Can we meaningfully operationalise the Ecological Footprint calculation at the organisational level?

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Abstract

Randwick City Council and neighbouring Waverley and Woollahra Councils in Sydney's Eastern suburbs have spent the past 3 years attempting to "operationalise" the Ecological Footprint calculation, measured previously for the 3 Councils by the School of Physics at Sydney University. This presentation aims to trace the approach taken in delivering this project across 3 very different local government organisations and their communities, some of the details and results of the various projects carried out, and the learning which may be of use to similar organisations or future project areas related to engaging with both local communities and senior management to achieve reductions in natural resource consumption as measured by the ecological footprint methodologies.

Keywords: urban sustainability, ecological footprint, resource consumption, local government

Introduction

Over a three year time frame, 2007 to 2010, a 3 Council collaboration in Sydney's Eastern suburbs undertook key initiatives as a means of responding to an earlier calculation carried out of their respective Ecological Footprints by the Integrated Sustainability Analysis (ISA) group located in the School of Physics at the University of Sydney.

This planned and strategic response across the 3 Councils is described within this paper as the "operationalisation" of the ecological footprint calculation, that is, the range of tangible actions taken aimed at generating measurable outcomes capable of impacting in a positive sense on the calculation or analysis of the ecological footprint. While significant limitations and constraints can be identified in attempting this "operationalisation" it remains a valid and important undertaking that adds relevance and potentially important data in its own right to the task of responding to ecological footprint calculations and analyses (see Global Footprint Network website, http://footprintnetwork.org)

This paper intends to build upon a previous presentation by the author just after the commencement of this 3-Council project with more specific details and results of projects carried out. This will include some comments on the limitations and constraints referred to above so future efforts to achieve an operationalisation of the ecological footprint calculation might reflect realistically on how a policy approach and implementation process can match up in real terms.

What is the 'Ecological Footprint"

Conceived originally as a simple and elegant method for analysing the consumption of natural resources among different populations, ecological footprint analysis claims to provide a relatively intuitive form of sustainability communications to a wide audience (Rees, 1992).

Over more recent times and with wider experience in the application and analysis of ecological footprint methodology itself, it is now considered important to balance or better inform the resultant footprint metric within the context of the biocapacity of the specific area in question. This aims to qualify the spatial extent of the footprint calculation to the level of natural resources available i.e. the biocapacity relevant to the population under investigation. Inclusion of a region's biocapacity recognises the importance of the land's regenerative capacity to provide 'nature's' resources as well as to absorb the volume of wastes generated. This can reflect either a city or regional population or national or global populations (Schaeffer et al, 2006).

The Ecological Footprint calculation converts the level of resource consumption into the land area needed to sustain that population indefinitely, primarily as hectares of resource required per person. When the required land area to support this consumption is compared to the actual area of productive land available for the selected population the relative level of sustainability or "unsustainability" is

represented as the ecological footprint. Similarly to corresponding terminology, if the overall land area required to support the actual consumption levels goes well beyond the nominated area of the selected population, the number represents an ecological 'deficit' or decline, while substantial land remaining may indicate an ecological 'credit' i.e. a more sustainable path of consumption. Put simply, the Ecological Footprint has been described as an accounting tool measuring human impacts on the environment – comparing human demand on the supply of resources provided by nature, or alternatively reflecting environmental impacts in terms of current consumption patterns (Barrett, 2003).

In terms of the global bio-productive land available, the calculation for the existing world population (2003) indicates there is approximately 1.8 global hectares (gha) of land available for each and every person. However, the corresponding calculation of the Ecological Footprint for this world population estimates an average level of consumption equivalent to 2.2 global hectares per person, an 'overshoot' of global capacity, or ecological deficit of approximately 25 percent (Wiedmann et al, 2008).

