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Engaging with the Ecological Footprint as a Decision-Making Tool: Process and Responses

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ABSTRACT Since the initial development of the Ecological Footprint in the early 1990s, the concept has gained increased interest amongst academics and practitioners internationally. In the UK, it is estimated that some 60 to 70 Ecological Footprint studies were undertaken between 1999 and 2004. Although the majority of interest in Ecological Footprinting has come from local government, a recent study has found that government officers involved in the formulation of council policy have not been able to engage with the Ecological Footprint as a process or use the results to inform policy decisions. This paper analyses how an Ecological Footprint has been developed for Cardiff, the capital city of Wales. The approach used to construct an Ecological Footprint for Cardiff has been significantly different to that which had been used previously in the UK, as it has involved a unique consortium of researchers at Cardiff University and policy development officers at Cardiff Council checking the quality of data used in the Footprint calculation, and developing a range of policy scenarios.

Introduction

Ecological Footprint (EF) analysis was initially pioneered in the early 1990s (see Wackernagel & Rees, 1996). Following its early conceptual development, the EF has gained interest amongst academics and practitioners internationally (for example, EcoTec Research and Consultancy–UK,

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2001; Lenzen & Murray, 2001; Lewan & Simmons, 2001; Environment Protection Authority [EPA] Victoria, 2003; WSP Environmental, 2003; National Assembly for Wales [NAfW], 2004; Network of Regional Governments for Sustainable Development [NRG4SD], 2004; Aall & Norland, 2005; Risk and Policy Analysts (RPA), 2005; Wiedmann et al., 2006; World Wildlife Fund, 2006). The concept has widespread appeal and provides an innovative approach to communicating messages about the global impact of current resource consumption.

Interestingly the EF emerged onto the international stage at a similar time to that of the concept of Environmental Space (Opschoor & Reijinders, 1991; Carley & Spapens, 1998) but their fortunes have subsequently markedly diverged. Both the EF and Environmental Space, and related terms, such as the 'Ecological Backpack', have been devised to link consumption to resource use (Carley & Spapens, 1998, p. 70). Within these different methods there is a desire to ask whether current patterns of resource use are sustainable and equitable. For both approaches the answer is clearly no, but they arrive at their conclusions in different ways. According to McLaren et al. (1998, p. 6)

> Environmental space is the share of the planet and its resources that the human race can sustainably take. Or in other words, the share of the earth's resources that humanity can use without depriving future generations of the resources that they will need.

Environmental Space identifies a number of resources that are key for production and consumption, including energy, strategic non-renewable resources (e.g. pig iron for steel, cement), freshwater, wood, land use (providing living space and a source of renewable resources (e.g. food production) (Carley & Spapens, 1998, p. 61). For each of these resources an assessment is then made of their exploitation (usually over a year) by humans without harming the quantity and quality that can be used by future generations. So, whereas the EF converts all impacts into a single unit (the global hectare), the Environmental Space method provides a separate measure of each of the key resources. As the advocates of Environmental Space admit, 'it is the more complex approach ... it is also probably more difficult to understand and communicate' (Carley & Spapens, 1998, p. 70).

In the UK, the EF has had a number of applications, including products, organizations, services, and at different levels of government (Chambers & Lewis, 2001; Best Foot Forward, 2002; Barrett & Scott, 2003; Barrett et al., 2005; Collins et al., 2005a). In contrast, there is, perhaps, only one significant example of the application of the Ecological Space approach in the UK, that of McLaren et al. (1998). Part of the reason for the different experiences of the EF and Environmental Space approaches is that the latter is targeted at national government and the former has much more flexibility in its application. The majority of interest in the EF has come from local government. However, research conducted as part of an EF study of Cardiff (UK) found that few examples existed of where the EF had been used to inform council policy decisions (Collins et al., 2005a). The weakness

running through the approaches used had been a limited involvement of officers in developing an EF for their area and a lack of trust in their EF results. This paper analyses how an EF was developed for Cardiff, the capital city of Wales, and one which sought to develop a more discursive approach to assessing evidence and policy development (see below). Cardiff provides an interesting case study because it is one of the first EF studies at a UK local government level that has focused on engaging policy development officers so they have a sense of ownership and trust in the results for their area. This process of engagement involved researchers at Cardiff University liaising closely with officers from Cardiff County Council (CCC) to check the quality of data used in the EF calculation, and inform the development of policy scenarios.

Evidence, Policy Development and Decision-Making

Moves towards a more deliberative style of policy development have been important at both a prescriptive and an analytical level. One feature of the Environmental Space approach has been its efforts to engage with a community of stakeholders to agree on the targets and timescales for action (see Carley & Spapens, 1998). Aside from an initial flurry of enthusiasm, there has been little attempt by advocates of Environmental Space to develop a more systematic engagement with governments or other interested parties on curbing resource use. The EF, by contrast, has been more explicitly concerned with developing a more deliberate form of policy development and, indeed, amongst its practitioners has tended to ally itself with a narrower and more technocratic model of decision-making (Collins & Flynn, 2005). However, the EF's power as a communication tool and reducing the environmental impacts of consumption into a single unit may make it well suited to an advocative style of decision-making. This is because the EF can be readily understood by diverse groups of professionals.

