanced as in the case of careful management schemes. That's why ecological footprints are always compared to the biocapacity of a given year (as mentioned earlier).
In fact, as footprint accounts point out, technological efficiency is one possible strategy to reduce humanity's draw on nature (as long as the efficiency gains are not outpaced by an increase in consumption).

5. Carrying capacity calculations have limited relevance when trade is possible since the scarce resource can be imported in exchange for another asset in which the exporting nation has a comparative advantage.
Footprint accounts do not argue against trade. They point out that not all countries can be net-importers of ecological capacity if global overshoot is to be avoided. Footprint accounts make ecological trade imbalance visible and show to what extent nations depend on net imports of ecological services. Furthermore, Pearce's interpretation that shifting to imports from high-yield areas will reduce a country's overall footprint is incorrect. From a global perspective, this is a zero-sum game at best. And in fact, in our accounts, a shift to imports from higher-yield areas does not reduce the importer's footprint.

6. Certain economies that are highly urbanised (The Netherlands, Singapore, Hong Kong) can never be sustainable since they can never meet their ecological demands from their own land.
Of course, urbanised economies are more likely, by definition, to need to import resources to meet their needs. This does not mean they can never achieve sustainability, it just means that they will have a more dispersed footprint, which will have a certain transportation 'overhead'.

7. Footprinting is a survivability concept not a sustainability concept. Survivability is about maximising the time available on earth for human species, independently of the quality of that existence.
Certainly footprint estimates are a minimum requirement for sustainability. In other words, living within global carrying capacity is necessary but not sufficient for sustainability. It may be desirable to increase the footprint to allow for a higher quality of existence.

8. Calculating the fossil fuel footprints in terms of area needed to absorb the corresponding CO_2 is inadequate according to some critics.
The area included for CO_2 sequestration represents the degree by which the planet would need to be larger in order to cope with anthropogenic CO_2 output. Finding other ways to combat atmospheric CO_2 accumulation would open dramatic possibilities for reducing humanity's footprint. Calculations for various forms of renewable energy are included in Chambers et al (2000). Another method of calculating the fossil-fuel footprint is to assess the biological area necessary to produce a substitute. This would lead to even larger footprints.

9. There are substantial uncertainties about how to calculate the land areas required to offset waste flows.
The science of accounting for various pollutants is in its early stages, and by omitting these, footprint studies underestimate environmental impact. Examples of studies where the footprints of wastes have been included are referred to earlier.

10. Footprint accounts make no distinction between land uses that are sustainable and those that are not.
This is correct. But as mentioned previously, changes in productivity due to unsustainable land use do appear in future estimates of biocapacity. If activities in one year lead to an increase in desertification, for example, then the bioproductive supply will decrease in subsequent years.

appendix 2 Ecological footprint – how it measures up

Measures what we want to know, or is an acceptable proxy for it	Ecological footprint measures human resource consumption against our stocks of natural capital – and answers the most basic question for sustainable development: 'How much nature have we got, compared with how much we use?'
Scientifically valid	The ecological footprint concept has been in use since 1992. More recently, it has been used to compare the ecological footprint of nations (see www.rprogress.org), and of regions (eg Oxfordshire, Isle of Wight, Guernsey, Santiago).
Simple and easy to interpret	Ecological footprint is both a technical concept and a metaphor. Intuitively the human footprint should not exceed the area able to support it. It also supports an equity perspective by showing that in order sustainably to accommodate Northern large footprints, very little space would remain for Southern footprints.
Shows trends over time	Ecological footprint can be used to compare against other countries, regions, organisations and individuals and against itself to show trends over time, ie has the footprint increased or decreased since the last measurement?
Sensitive to changes it is meant to indicate	Ecological footprint is an aggregate of resource consumption flows and waste assimilation, converted into a land mass area that represents ecosystem categories. Changes in consumption patterns will produce changes in the demands of each ecosystem category, and a corresponding change in the overall footprint.
Reliable/stable and reproducible, ie comparable information is obtained when a measurement is repeated	Comparison between regions, countries and individuals is reliable/stable and reproducible, given the same methodology. However, there is also potential to compare differing footprints between differing methodologies. Recent studies in Oxfordshire and on Guernsey produced similar results with differing methodologies.
Capable of being updated at regular intervals	The ecological footprint can be updated whenever new data is collected. This could be done on a yearly basis for instance.
Capable of use for extrapolation or prediction, because the processes it reflects are well enough understood	Ecological footprint analysis can be used to plan and model scenarios for the creation of a more sustainable future. Once the initial data has been collected, the data sets can be used to model differing scenarios and examine their impact on the footprint, eg waste management, food production, transport measures, renewable energy, etc.
Based on readily available data or data at a reasonable cost	Differing methodologies use differing sets of data. 'Compound' uses nationally available trade data. 'Component' uses data collected on a regional basis, readily available from Local Authority Areas. 'Direct household measurement' uses primary sourced data from individual or household consumption patterns.
Based on data adequately documented and of known quality	Both secondary sources of data (for either 'compound' or 'component' methodologies) are well documented and of known quality.
Have a target or guideline against which to compare it	Given planet earth's present population, our current 'fair earth share' is 1.87 ha per person. This is the target or baseline requirement for the maximum level of our ecological footprints.

