From Ecological Footprint to Ecological-Fingerprint – the Efforts of Randwick City Council to Measure and Minimise the Ecological Impacts of Consumption and Over-use of Natural Resources.

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Abstract: Increasing attention has been given to the impacts of human settlements and human activity on the finite resources of our Planet. Ecological Footprint calculations have been applied internationally, nationally and sub-regionally as a comprehensive analytical methodology to provide a consistent measurement of resource consumption at the country, city, organisational or individual levels.

Ecological Footprint analysis is gaining in reputation and credibility in its capacity to usefully inform governments, organisations and communities on the excesses of our society's resource consumption and our population's increasing pressure on diminishing natural resources. Despite this progress in improving the methodology and deriving a calculation, there are few cases where organisations appear to have "operationalised" the ecological footprint calculation, that is, translated the results into measurable policy responses and actions clearly aimed at reducing the "footprint" of a given population.

Late in 2005, Randwick City Council, commissioned the first Ecological Footprint analysis of key local government areas (LGAs) in the Eastern Suburbs of Sydney. Early in 2007, Randwick Council was successful in a $1.88 million funding application with two neighbouring Councils, Waverley and Woollahra, in a 3 year project aimed at reducing the Ecological Footprint of the Eastern Suburbs.

This paper will describe the approach underway, the progress to date, a number of related outcomes and challenges for the future.

Keywords: Ecological Footprint, Input-output Analysis, Urban Sustainability, Environmental Policy, Resource Consumption, Partnerships, Local Government, Water, Energy.

Introduction

The journey starts in the application of the Ecological Footprint methodology to the Eastern Suburbs of Sydney. Funded through a special environmental levy as part of 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).

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

The extent of resources consumed by the selected population is converted into a single index, the Ecological Footprint, which comprises the land area needed to sustain that population indefinitely. When the required land area to support this consumption is compared to the actual area of productive land inhabited by the selected population the relative level of sustainability or "unsustainability" is represented as the ecological footprint. If the overall land required to support consumption levels are well beyond the nominated population area, it may be considered in ecological 'deficit' or decline, while substantial land remaining may indicate an ecological 'credit' i.e. a more sustainable path of consumption.

Unsustainable (or less sustainable) populations are simply 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).

Since the formulation of the Ecological Footprint, the concept has undergone significant modification and improvement (Bicknell, et al, 1998; Simpson, et al, 2000; Lenzen and Murray, 2001) mostly in response to both observations and criticism levelled at the original concept by a number of

researchers (Levett, 1998; van den Bergh, et al, 1999; Ayres, 2000; Moffat, 2000; Opschoor, 2000; Rapport, 2000; van Kooten, et al, 2000). Since the early application of Ecological Footprint analysis 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 (Wackernagel, 1997; Wackernagel, et al, 2000).

Further refinement of the Ecological Footprint concept, its calculation methodology and its application within the policy context appears inevitable as reporting organisations and environmental management practitioners consider the range of metrics available for reporting and accounting purposes especially as they relate to policy outcomes. While accepting that the Ecological Footprint concept has advantages and disadvantages, this paper assumes some acceptance of Ecological Footprint methodology and aims primarily to focus on the relevance of Ecological Footprinting in a policy context, particularly within a sub-regional setting represented by Local Government.

One aspect of Ecological Footprint methodology is its capacity to represent variable data as a single metric, that is, the amount of hectares per person to sustain that person for a year in terms of resources consumed or waste generated.

The original Ecological Footprint methodology represents the area of land required to: a) produce the biotic resources at a world-average yield that meet the consumption needs of a population; and b) to absorb all their waste (Wackernagel, et al, 1995). In that approach, consumption is divided into 5 categories: food; housing; transportation; consumer goods; and services, while the land component is represented under the categories: energy land; degraded or built land; gardens; crop land; pastures and managed forests. For Australian conditions, the original method produces results skewed heavily towards CO_2 emissions from energy use, and largely under-rates land clearing and biodiversity decline. The Ecological Footprint methodology applied internationally has been tailored by Lenzen and Murray to respond to the Australian context and conditions. Lenzen and Murray apply a land disturbance weighting to reflect the impact of particular land uses on both land condition and on biodiversity (Lenzen and Murray, 2001).