The persuasive, advocative or argumentative perspective draws upon the insights into the decision-making process provided by Fischer and Forester (1993) and recognizes that decisions are made by groups of actors who engage in debate. Actors hold values and aspirations that will differ from their peers and so decision-making is a complex and collective process. The ability of individual actors to influence decision-making will vary, and, of course, those concerned with the promotion of sustainability or environmental concerns are often likely to find themselves needing to win arguments against well-entrenched developmental interests. There is, therefore, a need to develop arguments that can gain the support of other interests. It is not simply about presenting a case based upon 'facts' but about *persuading* other actors of the merit of the case. So, within the CCC, as we shall see, there were efforts to create spaces for deliberation, for example a Task and Finish Group, in which officers could discuss data, methods and the assigning of environmental values to resource use, and evidence needs for policy development.

However, those using the EF results and the tool itself as part of a case to persuade other actors to adopt a more sensitive environmental position must also recognize that at least some of those actors will be wedded to their positions, will deploy counter-arguments and bring to bear their own favoured tools. So whilst the EF raises challenging questions about the level of resource consumption, the balance of interests at both an official and political level may mean that these are kept to the margins of an organization. As Flyvbjerg (1998) notes, a tool like the EF may simply rationalize decisions that are made by powerful actors rather than providing an alternative development model.

Structure of the Paper

The following section begins by explaining what an EF is and then describes how EF analysis has developed in the UK since its initial introduction in the late 1990s. In the third section we briefly describe how EF studies were undertaken for local government between 1999 and 2003 and how local governments have responded to and used their EF results. The main part of this paper (the fourth section) describes how an EF was developed for Cardiff. We describe steps taken to gain the necessary political buy-in and corporate support for the Cardiff study and how officers across CCC were involved in the EF process. In the fifth section we report on the initial reactions of policy officers to the Cardiff EF results and how the organization has started to engage with the EF as a tool to inform policy decisions on sustainability issues. The final section provides a discussion on the merits of the EF process developed for Cardiff, and the implications for future EF studies.

What is Ecological Footprint Analysis?

The starting point for the EF concept, like that of Environmental Space, is that there is a limited amount of bioproductive land on the planet to provide for all human resource demands. Sustainable development requires that we live within the carrying capacity of the earth, allowing our economies to develop whilst still ensuring that human needs are met. The EF is an aggregated indicator of global ecological impact and is measured using a standardized area unit equivalent to a world average productive hectare or 'global hectare' (gha), and is usually expressed in global hectares per capita (gha/cap). The EF is derived for a defined population usually for one year by estimating the area of land required to support their resource consumption, for example, the demands of that population in terms of their food, travel and energy use. This demand on nature can be compared with the available biocapacity of the earth, which translates into an average of 1.8 gha/cap in 2001 (WWF, 2006). However, humanity is currently using 2.2 gha/cap, which indicates a situation of 'overshoot' whereby nature's capital is being spent faster than it is being regenerated (WWF, 2006). Overshoot may permanently reduce the Earth's ecological capacity.

The EF is often promoted by its advocates as being an intuitive and attractive means of measurement, as it helps to visualize human demands on the environment in terms of our use of the earth's available land and it personalizes sustainability by focusing on consumption. Although the EF is being widely used and applied in the UK and elsewhere, the concept has faced a number of criticisms. Amongst the main points, critics have argued that: the EF does not accurately reflect the impacts of human consumption (see van den Bergh & Verbruggen, 1999; Lenzen & Murray, 2001; Ferng, 2002); it does not allocate responsibilities of impact correctly (see Herendeen, 2000; McGregor et al., 2004); and it does not provide decision-makers with a useful tool for policymaking, as there is limited understanding of how different consumer activities relate to impact (see van Bergh & Verbruggen, 1999; Ayres, 2000; Moffatt, 2000; Ferng, 2002). A more recent critique of the Ecological Footprint concept can be found in McDonald and Patterson (2004, pp. 52–54) and a more general debate can be found in Ferguson (2001) and Van Vuuren and Smeets (2001). In disseminating the EF in CCC, officers too raised a number of concerns about the method and what the EF measured. As we shall see below, a part of the process of ensuring adoption of the EF within the CCC was to be able to reassure officers of the robustness and credibility of the tool.

In the following sections we now turn to consider a new and emerging debate that is concerned with how best to engage policy development officers with the EF so that they consider it to be a credible tool to inform their policy decision-making process.

Ecological Footprint Development in the UK

In the UK there are currently two leading organizations that undertake EF studies: Best Foot Forward (BFF), a consultancy based in Oxford, and the Stockholm Environment Institute (SEI) based at York University. The EF concept was first promoted in the UK by BFF in 1996 following its market testing of 'Eco-Cal', an EF calculator that was developed as part of the UK government's 'Going for Green' campaign and focused on individual lifestyle analysis. Following on from that, the EF has had a number of applications in the UK, including products, organizations, services and different levels of government.