Unsustainable (or less sustainable) populations are then simply put, populations with a higher Ecological Footprint for the land area available. Ecological footprints calculated according to this original method became important educational tools in highlighting the "unsustainability" of global consumption (Costanza, 2000). An extension of these concepts, still not widely applied but forming the focus of this presentation and its projects, is that the Ecological Footprint calculation and its analysis can be linked to the success or otherwise of environmental policy aimed at the range of tasks associated with reducing the consumption of natural resources and the amount of waste generated via human activity (Barrett, 2003).

Ecological Footprint measurement

Funded through a special environmental levy as part of the Randwick City Council's "Sustaining our City" initiative, specialists from the Integrated Sustainability Analysis (ISA) group in the School of Physics at the University of Sydney were engaged to undertake the first comprehensive Ecological Footprint analysis of key local government areas of the Eastern Suburbs of Sydney (Lenzen, 2006).

Although significant modification and improvement of the Ecological Footprint has been undertaken since its original development (Bicknell, et al, 1998; Simpson, et al, 2000; Lenzen and Murray, 2001; SEI, 2007) there has been a tendency to search for ways in which it can assist in policy development or implementation or in the accounting of policy actions carried out historically, or for the purposes of this presentation, 'operationalisation' of the Ecological Footprint (Wackernagel, 1997; Wackernagel, et al, 2000; Barrett, 2003).

The Ecological Footprint methodology applied internationally has also been tailored by Lenzen and Murray for improved application and relevance to the Australian context and conditions, particularly in terms of our extensive areas of arid and degraded landscapes and provide a variation on the application of bio-productive land stemming for example from fluctuating or less reliable patterns of rainfall and temperature across so many areas of the continent. This land disturbance weighting also recognises the impact of different land uses on both land condition and on biodiversity (Lenzen and Murray, 2001).

Over the past 30 years, an input-output approach has also been applied in numerous Ecological Footprint methodologies to provide a more detailed allocation of environmental impacts by human populations. Since its first application within the New Zealand context, input-output analysis has grown continuously, becoming a preferred approach in the calculation of a number of Ecological Footprint metrics for NSW, ACT Region and Victoria and at a local government level (NSW EPA, 2003; DEC, 2006; Weidmann et al, 2008; ISA 2010) also www.epa.vic.gov.au/eco-footprint/docs/vic_ecofootprint_demand.pdf).

The advantage of input-output-based Ecological Footprint calculations include:

- incorporation of the 'upstream' inputs and processes that flow on to the 'downstream' impacts, without incurring artificial system boundaries e.g. borders of state and local jurisdictional arms of government;
- reliance on detailed, freely available data sets collected regularly by government statistical agencies;
- enabling calculation for both industry sectors and product (consumption) groups, and at differing spatial settings e.g. States, local areas and cities, as well as for companies and households; and

- its capacity for integration with other National Accounts Systems.

The earlier calculation for Randwick and neighbouring local government areas included a capacity (not always taken up) to allocate a life-cycle responsibility of the Ecological Footprint metric to both consumers and to producers without the problem of double-counting (Committees have been established at an international level to continually improve and resolve inconsistencies and to develop standards for Ecological Footprint practitioners). Recognising these differences in the Randwick calculation enables a view of both consumer and supplier perspectives although much of the attention and subsequent policy context for the Footprint remains focussed on the calculations related to the consumer (see http://www.isa.org.usyd.edu.au/publications/reports.shtml).

Bastianoni acknowledged the importance of this separation, "assuming [only] a consumer responsibility […], producers are not directly motivated to reduce emissions, while consumers, […] without adequate incentives or policies, […] are not likely to be sensitive with respect to their environmental responsibilities […]"(Bastiononi, 2004, p-253).