A second methodological aspect is the accounting system. Over the past 30 years, an input-output approach has been applied in numerous Ecological Footprint methodologies to provide a more detailed allocation of environmental impacts by human populations. Since its first application to New Zealand, input-output analysis for Ecological Footprint analysis has grown continuously. In 2003 and 2006, this approach was applied to the Ecological Footprint calculation for the State of New South Wales (NSW) in Australia for the purposes of that State's triennial State of the Environment (SoE) Report (NSW EPA, 2003; DEC, 2006). A pilot study has also been completed for the State of Victoria (www.epa.vic.gov.au/eco-footprint/docs/ vic_ecofootprint_demand.pdf). In both cases, calculations were undertaken using various methodologies to enable comparison and understanding of the differences between earlier methodologies and the application of input-output analysis methodology.

Input-output-based Ecological Footprint calculations are considered to have a number of advantages including:

- they continue to incorporate 'upstream' inputs without incurring artificial system boundaries;
- they draw on detailed, freely available data sets that are collected regularly by government statistical agencies;
- they can be calculated for industry sectors and product groups, for states, local areas and cities, as well as for companies and households; and finally
- through integration into the System of National Accounts, input-output-based Ecological Footprint calculations arguably allow valid trade-offs with other indicators of sustainability, i.e. Triple Bottom Line (TBL) models or reporting frameworks.

A third methodological aspect is the capacity for allocation of life-cycle Ecological Footprints to both consumers and to producers without the problem of double-counting. In 2004, three committees set up by the Global Footprint Network aimed to resolve inconsistencies in methodologies through the development of standards for Ecological Footprint practitioners. A major difference from past methodologies was to separate out Ecological Footprint contributions into those of final consumers and those of their upstream suppliers (in the commonly employed full consumer responsibility for Ecological Footprints, companies and industries must have an Ecological Footprint of zero by default). This separation enables a clearer representation of upstream 'producer' Ecological Footprints without double-counting in the Ecological Footprint of final consumers. Sharing responsibility holds for many situations in business and in life and acknowledges that there are always two (groups of) people who play a role in commodities produced and impacts caused, hence two perspectives involved in each

transaction: the supplier's and the recipient's. Responsibility is shared between them, both in terms of benefits and burdens. Sharing each impact between the supplier and the recipient – for example on a 50-50 basis – alleviates the double-counting problem when Ecological Footprint between producers and consumers is calculated (see http://www.isa.org.usyd.edu.au/publications/reports.shtml).

Bastianoni acknowledges the importance of this separation as "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). An interesting feature arising out of applying a shared responsibility between producer and final consumer is that the upstream responsibility for a given impact decreases with increasing distance between the various 'actors' in the supply chain. In the more recent applications of Ecological Footprint analysis, both shared and full consumer responsibility are applied and contrasted.

Regional and Sub-regional Ecological Footprints

The ISA group at the University of Sydney has adopted the framework tailored to Australian conditions for calculating Ecological Footprints. This framework employs the most detailed and comprehensive information on land distribution and greenhouse gas emissions available in Australia. The methodology also applies comprehensive input-output tables prepared by the Australian Bureau of Statistics as well as CSIRO satellite-imagery assessments of land disturbance over the Australian continent. This methodology avoids significant truncation errors (often 25-50 percent) of upstream requirements that are common in Ecological Footprint calculations that are not based on input-output analysis.

In 2003 and 2006, this approach was used 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). The 2003 results were the first prepared specifically for and included in, the triennial NSW State of the Environment (SoE) Report (NSW EPA, 2003) although the analysis carried out included calculations based on other methodologies for comparative purposes (Lenzen, et al, 2004). While the main results were incorporated briefly in the NSW SoE Report, there was no attempt at considering the policy relevance or implications of the Ecological Footprint calculation in the NSW SoE Report.

In 2005, ISA also undertook an Ecological Footprint calculation to assist Randwick City Council establish baseline information for the preparation of its strategic 20-year City Plan, a key element of which acknowledged the importance of understanding and minimising the Randwick community's ecological footprint (Randwick City Council, 2006). The analysis included not only the population of the Randwick Local Government Area (LGA) but a number of other Statistical Subdivisions (SSDs) and Statistical Local Areas (SLAs) within the Eastern Suburbs of Sydney. To enable some understanding of potential differences across these areas and consider the potential implications within a policy context, two calculations were provided for each area: 1) a detailed component breakdown of the aggregate Ecological Footprint in terms of critical inputs and impacts; and 2) a short time series of the Ecological Footprint, in order to identify significant trends and changes.