There is currently no complete catalogue of EF studies undertaken in the UK. However, based on interviews with EF experts at BFF and SEI it is estimated that between 1999 and 2004 some 60 to 70 studies were undertaken. In the UK, local and regional governments and devolved administrations have shown a strong interest in the EF. Studies at local government level studies completed to date include the Isle of Wight, London, York, Cardiff and North and North East Lincolnshire. Studies are currently being undertaken for the Greater Nottinghamshire area and also Aberdeen City, Aberdeenshire and North Lanarkshire as part of the Scotland Global Footprint Project. A number of regions including the South East, South West and North West of England and the devolved administrations of Wales, Scotland and Northern

Ireland have also commissioned EF studies of their areas. As shown in Figure 1, the number of studies undertaken has increased rapidly since 1999, particularly amongst local governments, the greatest number of studies being undertaken in 2002. During 2003 and 2004 the total number of studies being undertaken decreased by almost half. The main reason for this was that studies undertaken during this later period were more detailed in their analysis and thus of longer duration. Many of the studies undertaken during this period have been used by consultants for refinement of the EF methodology.

There are two main reasons for the surge of interest in the EF and the number of studies commissioned by or involving local government since the late 1990s. First, local governments across the UK were experiencing difficulties in making the link between local and global aspects of sustainable development in their initial local sustainability strategies. The EF concept was considered by officers as one possible approach by which they could communicate and raise awareness of environmental and sustainability issues amongst the general public and a range of other stakeholders. Even advocates of Environmental Space recognize that the EF is a powerful communication. Second, following the introduction of a landfill tax credit scheme in 1996, Biffa Waste Services under the fund name 'Biffaward', funded a unique series of research projects examining resource flows in the UK using mass balance principles. These projects quantified the movement of resources, including waste, through specific material or industry sectors and also geographical areas. A key component of the geographical studies involved calculating the EF of material resources consumed and disposed of by residents living within those areas.

In the following section we describe how some of the earliest studies were undertaken and how policy development officers in local government have responded to and used their EF results.

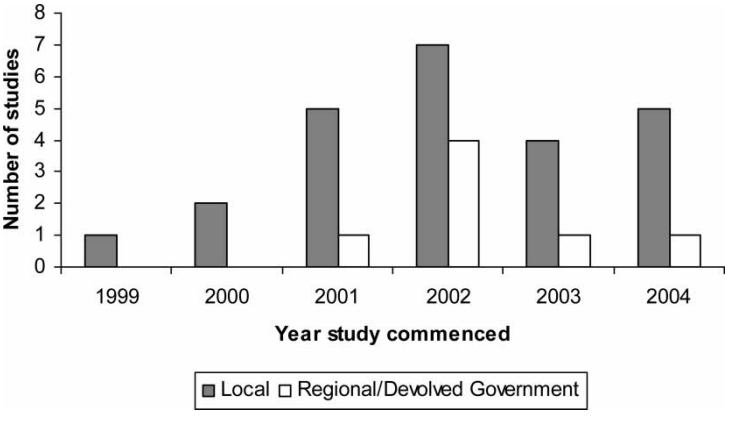

Figure 1. UK Ecological Footprint studies: local, regional government and devolved administrations (commenced 1999–2004)

Source: Data from consultants and organisations involved in EF studies in the UK and reports made available on the internet.

Constructing Ecological Footprints: UK Local Government Experiences and Outcomes

Between May 2003 and March 2004, researchers at Cardiff University undertook interviews with key individuals from organizations involved with EF studies undertaken for UK local government between 1999 and 2003 (Collins et al., 2005a). Given that the EF community in the UK is small, we have not identified organizations or interviewees. This analysis found that the majority of studies were developed through a narrow base in each organization. Projects were often driven by a single officer, often in a low-ranking position, who coordinated and collected relevant data from across their organization. This data were then given to an EF consultant to use alongside other data in the EF calculations. None of the studies included in the review had taken steps to gain corporate support for the project or its future use in policy-making processes. Studies were undertaken using a hands-off approach with minimal involvement by government officers in validating data and assumptions used in the calculations. Below we discuss local government officers' experiences and describe how they have responded to and used their EF results.

Previous Experiences and Outcomes

For most local government studies, the publication of a project final report has often marked the end of EF. Where the EF results have been used, this has been primarily for education or awareness-raising exercises amongst local communities. Local government officers who were interviewed expressed a number of common concerns relating to the credibility of the tool and the accuracy of their EF results, as it was not always clear what data sources had been used or how figures had been derived or estimated. This lack of transparency as to how an EF was calculated has led local government to lack confidence in using the tool to inform policy decisions. For example, one local government officer in an interview raised concerns that the data used in calculations did not match up with data that had initially been provided by officers to the EF consultants. As there was a perceived anomaly between data provided by officers and that used by consultants in the calculations, the officers were reluctant to use the EF results.

Based on the above experiences, two factors have emerged that may provide some explanation as to why local government has not used their EF results to inform policy decisions. The first issue relates to failing to generate the necessary political buy-in and corporate commitment towards data collection and subsequent use of the tool. The second issue relates to the transparency of data sources used and assumptions made within the EF calculation. As local government officers were not involved in checking the appropriateness of assumptions about their local area and how data provided by them were used to developing an EF for their area, they have lacked confidence in the results and knowledge as to how they relate to policy.

To overcome the above-mentioned problems associated with previous EF studies, there was a strong determination by CCC that their EF results

should have validity and resonance for policymakers. From the outset, project partners developed a process that was transparent and engaged officers from across CCC. Opportunities were created for discussion and exchange of ideas. Uniquely, in the context of an EF study, Cardiff University not only worked closely with CCC and EF consultants to collect local data for the EF calculation, but also liaised closely with policy officers from CCC to develop sustainable policy scenarios. This novel approach for EF has developed new processes and ways of working for all partner organizations involved. In the section below we provide background to the Cardiff case and outline why CCC wanted to undertake an EF study of the city.