Regional and sub-regional ecological Footprints

In 2003 and 2006, this approach was also applied to calculate the Ecological Footprint of the State of NSW in Australia and for the Statistical Divisions making up Sydney's Greater Metropolitan Region (GMR) (Lenzen 2002) (see Table 1). The 2003 results were the first prepared specifically for and included in, the triennial NSW State of the Environment (SoE) Report (NSW EPA, 2003; DEC, 2006). While the main results were incorporated briefly in these NSW SoE Reports, there was no substantial attempt at considering the policy relevance or implications of the Ecological Footprint calculation across subsequent NSW planning frameworks.

More recent figures calculated for the ACT Region and Victoria indicate similar results and figures well above national and international average Ecological Footprints (see Table 1) [Note: earlier Australian calculations reflect hectares per person rather than global hectares per person, due mainly to the local methodology applied but for the purposes of this discussion remain sufficiently comparable and consistent with one another].

Table 1: Ecological Footprint calculations for NSW, Victoria and ACT Region (various years)

Region	1996 (per person)	1998-99 (per person)	2001 (per person)	2003-2004 (per person)	2008-2009 (per person)
Greater Sydney Metropolitan Area, NSW	5.87 ha	-	6.18 ha	-	-
NSW	5.63 ha	-	5.92 ha	-	-
Melbourne Victoria	-	-	-	6.89 gha	-
Victoria	-	-	-	6.83 gha	-
Australia	-	-	-	6.56 gha	-
ACT Region	-	7.4 gha	-	8.5 gha	9.2 gha
Global Average	-	-	-	2.2 gha (2003)	2.7 gha (2007)

Ecological Footprint calculation at the Local Government level

In 2005, the Integrated Sustainability Analysis (ISA) Group at the University of Sydney prepared an Ecological Footprint calculation at the local government level mainly as a means of informing commitments established and adopted by Council in Randwick's 20-year strategic City Plan. A key starting point for the development of this strategic plan was it's incorporation of the UNEP-auspiced *'Melbourne Principles for Sustainable Cities'*, which included the objective to *"enable communities to*

minimise their ecological footprint" (Randwick City Council, 2005). Without enabling a calculation of their Ecological Footprint there was no tangible way that planners or policy-makers in Council could determine the basis of their residents' resource consumption or to interpret or understand subsequent changes over time. Although as with most organisations utilising or not using Ecological Footprinting, there may be an assumption that changes are occurring over time from policies implemented, Randwick Council preferred to undertake a sound analysis so as to determine a baseline Ecological Footprint and then monitor the level of change that occurring over time. By default, this implied or suggested such changes were due at least in part to outcomes and implementation of new or strong policy or policies over time. In terms of a pragmatic approach there is an obvious potential risk related to policy efficacy being linked to the Ecological Footprint calculation, after all bureaucrats and their management alike are not always known for accepting a long term scrutiny of their policy-making or success of its implementation.

In the Randwick case, a level of comparison and understanding relative to their industry was of interest so the Ecological Footprint calculation and subsequent analysis by the ISA Group for Randwick included the calculation not only of the Randwick Local Government Area (LGA) but a number of their local government neighbours (defined through the Statistical Subdivisions (SSDs) and Statistical Local Areas (SLAs) determined in Australian Bureau of Statistics data sets). This captured much of the Eastern suburbs municipalities of Sydney, Inner Sydney, Randwick, Waverley and Woollahra. In addition, the comparison and calculations were taken over two Census periods to capture a time series as well as spatial representations of the data. These results can be seen in Table 2.

A more detailed analysis of the rationale and calculation results are available in a previous presentation by the author (Maganov et al, 2007) so much of the rationale and specific results need not be covered in detail again – the focus in this presentation is to consider the results of related projects and limitations to the idea of Ecological Footprint operationalisation. An addendum will also be added to this presentation as the recalculation of the Ecological Footprint for these areas of Sydney's Eastern suburbs are still underway.