Through this approach, results can be interpreted ex-post, as answers to the questions: "What the Ecological Footprint would have been assigned to the user's entity, given base year economic and resource use structure, and assuming proportionality between monetary and resource flows?" Results however cannot readily be interpreted in an ex-ante, predictive way, such as, "How would the Ecological Footprint change as a consequence of changes in the user's financial and resource flows?"

Two features of the modified Australian Ecological Footprint methodology are important for formulating local and regional policy. As mentioned earlier, in the original Ecological Footprint methodology, the areas of forest, pasture and crop land do not represent real land, but bio-productivity requirements translated into hypothetical areas (known as "global hectares") that would be needed to support the consumption of the population, if local farming and forestry was conducted at 'world average productivity'. Proceeding as such makes it easy to compare Ecological Footprints of different countries or populations (Wackernagel, et al, 1999). However, the conversion to world-average productivity and global hectares makes it impossible to use an Ecological Footprint for formulating regional policies, because the latter always involves regional-specific economic, political, technological, environmental and climatic aspects (Lenzen and Murray, 2001). Therefore, actual local areas and "local hectares" were used. Secondly, the bio-productivity metric of the original Ecological Footprint methodology does not readily apply to the pressing environmental problems confronting Australia. For example, productivity in Australia is low compared to world averages, so that significant

pressure on land and biodiversity from animal grazing falls by the wayside, even though they have a strong bearing on future bio-productivity and biodiversity in Australia. In contrast, a land disturbance metric is sensitive to current land usage patterns and shows up in current accounts precursors to long-term bio-productivity and biodiversity loss. These include broad-scale vegetation clearing, salinisation and other types of land and ecosystem degradation. Therefore, a land disturbance metric was applied to recognise these relevant 'local' conditions.

Results highlights and summary

The main results (see Table 1) summarises the results for the per-capita Ecological Footprint of all regions and years examined, based on both a shared responsibility (both producer and consumer) and on a full consumer responsibility. The quantities shown are "total impact" (total Ecological Footprint per capita), and "total intensity" (Ecological Footprint per capita and per dollar of expenditure). Results are shown for the Statistical Subdivisions of Inner Sydney and the Eastern Suburbs. The categories "government administration" and "capital infrastructure" cover expenditures that are not made by final consumers themselves, but by the government and producers in order to provide the "commons", i.e. government administration and infrastructure such as buildings, roads, ports etc.

Note that Statistical Local Areas (SLAs) results for Randwick, Woollahra and Waverley are based on estimated not surveyed expenditure figures (see Figure 1 for Local Government Areas covered). Results are therefore partly an effect of the regression estimation procedure and the explanatory variables used. Inner Sydney is listed for comparison. Finally, the benchmark is the average Australian consumer.