Background to Cardiff's Ecological Footprint Project

Between January 2003 and January 2005, a partnership including the ESRC Centre for Business Relationships Accountability, Sustainability and Society (BRASS) at Cardiff University, CCC, SEI and WWF Cymru (Wales) undertook a collaborative project to measure Cardiff's EF (see Collins et al., 2005a). This project was part of the 'Reducing Wales' Ecological Footprint' project (see Barrett et al., 2005) which was funded by a £300,000 Biffaward, together with funding from the Welsh Assembly Government and Cardiff and Gwynedd Councils. The Cardiff project involved one full-time researcher at Cardiff University and two other members of staff contributing on a part-time basis, one of whom was seconded by CCC to the university for one year. This was invaluable in providing access to council officers and data, and also reinforcing the legitimacy of the project to local stakeholders. At the time of study, CCC was the only council in Wales that had adopted a commitment to the EF in its Local Sustainability Strategy (see CCC, 2000).

Reasons for Undertaking an Ecological Footprint Study of Cardiff

The EF concept was first considered by CCC in 1999 during the drafting stages of its Local Sustainability Strategy (CCC, 2000). At that time, CCC like a number of other Councils across the UK was experiencing difficulties in making the link between the local and global elements of sustainable development. CCC's initial decision to measure the city's EF was based on a perception that it was a positive step and would enable the CCC to make this local–global connection. As Cardiff is the capital city of Wales, CCC also wanted to be seen to be taking the lead on sustainability and to be one of the first councils in Wales to measure its EF. Minimal effort was needed to persuade politicians to commit to measuring Cardiff's EF and including it in the Local Sustainability Strategy (CCC, 2000). This Strategy commits CCC to integrating sustainable development into its decision-making processes, raising awareness of sustainability and assessing Cardiff's impacts on the global environment.

CCC had specific reasons for wanting to undertake an EF study of the city. First, the CCC's Local Sustainability Strategy (CCC, 2000) and Community Strategy (CCC, 2004) endorsed the EF approach and CCC wanted to

mainstream the project and its outcomes into existing policy. From the viewpoint of CCC's Sustainable Development Co-ordinator, the inclusion of the EF in these strategies had meant there was the potential that CCC would be able to go beyond its rhetorical commitment to sustainable development and demonstrate that it was taking positive action. Second, policy officers wanted a clearer picture of the scale of the environmental challenge that the city faces if it is to become more sustainable. The EF study would provide CCC with an initial benchmark for the city, and future EF exercises could then be used to track the city's performance. Third, the EF would provide CCC with a resonant tool and metaphor with which to promote internally and externally awareness of sustainable consumption and lifestyles. Finally, data on resource use and the EF results would provide policy officers with additional evidence from which to inform debate and policy development within CCC. More specifically, the team of sustainability officers within CCC hoped that the EF study could answer the following questions: What is Cardiff's EF per capita? What is the EF made up of? What are the most significant areas of resource use within the city? Is CCC prioritizing the right areas to reduce the City's EF? Are CCC's current policies sufficient to move the city towards more sustainable consumption? How can the data derived from the EF study be used to inform policy?

To provide credible answers to these questions, researchers at Cardiff University and staff at CCC felt that two types of methodological innovation needed to be developed. First, the process of data collection and analysis needed to be as transparent as possible and engage with key council officers to ensure as far as possible that they regarded the EF results as legitimate. Second, policy development officers must understand how the EF captured resource use and measured sustainability, so that these aspects could then be introduced to local environmental policymaking. This process of engagement—which arose through the creation of spaces for deliberation—was significantly different to the way in which previous studies were undertaken for local and regional governments elsewhere in the UK.

Selling the Ecological Footprint: Processes of Promotion within the Council

CCC's Sustainable Development Unit (SDU) took the lead in promoting and developing the project within the CCC. This involved 'selling' the EF concept upwards from the 'middle' of the organization to politicians and senior management as well as to policy and technical staff across 22 departments. Below we describe how the EF concept was sold to politicians and key council officers.

Selling the Ecological Footprint project to politicians

The request to secure council support to measure Cardiff's EF involved preparing a Cabinet Report for politicians in mid 2002. This report outlined the necessary financial contribution together with other resource implications including officer time to provide data and to work on

developing sustainable policy scenarios. The CCC's Environment Scrutiny Committee was also briefed on the project. The approach used to sell the EF project to politicians focused on four key issues. First, measuring Cardiff's EF would enable CCC for the first time to measure the city's global environmental impact. Cardiff's EF would be developed with the support of researchers at Cardiff University who would scrutinize the model and ensure that the best quality data available were used in the calculations. Second, the EF would identify the most significant environmental issues facing the city in terms of resource use, and would enable CCC to develop its policies in a more informed way. Finally, measuring Cardiff's EF would provide CCC with evidence to show that the city encounters different resource issues than the rest of Wales.

The request for corporate support to measure Cardiff's EF was received enthusiastically by politicians and with minimal resistance as they wanted CCC to be seen as leading on sustainability within Wales. This political acceptance meant that there was corporate support for undertaking the project and an opportunity that the results could be considered alongside other issues when developing local policy.