Table 2: Ecological Footprint calculations for Sydney Eastern suburbs Local Government Areas (as defined by Statistical Local Area boundaries) for 1996 and 2001

Local Government Area (as per Statistical Local Area)	1996 per person	2001 per person
Randwick (SLA)	4.87 ha	5.30 ha
Waverley (SLA)	5.88 ha	6.32 ha
Inner Sydney (SLA)	6.01 ha	6.87 ha
Woollahra (SLA)	6.47 ha	6.66 ha

Sydney's Eastern suburbs 3-Council Ecological Footprint project

Following the Ecological Footprint calculations and analyses provided to Randwick for its strategic planning purposes, the Council established a collaboration with neighbouring Waverley and Woollahra Councils and successfully applied for funding of $1.8 million for a 3 year project from the NSW Government Environment Trust. Using the footprint calculation as a starting point, the basis of the 3-Council project was to achieve measurable reductions in resource use, particularly around energy and water consumption and volume of household waste generated (Wilson, 2011). Although in hindsight, the objectives and outcomes were perhaps overly ambitious, the project was groundbreaking, firstly in its collaboration between inner urban local governments agreeing to target a mix of major

environmental issues and outcomes at the same time, but also as a group of Local Councils focussing their efforts to operationalise, or respond meaningfully to the findings of their individual Ecological Footprint calculations.

Outcomes – Energy saving

A series of financial incentives were provided to residents, initially across the Randwick Local Government Area and based on the success and experience of the two rounds offered, a third round was extended across the 3-Council areas specifically for the Ecological Footprint project with Waverley and Woollahra Councils. The latter round was marred with the confusion and rapid changes of incentives at the NSW and Commonwealth Government levels and then the closure at short notice of the Commonwealth solar incentive bonus. The first round offered by Randwick was packaged around a pledge program, free home energy audits and specific financial rebates. This round attracted 1100 participants for the pledge and 650 households receiving early audits and energy saving plans. Greenhouse gas savings were estimated in the order of 2,000 tonnes of CO_2 annually (Morrison, 2011).

The second round promoted specifically around cost and energy savings for residents provided incentives to another 500 households and contributed to $2.4 million in new energy and water saving measures being installed in Randwick households. This included savings of 10 million litres of townwater per year, mainly from additional rainwater tank installations and approximately 900 tonnes of CO_2 annually across a range of energy saving installation but excluding photovoltaic (PV) solar panels (Morrison, 2011).

The third round of incentives focussed on both PV solar panels and solar hotwater systems. However the creation of the generous gross feed-in tariff in NSW resulted in solar panel inquiries and installations overwhelming the level of interest or installation of solar hotwater systems. Although 265 solar hotwater systems had been installed from the second round in Randwick alone, less than a dozen were installed in the third round. The 3-Council program, known as Go Solar, resulted in an additional 21 PV solar systems installed with additional greenhouse gas savings estimated at around 70 tonnes of CO_2 per annum. This was despite more than 700 registrations and site visits carried out (Wilson, 2011). Interestingly the NSW Government process for the gross feed-in tariff for solar panel systems saw more than 1000 households across the Eastern suburbs apply for and install solar PV systems before the system was closed off due to the huge rush and subsequent over subscription of renewable energy applications from householders (Morrison, 2011).

Outcomes – Water saving

A major focus of water saving attention and action through the 3-Council Ecological Footprint project across the 3 Local Government Areas was on small to medium (SME) businesses. Additional external funding provided by Sydney Water using the initial funding as leverage enabled a specific project officer to be engaged to service and follow up interested SME businesses across the Eastern suburbs. At the close of the project which had taken place over a two year period the results showed that 87 local businesses had participated, generating metered water savings of almost 300,000 litres per day. The costs of implementing these water saving actions was just over $11,000 across participating businesses but implementation generated water savings of 283,000 litres per day equivalent to cost savings of $231,000 per annum. A further 1.5 million litres of water were saved at one Council site through funding from the 3-Council project for on-street stormwater capture and re-use (Wilson, 2011).