Table 1 Ecological Footprint results for the Eastern Suburbs, 1996 - 2001

Ecological Footprint	Total impact		Total intensity	
	shared responsibility	full consumer responsibility	shared responsibility	full consumer responsibility
Randwick SLA 1996	2.69 ha	4.87 ha	2.84 m2/$	1.85 m2/$
Randwick SLA 2001	2.87 ha	5.30 ha	2.70 m2/$	1.68 m2/$
Woollahra SLA 1996	3.47 ha	6.47 ha	2.60 m2/$	1.70 m2/$
Woollahra SLA 2001	3.53 ha	6.66 ha	2.53 m2/$	1.57 m2/$
Waverley SLA 1996	3.16 ha	5.88 ha	2.49 m2/$	1.59 m2/$
Waverley SLA 2001	3.34 ha	6.32 ha	2.40 m2/$	1.44 m2/$
Eastern Suburbs SSD 1998	3.16 ha	5.97 ha	2.62 m2/$	1.46 m2/$
St George - Sutherland SSD 1998	3.08 ha	5.48 ha	3.10 m2/$	1.96 m2/$
Inner Sydney SLA 1996	3.16 ha	6.01 ha	2.64 m2/$	1.53 m2/$
Inner Sydney SSD 1998	3.00 ha	5.60 ha	2.61 m2/$	1.54 m2/$
Inner Sydney SLA 2001	3.54 ha	6.87 ha	2.52 m2/$	1.56 m2/$
Government administration	0.11 ha	0.34 ha	0.70 m2/$	0.59 m2/$
Capital infrastructure	0.57 ha	1.31 ha	1.80 m2/$	1.89 m2/$
Benchmark: average Australian consumer	2.04 ha	3.57 ha	3.53 m2/$	2.23 m2/$
Including government and infrastructure				
Randwick SLA 1996	3.37 ha	6.52 ha	3.88 m2/$	2.89 m2/$
Randwick SLA 2001	3.55 ha	6.95 ha	3.74 m2/$	2.72 m2/$
Woollahra SLA 1996	4.15 ha	8.12 ha	3.64 m2/$	2.74 m2/$
Woollahra SLA 2001	4.21 ha	8.31 ha	3.57 m2/$	2.61 m2/$
Waverley SLA 1996	3.84 ha	7.53 ha	3.53 m2/$	2.63 m2/$
Waverley SLA 2001	4.02 ha	7.97 ha	3.44 m2/$	2.48 m2/$
Eastern Suburbs SSD 1998	3.84 ha	7.62 ha	3.66 m2/$	2.50 m2/$
St George - Sutherland SSD 1998	3.76 ha	7.13 ha	4.14 m2/$	3.00 m2/$
Inner Sydney SLA 1996	3.84 ha	7.66 ha	3.68 m2/$	2.57 m2/$
Inner Sydney SSD 1998	3.68 ha	7.25 ha	3.65 m2/$	2.58 m2/$
Inner Sydney SLA 2001	4.22 ha	8.52 ha	3.56 m2/$	2.60 m2/$
Benchmark: average Australian consumer	2.72 ha	5.22 ha	4.57 m2/$	3.27 m2/$

The following main results were established (Lenzen, 2006):

a) The per-capita Ecological Footprint of Eastern Sydney is above that of the average Australian, no matter which calculation method is employed, and which year is appraised. This is most likely due to the greater affluence of households in Eastern Sydney, compared with the average Australian.

b) The per-capita Ecological Footprint of Eastern Sydney has increased between 1996 and 2001. This result is independent of inflation, which has been taken out of the figures. It is most likely due

to increasing living standards. The percentage increase of the Ecological Footprint between 1996 and 2001 is highest for the Randwick SLA with a percentage increase of 6.6 percent.

c) The Ecological Footprint intensity (Ecological Footprint per dollar of expenditure) is low in areas with high Ecological Footprint, and high in areas with low Ecological Footprint. This is due to the fact that wealthy households purchase a larger proportion of services than less wealthy households. Since services are associated with smaller Ecological Footprint intensity, the overall Ecological Footprint intensity of wealthier households is lower.

d) The per-capita Ecological Footprint for Australia's commons (government and infrastructure) constitutes about 30 percent of the average Australian's per-capita Ecological Footprint, but only about 17 percent of the Ecological Footprint of Eastern Sydney residents. This result is due to the fact that the common components were allocated on a per-capita basis, i.e. an equal amount to each Australian.

e) The Ecological Footprint calculation based on shared responsibility is smaller than the Ecological Footprint calculation based on full consumer responsibility. This result is due to the fact that within shared responsibility, Ecological Footprints are shared between producers and consumers, and only a part of the responsibility is passed on to consumers. Shared responsibility recognises that Australian companies are capable of calculating their own Ecological Footprint. Also, within shared responsibility, the sum of all producers and consumers equals the total national Ecological Footprint. Within full consumer responsibility, the Ecological Footprint of any producer (company, industry sector etc) is zero.

f) Ecological footprint intensity calculations based on shared responsibility are higher than Ecological Footprint intensity calculations based on full consumer responsibility. This is due to the circumstance that within the household's consumption bundle, footprint-intensive commodities such as meat, electricity or petrol have their impacts in production stages that are relatively close to the final consumer. Considering that shared responsibility has an inherent feature of down-weighting Ecological Footprints that are caused in more remote production stages, and up-weighting Ecological Footprints in more proximate stages, this leads to an overall increase of the Ecological Footprint intensity compared to full consumer responsibility.

g) The Ecological Footprint of the average Australian consumer is lower at 5.22 ha/cap than a previously calculated value of 6.7 ha based on the 1994-95 input-output system. This is due to the fact that the previous figure included capital expenditure as intermediate and not final demand.

h) Most of the total Ecological Footprint is due to the land component, and not to greenhouse gas emissions. This result stands in contrast to results that would have been obtained using the bio-productivity metric. In the latter, CO_2 emissions would have dominated.