references & contacts

References

Aaland, D, M and Caplan, A, J (1999) "Household valuation of kerbside recycling" in *Journal of Environmental Planning Vol 42,* No 6 Glasgow, pp781-799

Barrett, J and Scott, A (2000) "Public perception of sustainable development within Dingle, Liverpool and a guide to developing a successful Local Agenda 21 strategy". Unpublished report for Dingle SRB Partnership, February 2000

Brundtland Commission (1987), *Our Common Future,* World Commission on Environment and Development

Canadian Conservation Commission (1915) cited in *Building Sustainable Communities: A resource for Citizens and their Governments*

Chambers, N, Simmons, C and Wackernagel, N (2000) *Sharing Nature's Interest: Ecological Footprints as an Indicator of Sustainability,* Earthscan, London

Department of Environment, Transport and the Regions (2000), "School Travel" – visit www.localtransport.detr.gov.uk/schooltravel/index.htm

Folke et al (1997) cited in *The Footprint of Wales: A Report to the Welsh Assembly Government,* WWF Cymru (2002)

Holmberg, Lundqvist, Robért and Wackernagel (1999) cited in *The Footprint of Wales: A Report to the Welsh Assembly Government,* WWF Cymru (2002)

Krotscheck and Narodoslawsky (1996) cited in *The Footprint of Wales: A Report to the Welsh Assembly Government,* WWF Cymru (2002)

Levett (1998) in Chambers, N, Simmons, C, and Wackernagel, N (2000) *Sharing Nature's Interest: Ecological Footprints as an Indicator of Sustainability,* Earthscan; London

London and Romieu (2000) cited in *The Footprint of Wales: A Report to the Welsh Assembly Government*, WWF Cymru (2002)

Lewan, L and Simmons, C (2001) "The use of Ecological Footprint and Biocapacity Analyses as Sustainability Indicators for Sub-national Geographical Areas: A Reccomended way Forward"– visit http://www.prosus.uio.no/english/sus_dev/tools/oslows/2.htm

Simmons C, Lewis, K and Barrett, J (1997). "Two feet – two approaches: a component-based model of ecological footprinting" in *Ecological Economics,* Elsevier Science, Oxford, pp 375-380

Von Weizacker, E, Lovins, A, B and Lovins, L, H (1997) *Factor Four: Doubling Wealth, Halving Resource Use – The New Report to the Club of Rome,* London, Earthscan

Wackernagel, M and Rees, W (1996) *Our Ecological Footprint: Reducing Human Impact on the Earth,* New Society Publishers, British Columbia

Wackernagel et al (1997) cited in *The Footprint of Wales: A Report to the Welsh Assembly Government,* WWF Cymru (2002)

Wackernagel et al (1999) "National natural accounting with the ecological footprint concept" in *Ecological Economics*, Elsevier Science, Oxford, pp 375-390

Wackernagel et al (2000) "Ecological Footprint" in Loh, J (ed), *Living Planet Report 2000,* WWF International

WWF Cymru (2002) *The Footprint of Wales: A Report to the Welsh Assembly Government*

WWF International (2000), *Living Planet Report 2000*

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ADVICE NOTE

This document is designed to give local authorities and regional assemblies help, advice and guidance on the 'why' and 'how' of engaging with ecological footprinting. It does not give you the expertise to construct a footprint yourself, rather it is designed to help, aid and inform sustainable development practitioners to be able to consider this tool as part of their sustainable development strategies.

The use of the footprinting concept is becoming more widespread – whether that be in institutions, in the classroom or on the street corner. This tool is the first in a series: it will help you to take the first steps. For more information, contact Stuart Bond at the WWF Cymru (Caernarfon) office – see above.

For further copies of this report, please contact Jo Boyes, Local Sustainability Unit at the WWF-UK address above, or Stuart Bond, WWF Cymru (Caernarfon).
Copies can also be downloaded from our website at
www.wwf.org.uk/filelibrary/pdf/ecologicalfootprints.pdf

ecological footprints

A guide for local authorities

By Stuart Bond

To address sustainability requires us to understand two fundamental dynamics, a biological dynamic and a social dynamic. If we examine these dynamics, essentially what we are seeing are two trends: human demand is increasing, while ecological capacity is decreasing. And the hard fact of life is that human demand has the ability to exceed nature's supply: like money, we can spend more than we can earn.

So to what extent are we living within the means of nature? To what extent are we using the regenerative capacity of the planet through solar energy to produce sustainable flows? Are we eating into our natural capital – using technology to exploit nature – at a pace that exceeds its regenerative capacity?

To answer these questions, we need to compare nature's supply with human demand. Calculating the supply side is easy – we have one planet. To calculate human demand we need to add up 'units' of nature for fibre, food, energy, urban land and waste assimilation. This gives us our ecological footprint.

This is a guide for all sustainable development practitioners who wish to learn more about applying the ecological footprint concept. It is about taking the first steps in using this powerful metaphor and technical concept to help us measure sustainable development. And, through measuring it, we can then begin to understand the reality of our impact on the planet, and make positive incremental changes towards a more sustainable world.

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