Outcomes – Resource conservation

An 18 month trial project known as the Compost Revolution was developed and rolled out across two of the LGAs (the other had its own food waste collection service operating). The Compost Revolution saw 580 householders participate in a home composting program aimed at diverting householder food waste from landfill as well as 20 community area and school compost systems being set up. Just over 100 tonnes of food waste was diverted from landfill and in separate evaluations almost 100 percent of participants said they would continue with the composting of food waste from their homes after the trial period ended.

In an analysis of results, Hyder Consultants established that an ongoing program extending by 20 percent over households in the Council areas would generate waste disposal cost savings just under $1 million per annum and just over $2 million for a 40 percent extension. The corresponding

greenhouse gas savings were in the order of 7 percent per annum and approximately 13 percent respectively (Hyder, 2010).

To facilitate a wider take up and continuation of the Compost Revolution, an online tutorial system was created enabling higher numbers of householders to participate in the ongoing Compost Revolution program. Successful completion of the tutorial enables the householder to receive a free compost bin or worm farm and ongoing support from a newly appointed project officer. As a result of the program's success, 6 other Councils are in the process of seeking permission via free licences to take-up and roll-out local area versions of the Compost Revolution for their communities.

Outcomes – Community education and involvement

More difficult to quantify in terms of measurable outcomes is a number of major community education and participation programs separate from those already mentioned. A major initiative across the 3-Council areas was the creation of the Barrett House Sustainability Demonstration Project. A small cottage bequeathed to Randwick Council was transformed into a local sustainability house, designed by well known sustainability practitioner, Michael Mobbs. The focus in this project was to install sustainability measures, small scale but effective energy, water and waste reduction infrastructure, within the house for a sum of around $15,000 as a means of demonstrating to householders what could be achieved within a reasonably priced budget. As well as regular openings provided for local residents culminating each year in an annual Sustainable House Day event, Barrett House as it is known, is the base for numerous local community groups, is utilised by staff across the 3 Council LGAs for various free workshops conducted for local residents, has its own small scale permaculture garden soon to be extended into a food and native verge garden and has development application approval to change the free standing garage into a showroom or incubator for the display or demonstration of innovative sustainability technologies (Wilson, 2011).

Another key outcome has been the design, development and review of an interactive website www.reduceyourfootprint.com.au to create an area for residents to ask and respond to questions and experiences of those making or seeking sustainability changes around their home, school and workplace. In addition, a number of major spin-offs for the 3-Councils is their participation in the locally accessed, organic food boxes for residents, known as Food Connect; development and nurturing of local neighbourhood sustainability groups through the Sustainability Street initiative established by well known environmental educators, Vox Bandicoot; and coordinated campaigns across the 3 Councils including Earth Hour, the National Garage Sale and Best Gift (in the World) Christmas initiative (Wilson, 2011).

Some constraints / limitations

A current recalculation of the Ecological Footprint for the Eastern suburbs Councils is underway. Even without the recalculation there are some assumptions and limitations apparent in the efforts to operationalise the footprint calculation across the participating Local Government Areas. If the resources consumed across these Council areas are already in a measurable deficit, as they appear to be compared to the Australian and international averages, it is impractical to expect a project even as well funded as this one to make in-roads and reduce consumption substantively enough within a 3 year timeframe. Of course, without the data it is easy to speculate one way or the other on whether the footprint has changed in a positive or negative direction. For those experienced in environmental data collection it may be of little surprise that a lag time is also likely between achieving significant reductions in consumption / waste generation etc and when those achievements can be expected to show up in the calculation of the footprint.