Policy Responses to Randwick's Ecological Footprint

Randwick's overall strategic priorities in terms of governance, social, environmental and economic planning and decision-making are set out in Council's recently completed 20-year City Plan (Randwick City Council, 2006). A major direction within City Plan includes the incorporation of the Melbourne Sustainability principles into established goals and objectives. This includes recognition of the need to establish and reduce the Ecological Footprint of the Randwick Local Government Area (LGA), an area of approximately 39 square kilometres.

In order to facilitate the capacity to achieve a reduction in the Ecological Footprint of Randwick City, a special environmental levy equivalent to 6 percent of the business and residential rate commenced from July 1, 2004 for a 5-year period. This levy, calculated to raise around A$2.4M each year, is for spending on specific environmental improvements and sustainability initiatives under Randwick's Sustaining our City Program.

Being located approximately 8 kilometres from Sydney's Central Business District and with 29 kilometres of coastline including the Pacific Ocean and the historic south-eastern shores of Botany Bay, the Sustaining our City Program has a major coastal focus. The Program's 5 main thematic areas and budget streams include: Coastal Protection; Conserving Resources; Protecting Biodiversity; Tackling Greenhouse; and Community Participation.

Over the 3 years to date of the application of the environmental levy, Council staff have invested substantial effort in integrating City Plan directions and Sustaining our City outcomes into Council's annual business and management planning, reporting and budget processes. This ensures regular accountability of City Plan and sustainability progress in Randwick's annual Management or Business Plan. This Plan is exhibited for public comment and submitted to the NSW Minister for Local Government (see http://www.randwick.nsw.gov.au/).

As well as a comprehensive strategic approach, various projects and operational initiatives have commenced across each of the major themes of Randwick's Sustaining our City Program. A number of these are appropriate to highlight for the purpose of this discussion. For example, Council adopted a 20 percent voluntary reduction target late in 2005 for both water and energy consumed across Council.

On top of major improvements in water and energy management, Council is also required to achieve an overall waste reduction target of 14 percent within a statutory timeframe of 2014. These targets are on track to being achieved through improved mechanisms for kerbside recycling collection and the separation and processing of organic 'greenwaste'. Council's new Recycling facility is currently reprocessing around 95 percent of 60,000 tonnes of material received annually into 16 final products, most of these meeting stringent quality assurance standards before being sold on to bulk supplies and other local Councils. In addition, a waste education classroom has been constructed on-site to enable small educational groups to visit the facility and through the environmental levy will incorporate rooftop solar power and rainwater storage systems.

Major environmental levy projects include:

Water Saving Projects	*Savings*
Construction of a 140,000 litre underground stormwater recycling and re-use system at Randwick's Community Nursery	Delivering savings of approx 2 million litres of townwater per annum and providing around 60 of the Nursery's water requirements.
Construction of a substantial wastewater treatment and re-use system at Council's main Depot	Delivering savings to date of more than 5 million litres of townwater and making the site 70 percent self sufficient in its water requirements.
Currently undertaking a 240,000 litre backwash and bore water treatment and re-use system at Randwick's Des Renford Aquatic Centre	Resulting in savings of more than 15 million litres of townwater per annum and providing more than 80 percent of the Aquatic Centre's water needs.
Construction of a 315,000 litre stormwater re-use and recycling system at Council's Recycling Centre	Generating savings of more than 4 million litres of townwater in its first 12 months and making the site 90 percent self sufficient in on-site water requirements.
Utilising stormwater and borewater at a number of Council reserves and parks	Resulting in 100 percent of some parks water requirements and generating savings of approximately 60 million litres of water each year.