Selling the Ecological Footprint to policy officers

The approach used to sell the EF project to officers across CCC involved the SDU initially promoting the project to the Council's Sustainability Advocates, and it was here that structures were nurtured to facilitate a more persuasive style of policy development. The Sustainability Advocates network represented middle management from 22 different departments set up to work corporately on sustainable development across CCC. A briefing session was provided for Advocates in early 2002 to highlight the potential of the project, explain what the EF was and identify key departments across the authority which would be required to provide data for the project. A follow-up session in June 2003 involving SEI and Cardiff University provided Advocates with more detail on how the project would work and the requirements of key departments. At these briefing sessions explanations were provided of what was meant by measuring Cardiff's EF and how it would be measured. The approach used to sell the EF model to officers was non-threatening, as they were informed that the results would be likely to reinforce many existing policy agendas. The EF process would be transparent and involve officers from across CCC in providing data and checking the appropriateness of assumptions used in the calculations. The involvement of Cardiff University was also stressed, as researchers would scrutinise the EF model and data being used in the calculations. It would also mean that data collection by officers would be minimized, since this task would be undertaken by the university.

Within the first six months of the project starting (December 2003) a progress report was also prepared for Advocates by Cardiff University. This focused on existing data and the strategy for collecting additional data. This regular reporting at both political and managerial level was designed to involve and develop corporate ownership of the project and provided

the project with authority, status and credibility. It also helped to make the EF project central to CCC's agenda, rather than something separate and distinct. Adopting an open and corporate approach to selling the EF concept was important for two key reasons. First, it would support the data collection process, as officers would trust and understand how data provided by them would be used in the calculations. Second, the EF results would be widely understood by officers, since they had ample opportunity to voice any queries, and could be used to inform policy decisions across CCC.

Project Task and Finish group

Following the suggestion of Sustainability Advocates, a corporate 'Task and Finish' group—another opportunity for deliberation—was set up in September 2003 for the duration of the project. This involved policy officers from departments dealing with transport, waste, economic development, housing, energy, sustainable development and research. The role of the Task and Finish group was to assist Cardiff University in collecting data for the EF calculation and to validate data and assumptions. The group also provided ideas and suggestions on additional data sources and points of contact. In some instances the group also acted as a gatekeeper to organizations and companies that held data that the project might not otherwise have had access to for reasons of commercial confidentiality. This was valuable in ensuring that the EF was as accurate as possible and minimised the use of proxy data. For example, a local bus company provided estimates of passenger numbers and distances travelled within Cardiff. The group also assisted in addressing some of the data gaps, for example, helping to undertake a survey to ascertain how much food was grown in Cardiff's allotments for the baseline year.

Data collection process

Data collection was initiated in June 2003 and involved collecting consumption data for Cardiff residents for the component areas listed in Table 1. Up to thirty officers from across CCC contributed to the data collection process, as well as a number of external organizations, including a local bus company and Cardiff International Airport for passenger travel data relating to Cardiff residents and Cardiff visitors.

Each component of the EF was considered in turn by contacting the relevant member of the project Task and Finish group. Assessing the appropriateness and quality of data being used and assumptions made in the calculations required a continuous dialogue between researchers at the university, CCC and EF consultants. Throughout the study CCC officers were kept informed of progress made on data collection and were provided with opportunities to ask questions about how the EF findings would relate to their specific policy areas. Researchers at Cardiff University were also able to provide answers and respond to queries that might have undermined the EF model and data used, and provided assurance that the calculation was both robust and accurate.

In addition to calculating Cardiff's EF, Cardiff University also developed a number of novel applications of the EF that were specific to visitor

Table 1. Ecological Footprint results for Cardiff, 2001

Consumption Activity	Cardiff's Ecological Footprint (gha/cap)	Description of consumption activities included in each category
Food and drink	1.33	Includes food and drink consumed at home and catering establishments.
Domestic energy	0.99	Includes energy used at home (electricity, gas and other fuels).
Travel	0.99	Includes journeys made by all modes of transport in the UK and journeys made to destinations outside the UK.
Capital investment	0.74[1]	Includes investment in tangible fixed assets (e.g. machinery, transport equipment, dwellings and other buildings and structures), intangible fixed assets, improvements to land and costs associated with the transfer of assets.
Consumables and durables	0.64	Includes items such as newspapers, items for personal care, clothing. household appliances, furniture, audio-visual items, jewellery and items for recreational use.
Government	0.41[1]	Includes consumable and durable items used in providing local and central government services.
Services	0.26	Includes water, hospital, postal, telephone, recreational, educational, insurance, social protection, commercial and finance.
Housing	0.16	Includes materials used for building, maintenance and repair.
Holiday activities	0.10	Includes resources used by residents on holidays abroad (e.g. travel, accommodation, entertainment).
Other	−0.03	Includes non-profit institutions serving households; changes in inventories and valuables; and overseas tourist in the UK. The EF of overseas tourists results in a negative figure, as the EF is felt in their home geographical area.
Total	**5.59**	
Waste (satellite account)	0.81	Includes waste materials and how they are managed and finally disposed of (e.g. landfill, recycled, composted).
Tourists (satellite account)	8.67/tourist	Includes travel to the UK, transport services in the UK, purchases of consumable and durable items, catering, accommodation and other services.