Broadly speaking the 'overshoot' or ecological deficit of Western consumption patterns are well known and has been measured annually for some years as 'Earth Overshoot Day'. In 2011, this 'overshoot' was calculated to commence on September 27. This global overshoot translates to a level of resources equivalent to 1.2 and 1.5 Planet Earths per annum for all our current consumption patterns to be met for the global population (GFN, 20/09/11). As stated in the 2008 calculation of the Victorian Ecological Footprint, described as quite representative of the national average for Australia, the Australian / Victorian equivalent of the ecological deficit or overshoot suggests "if everyone in the world had the same Footprint as the average Victorian resident, we would need 3.8 planets to live within ecological limits" (Weidmann, 2008). This statement is equally applicable to the results of the previous calculation and analysis for Sydney's Eastern suburban residents so it may be relatively unrealistic to expect too great a change for these combined Local Government Areas without a very concerted effort.

If this is the case, why might an organisation consider going through the process of calculating its Ecological Footprint? As established previously in this presentation, an organisation referring to Ecological Footprint considerations shouldn't necessarily do so without making some commitment to its calculation. But in doing so, there is clearly an argument that consideration should also be made in responding to the number established by the footprint, otherwise why do it? Importantly, most or many organisations are taking a range of actions aimed at stemming the rise in environmental damage constantly talked about across a matching range of issues. One of the serious matters considered in this 3-Council project is whether the actions underway can or should be linked to the calculation and analysis of the localised Ecological Footprint? For the 3 Councils involved, a decision has been made in the affirmative. The rationale is to establish and understand the baseline of the Ecological Footprint metric and keep working to understand a) how sustainability actions taken may influence the changes to the Footprint over time but also and perhaps more importantly, b) creating stronger accountability of outcomes related to actions taken in response to the range of environmental issues and problems facing our communities.

Part of the task of the 3 Council project then has been to work harder at being accountable for projects carried out and establishing linkages to issues picked up in the Ecological Footprint methodology (biodiversity conservation is not readily picked up in the international methodology but is part of the reason for the adjusted Australian land disturbance weighting). Such accountability currently misses out on accounting for the outcomes of other projects underway within the participating local Councils with the capacity or specifically targeted or responding to the wider set of environmental and sustainability issues.

Another reality appears to be the broad nature of the calculation methodology and the application of the high-level input / output data utilised. Responses set in place by necessity tend to be small scale and short term. At what point in time might a small scale project such as the Compost Revolution develop broadly enough so that it can have a meaningful impact on the Ecological Footprint of an area. Is the potential expansion of the Compost Revolution to additional Councils the start of a wider application of the solution it represents and the level of operationalisation necessary to make a difference? Of course, time may enable a more informed answer. In addition, the breakdown of the larger Ecological Footprint into energy, water, waste, transport and similar more specific footprints is expected to assist differentiate between some projects and their outcomes and others.

If an organisation and its management concur with the view that it is necessary to tackle the issue of over-consumption of our natural resources, or the broadly "unsustainable" nature of current lifestyles then it is necessary to have a baseline level of robust data and information to respond to, presumably in organisational resource investment, policy development, implementation, evaluation and review. Ecological Footprinting provides one such potential to inform organisational decision-making, robustly and consistently over time.

Conclusion

There is a relatively high level of investment in time and resources in Ecological Footprint methodology, calculation, analysis and potential linkage to project outcomes for the 3 Councils participating in this 3 year project, extended temporarily for an additional 12 months (and maybe beyond this timeframe again). This presents some bias and / or commitment to the original question as to whether operationalisation of the footprint is meaningful or not for organisations. It is doubtful that either the funding application or the collaboration that followed would have occurred without the leverage provided by the calculation of the Ecological Footprint of these Eastern suburbs Local Councils.

Even considering these points as caveats to providing a concluding statement, the importance of accountability of environmental outcomes and their linkage to robust and sound policy direction, implementation etc is probably the important consideration here. As Ecological Footprint methodology in turn becomes more robust and understood as a tool for informing on the high human impacts of resource consumption (and depletion for future generations), the opportunities are that it can sharpen the focus of actions taken and their influence on sustainability directions that are becoming increasingly important and apparent for organisations and individuals alike.

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