Energy Saving Projects	*Savings*
Distribution of 55,000 energy saving light globes free-of-charge to Randwick residents over a 4 month timeframe	Potential savings of $2.4 million off household energy bills and reductions of 25,000 tonnes of greenhouse gases over the life of the globes (equivalent to removing more than 5,500 cars off the road).
Commencement of Randwick's Home Energy Makeover, one of the largest scale residential energy saving campaign in Australia at the time and comprising: • a Home Energy Pledge, • free Home Energy Audits and • a Home Energy Rebate providing savings of up to 40 percent off the cost of actions such as: – installating solar hotwater; – thermal insulation installation; – upgrading to 4 or 5 star energy appliances; – changing over inefficient downlight systems to energy efficient downlights	To date, 600 Home Energy Pledges have been received and 300 Home Energy Audits have been completed, generating savings of $400,000 off household energy bills and reducing greenhouse gas emissions in the order of 2,000 tonnes. The Home Energy Rebates have recently commenced with a target number of 220 households.
Solar installations at Council sites including: – solar hotwater at high use sites including the Depot, Aquatic Centre and beach amenities; and – 12 kilowatt photovoltaic panel system at Council's Depot	The solar hotwater systems are saving; – approximately 15,000kgs of CO_2 each year and $3,000 off energy bills; and – the equivalent energy of six average sized homes each year.
Installing a major Building Management System for Council's Administration building scaleable to other Council locations	Saving approximately 147MWh of energy each year and generating savings of more than $13,000 per annum.
Establishing a community carshare for residents that includes access to carshare vehicles for staff use	Currently not calculated.
Provision of corporate bicycles and an updated Randwick Bicycle Plan to improve the take-up of cycling opportunities for Randwick residents	Currently not calculated.

Other programs implemented for Randwick residents include:

- free Sustainable Living workshops conducted each term through the local community evening college, free-of-charge to residents, providing practical tips and demonstration to be more sustainable around the home, school, garden and workplace;
- a series of Open Days held at Council facilities to showcase major energy and water saving projects such as those referred to above;
- an annual EcoLiving Fair to coincide with World Environment Day in June with sustainable workshops, demonstrations and presentations ; and
- an annual Environmental Report Card to update residents on Council's sustainability projects and their outcomes.

To facilitate a cooperative approach on innovative sustainability outcomes, Randwick Council and the nearby University of New South Wales has signed the first Sustainability Agreement between a university and local Council in Australia. The Agreement has enabled final year students to apply their learning to address specific operational and on-ground problems and given Council access to relevant sustainability-related research and projects underway by students and academics. To date projects have been developed with wastewater and photovoltaic engineering students, multimedia courses, architecture and fine arts.

Randwick's 3-Council Ecological Footprint project

Council's investment in its environmental levy has also provided useful leverage in a number of external grants applications successfully attracting more than $2.5 million in additional external funding over the past 15 months.

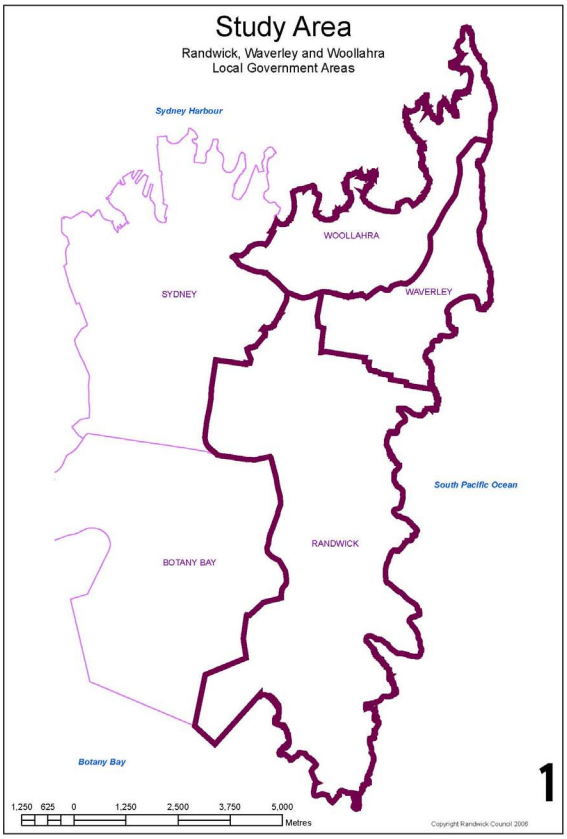
As an extension to the Ecological Footprint calculation and analysis carried out for Randwick Council and to assist in the potential implementation of policy responses to these results, Randwick Council

successfully sought funding application on behalf of 2 of its neighbouring Councils to undertake a longer term approach to reducing and measuring the Ecological Footprint of the three relevant local government areas. Early in 2007, a grant for $1.88 million was awarded for a 3 year project across the 3 Council areas, Randwick, Woollahra and Waverley, under the Urban Sustainability Program of the NSW Department of Environment and Climate Change.