[1]The EF calculations assume shared responsibility per capita in the UK.

consumption activities in the city; the 2003/2004 Football Association (FA) Cup Final and Cardiff's International Sports Village, a proposed large-scale development in Cardiff Bay (see Collins & Flynn 2005; Collins et al., 2007). These applications were used to illustrate the flexibility of the tool and demonstrate how the EF could be used to predict the environmental impacts of future developments in the city, and for officers to consider what policy changes were needed in order to mitigate those impacts.

From an academic and policy perspective it is important to be able to assess the rigour of the EF as a tool and how it may work alongside or compete with other organizational decision-making tools to assess environmental or sustainability impacts. For example, environmental or sustainability appraisal tools require professionals to make judgements about the impacts of a policy, programmes or plans on the environment. By way of contrast, the EF has the potential to provide environmental data in a user-friendly form by converting the impact of resource use for different activities into the same unit of measurement, the global hectare, so that decision-makers can, if they wish, claim to make more 'objective' or 'informed' judgements. To this end considerable effort was devoted to developing with council staff a number of different scenarios so that it could be shown what effect different policies would have on Cardiff's EF, for example, recycling of household waste versus waste reduction and replacing car travel with rail and bus.

Developing policy scenario options

The EF results of different policy scenarios were presented and discussed with officers in a series of workshops conducted during the summer of 2004. The aim of the workshops was fourfold. First, to continue the ongoing process of engagement with, and between, council staff. Second, to present preliminary EF results and check the quality of data and the appropriateness of the assumptions made in the calculations. Third, to encourage policy officers to think differently about how they could address sustainability issues in their area of work. Fourth, to assess how different policy areas inter-relate, for example, food, energy and waste, and consider whether current policies are effective or failing to address the most significant issues. The workshops also had the potential to help formulate targets based on the best available evidence in areas where CCC policy is poor, for example, climate change, energy and food, and what direction policy needs to take to achieve a reduction in Cardiff's EF. This mechanism has helped the SDU to raise awareness and sell the EF further across CCC as the results and policy implications were reported by members to their relevant management teams across the CCC.

Initial Reactions to Cardiff's Ecological Footprint Results

The overall EF for Cardiff was 1.72 million global hectares in 2001. On a per capita basis, the Ecological Footprint of an average Cardiff resident was 5.59 global hectares, which is greater than that for the average UK and Welsh resident (5.35 gha/cap and 5.25 gha/cap, respectively). The magnitude of these

figures shows that the level of consumption by Cardiff residents is currently unsustainable, as they are using resources more than three times the average 'earthshare' of 1.8 gha/cap. To be sustainable, Cardiff's residents would need to reduce their ecological demand by 68% to reach the average earthshare. Table 1 highlights the relative size of the different components of the EF. Almost a quarter of Cardiff's EF is consumption of food and drink, and this together with three other components—travel, energy and consumables—contributes 70% of the total EF. Cardiff's waste had an EF result of 0.81 gha/cap. Cardiff's tourists had an EF of 8.67 gha/tourist, which is considerably higher than the EF of a Cardiff resident (5.59 gha/cap). For a more detailed account of the Cardiff EF results and how they compare with Wales and the UK see Collins et al. (2006). A detailed description of the methodology used to calculate the Cardiff EF is published in Wiedmann et al. (2006) and addresses issues including the accounting of capital investment, the embedded impacts throughout all consumption categories as well as limitations and assumptions inherent to the method.

The Cardiff EF study has provided policy officers for the first time with evidence on the ecological impact of residents' consumption and how it compares with that for Wales and the UK. For example, Cardiff's EF per capita for travel and waste is significantly larger than that for Wales and the UK. The study also calculated the impact of various policies that could be developed to reduce it. For example, a 50% reduction in the amount of paper and card used by Cardiff residents could reduce their waste EF by 16% compared with a 12% reduction achieved by recycling. Or, to achieve a 10% reduction in the transport EF would require a 20% reduction in the distances travelled by car. In some policy areas, especially where there are already existing models and worldviews, professionals have reacted with at best caution to the findings. In other policy areas where professional groups have been weak or under threat, the EF results have been used to bolster positions and were much more enthusiastically embraced.

The EF results provided CCC with an evidence base that could support and encourage its officers to think in a more integrated way, as the results show that at present the activities of one part of the organization is putting costs on to another. For example, one department promotes tourism and events whilst another is then responsible for the collection and management of large amounts of visitor waste. These costs did not appear to have been taken into account in event-planning or tourism promotion. Within CCC, staff and elected members have also recognized the value of the EF as an aid to decision-making on sustainability issues and have gone so far as to make suggestions for further areas of research, including commuting, schools, and food procurement.

More recently, two key outputs have resulted from the Cardiff EF study. CCC together with Cardiff University has published a Summary Report which highlights key findings from the project together with actions and policy changes needed to reduce the city's EF (see Collins et al., 2005b). A key message within the report is that over the coming years Cardiff faces a fundamental challenge in terms of slowing the growth of its EF, before it

can start to think about reducing it. Suggested policies and action to slow the growth of Cardiff's EF include: consuming more organic and seasonal food and drink; generating energy from renewable sources such as solar, wind and tidal; reducing the amount of paper and card entering the waste stream; travelling fewer journeys by air and car; considering the resource use and impact of a development over its lifetime; and considering the ecological impacts in planning and managing events. The second output has been the preparation of a Cabinet Report for senior management and politicians. This report made recommendations that in addition to using the EF for awareness-raising and monitoring purposes the CCC should also commit to using the EF to assess the effects of new council policy and to inform future policy formulation.

Conclusions

The current emphasis placed by those conducting EF studies has been to standardize and increase the robustness and accuracy of the EF methodology. From the viewpoint of leading UK EF organizations, the standardization of the EF methodology is key to the EF being used by decision-making organizations such as local government. Standardization is also important if local communities such as Cardiff want to make comparisons with others. Building the capacity of organizations to use the EF has not been a focus for studies undertaken prior to Cardiff. Funding packages have tended to support the communication and awareness-raising aspects of the EF, and have focused less on engaging decision-makers with the tool. There has been relatively limited investment by funding regimes for capacity-building, which can be very resource intensive. Building the capacity of partners involved was a key element of the Cardiff EF study and from the outset CCC officers were involved in the process of constructing an EF for the city.

The process used to conduct the Cardiff EF study has been significantly different to that used previously for other UK local and regional government studies, as it involved a unique consortium of researchers at Cardiff University and CCC policy officers in checking the quality of data used in the calculations and the validating of any assumptions that were made. This process has required researchers at Cardiff University to liaise closely with officers when interpreting local data and considering their appropriateness and use in the EF calculation. Although this aspect of the Cardiff EF study has been extremely resource intensive and required a great deal of investment by the three partners, it has helped to ensure that the EF calculation is as accurate as possible and has raised the credibility of the whole process and project within CCC.

The value of the EF as a communication tool that can strike a resonant chord with diverse policy interests and the efforts to create a deliberative process to promote engagement with the EF across the CCC have combined to produce a more participative process. This has been a key feature in ensuring that Cardiff's commitment to the EF has been more widely dispersed

amongst policy officers than has been the case for other councils. Compared with the concept of Environmental Space, the EF and its calculations can be communicated in a relatively straightforward manner. Building upon existing structures, council staff were able to create spaces for deliberation on the EF. Officers were able to discuss issues of data, method and assigning ecological value to resource use, and to shape the process to produce data that they felt would be helpful to them in policy analysis. In short, awareness of the EF spread throughout much of the organization, rather than being ghettoized in environment departments as appears to have happened in many previous local government experiences of the EF. It is important, though, to provide a note of caution on the experiences of a more persuasive style of engagement. Our evidence indicates that deliberation and argumentation were taking place across the organization and engaging middle management. There is little to suggest that senior management or politicians engaged in a more advocative style of decision-making. Instead, high-level commitment to the EF and its results was secured through texts, via key corporate documents that were adopted by the CCC.

For Cardiff, the results from this study have shown that the EF is a useful tool by which CCC and other organizations can consider the resource use of residents and their global environmental impacts. The EF allows the identification of areas of priority for policy and can help officers and local politicians to contribute to more informed debates about a vision of a sustainable Cardiff. Even so, interest in the EF results is variable, in part depending upon calculations of whether particular interests will be furthered or stifled by promoting the EF. For example, in novel policy areas for CCC, such as food, or climate change, some officers have been keen to utilize the EF results and champion it as a tool as a way of bolstering their position and credibility within the organization. Meanwhile, other officers have felt that the EF results may challenge long-held policy objectives or favoured policy evaluation tools and have sought to dismiss or discredit the findings. The debates that the EF process has provoked have subjected the methodology to considerable scrutiny.

As officers within CCC have become more confident in the robustness of the EF as a tool and the legitimacy of its data, they have been keen to engage in evaluations of different policy options. Here the EF provides an innovative perspective on environmental pressures and is able to communicate them to officers in a readily understandable form. On its own, though, the EF will not change decisions within the CCC (or any other organization). Economic factors continue to dominate and the interpretation of the EF results or the development of alternative developmental perspectives based on the EF currently remains within the shadow of a pro-growth agenda.

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References

Aall, C. & Norland, I. T. (2005) The use of the Ecological Footprint in local politics and administration: results and implications from Norway, *Local Environment*, 10, pp. 159–172.

Ayres, R. U. (2000) Commentary on the utility of the Ecological Footprint concept, *Ecological Economics*, 32, pp. 347–349.

Barrett, J. & Scott, A (2003) The application of the Ecological Footprint: a case of passenger transport in Merseyside', *Local Environment*, 8, pp. 167–183.

Barrett, J., Birch, R., Cherrett, N. & Wiedmann, T. (2005) *Reducing Wales' Ecological Footprint—Main Report* (Cardiff, WWF Cymru), <http://www.walesfootprint.org>.

Best Foot Forward (2002) *City Limits. A resource flow and ecological footprint analysis of Greater London* (Best Foot Forward, Oxford).

CCC (2000) *Local Sustainability Strategy for Cardiff* (Cardiff).

CCC (2004) *Cardiff's Community Strategy 2004–2014 Better Communities Better Lives* (Cardiff).

Carley, M. & Spapens, P. (1998) *Sharing the World* (London, Earthscan).

Chambers, N. & Lewis, K. (2001) *Ecological Footprint Analysis: Towards a Sustainability Indicator for Business* (London, ACCA).

Collins, A. & Flynn, A. (2005) A new perspective on the environmental impacts of planning: a case study of Cardiff's International Sports Village, *Journal of Environmental Policy and Planning*, 7(4), pp. 277–302.