From major energy and water saving measures, comprehensive waste and recycling initiatives, innovative community education and communications, the strategic alliance of these three Councils working with a number of partnering organisations are involved in quantifying responses aimed at reducing the Ecological Footprint of the Eastern Suburbs, creatively and practically. These project partners include the University of Sydney's ISA Group, environmental data specialist, Planet Footprint, and award-winning environmental educators, Vox Bandicoot.

This latter project partner has been supported by Randwick Council in the development and application of Vox Bandicoot's ecological-fingerprinting initiative. Whilst still in development, ecological fingerprinting (or eco-fingerprinting) aims to offset the 'doom and gloom' (despair and disempowerment) response often following the presentation of Ecological Footprint results. Eco-fingerprinting aims to empower individuals to respond to the data and information presented within the Ecological Footprint calculation. Focussing on individual efforts to reduce waste, conserve energy and water, reduce greenhouse gas emissions, conserve and expand on habitat areas and protect vegetation, Vox Bandicoot have devised a comprehensive range of positive and tangible steps that translate into individual action. Currently in a beta test version, the results are quantified electronically and displayed back to individuals in an accessible form such as mobile phones and internet blog sites but aimed at appealing to a younger and potentially less environmentally inclined target grouping.

Figure 1 Local Government Areas covered in the 3-Council Ecological Footprint project



Whereas an individual or organisation aims to reduce their ecological footprint, the budding 'fingerprinter' aims to increase their ecological fingerprint through identifiable actions quantified over time through measurable and responsive metrics. International sustainability advocate, Dr David Suzuki has recently provided endorsement of Vox Bandicoot's ecological fingerprint.

Positive spin-offs have already commenced through the 3-Council Ecological Footprint project with new collaborations and investigations to cooperate and combine on major projects including an organic waste trial, sewer mining investigations, and establishing a demonstration sustainability house accessible to residents across the 3 municipalities. The first combined event to mark commencement of the 3-Council project is planned as a 25 kilometre, 3-Council community bike event taking in popular harbour, beachside and recreational locations including Rose Bay, Bondi, Coogee and Centennial Park. A dedicated project officer has commenced to coordinate project outcomes.

Conclusion

Plans are already underway to revisit and update the Ecological Footprint results of the Eastern Suburbs to gauge whether remedial actions and changes can be detected in subsequent footprint results. There may be as many questions and issues raised on the methodology and its capacity to reflect changes introduced, as there are on the practical application of Ecological Footprint calculations to influence policy changes and responses. Current conservative calculations show that if

everyone in the world was consuming the same amount of resources as a typical Sydneysider, a total of 3 to 4 planets of resources would be required each year to meet the level of consumption. On this basis it would seem apparent that substantial changes may be required to human consumption patterns including waste disposal if a change in overall Ecological Footprint results is to be achieved.

The current trend to focus on the 'Carbon Footprint' of individuals and organisations, that is greenhouse gas emissions occurring from the individual's actions, rather than the Ecological Footprint is potentially distracting and confusing to a wider audience. Representing potentially only around 50 percent of the total Ecological Footprint, the Carbon Footprint concept may serve some useful purpose in cementing in a greater understanding or uptake of "footprinting" concepts in the hearts and minds of a wider audience. However, the risk is that the still evolving Carbon Footprint methodology represents not just less rigor or consistency, but actually a reduced coverage of human impact. Too great an emphasis on Carbon Footprinting results present new challenges on how Ecological Footprints are prepared and their results are communicated, particularly as the latter has an arguably greater relevance and significance in influencing the necessary policy responses and changes necessary into the longer term but may be extensively overshadowed by the current inclination to measure and emphasise the Carbon Footprint.

Further information on Randwick Council's Sustaining our City and 20-year City Plan can be obtained via Council's website at http://www.randwick.nsw.gov.au or by contacting either, Richard Wilson, Ecological Footprint Project Officer, by email to richard.wilson@randwick.nsw.gov.au or Peter Maganov, Manager, Sustainability, email peter.maganov@randwick.nsw.gov.au or alternatively Team.Eco@randwick.nsw.gov.au).

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