Collins, A., Flynn, A. & Netherwood, A. (2005a) *Reducing Cardiff's' Ecological Footprint—a Resource Accounting Tool for Sustainable Consumption* (Cardiff, WWF Cymru), <http://www.brass.cf.ac.uk/uploads/20050WWFCardiffTechRpt.pdf>

Collins, A., Flynn, A. & Netherwood, A. (2005b) *Cardiff's' Ecological Footprint Summary Report* (Cardiff, CCC).

Collins, A., Flynn, A., Barrett, J. & Weidmann, T. (2006) The environmental impacts of consumption at a sub-national level: the Ecological Footprint of Cardiff, *Journal of Industrial Ecology*, 10(3), pp. 9–24.

Collins, A., Flynn, A., Munday, M. & Roberts, A. (2007) Assessing the Environmental Consequences of Major Sporting Events: The 2003/04 FA Cup Final, *Urban Studies*, 44(3), 1–20.

EcoTec Research and Consultancy (2001) Ecological Footprinting: a technical report to the STOA Panel (EP/IV/A/STOA/2000/09/03) European Parliament, Brussels,

EPA Victoria (2003) EPA Victoria and Eco-footprint, <http://www.epa.vic.gov.au/eco-footprint>.

Ferguson, A. R. B. (2001) Comments on eco-footprinting, *Ecological Economics*, 37, pp. 1–2.

Ferng, J. J. (2002) Toward a scenario analysis framework for energy footprints, *Ecological Economics*, 40, pp. 53–69.

Flyvbjerg, B. (1998) *Rationality and Power* (Chicago, University of Chicago Press).

Fischer, F. & Forester, J. (Ed.) (1993) *The Argumentative Turn in Policy Analysis and Planning* (London, UCL Press).

Herendeen, R. A. (2000) Ecological Footprint is a vivid indicator of indirect effects, *Ecological Economics*, 32, pp. 357–358.

Lenzen, M. & Murray, S. A. (2001) A modified Ecological Footprint method and its application to Australia, *Ecological Economics*, 37, pp. 229–255.

Lewan, L. & Simmons, C. (2001) The use of Ecological Footprint and biocapacity analyses as sustainability indicators for sub-national geographical areas: a recommended way forward, <http://www.prosus.uio.no/english/sus_dev/tools/oslows/2.htm>.

McDonald, G. W. & Patterson, M. G. (2004). Ecological Footprints and interdependencies of New Zealand regions, *Ecological Economics*, 50, pp. 49–67.

McGregor, P. G., Swales, J. K. & Turner, K. R. (2004) The impact of Scottish consumption on the local environment: an alternative to the Ecological Footprint?, *Quarterly Economic Commentary—Economic Perspectives*, 29(1), pp. 29–34.

McLaren, D., Bullock, S. & Yousuf, N., (1998) *Tomorrow's World. Britain's Share in a Sustainable Future* (London, Earthscan).

Moffatt, I. (2000) Ecological Footprints and sustainable development, *Ecological Economics*, 32, pp. 359–362.

NAfW (2004) Sustainable development indicators for Wales 2004, National Assembly for Wales, Statistical Bulletin 18/2004, < http://www.wales.gov.uk/keypubstatisticsforwalesheadline/content/sustainable/2004/hdw20040323-e.htm > .

NRG4SD (2004) International Seminar on Sustainable Development Indicators—bases for developing common indicators at a regional level. (Bilbao, ENCORE) 9–10 November 2004, <http://www.nrg4sd.net/ENG/Events/Other/BilbaoNov2004.htm> (accessed 24 October 2006).

Opschoor, J. B. & Reijinders, L. (1991) 'Towards sustainable development indicators' in Verbruggen, H and Kuik, M, *In Search of Indicators for Sustainable Development* (Dordrecht, The Netherlands, Kluwer Academic Press).

RPA (2005) 'Sustainable Consumption and Production—Development of an evidence base. Study of Ecological Footprinting.' Final Report prepared for Department of Environment, Food and Rural Affairs (DEFRA) (CTH50401), London, < http://www.defra.gov.uk/environment/business/scp/methodology.htm > (accessed 16 January 2006).

Van den Bergh, J. C. J. M. & Verbruggen, H. (1999) Spatial sustainability, trade and indicators: an evaluation of the 'Ecological Footprint', *Ecological Economics*, 29, pp. 61–72.

Van Vuuren, D. P. & Smeets, E. M. W. (2001) Ecological Footprints: reply to A.R.B Ferguson, *Ecological Economics*, 37, pp. 2–3.

Wackernagel, M. & Rees, W. E. (1996) Our Ecological Footprint. Reducing human impact on the earth (Gabriola Island, BC, New Society).

Wiedmann, T., Minx, J., Barrett, J. & Wackernagel, M. (2006) Allocating Ecological Footprints to household consumption activities by using input–output analysis, *Ecological Economics*, 56, pp. 28–48.

World Wildlife Fund (2006) Living Planet Report 2006. <www.assets.panda.org/downloads/living_planet_report.pdf> (assessed November 2006).

WSP Environmental and Natural Strategies (2003) *Towards a Sustainable London—Reducing the Capital's Ecological Footprint* (London, WSP Environmental; Oakland, CA, Natural Strategies), <http://www.londonremade.com/lr_footprinting.asp>.