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A novel Ecological Footprint and an example application



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Manfred Lenzen, Sven Lundie, Grant Bransgrove, Lisa Charet, Fabian Sack



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Manfred Lenzen
Phone: (02) 9351 5985
Fax: (02) 9351 7725
Email: m.lenzen@physics.usyd.edu.au

School of Physics
The University of Sydney
Building A28
N.S.W. 2006

Sven Lundie
Phone: (02) 9385 5097
Fax: (02) 9313 8624
Email: S.Lundie@unsw.edu.au

Centre for Water and Waste Technology
School of Civil and Environmental Engineering
University of New South Wales
Building H22, Vallentine Annex
Kensington 2033

Grant Bransgrove, Lisa Charet and Fabian Sack

Fax: +61 / 2 / 9350-5929

Sydney Water Corporation
115-123 Bathurst St, Sydney NSW 2000
Australia

Sydney Water and the Ecological Footprint

Sydney Waters' commitment to Ecologically Sustainable Development

Sydney Water is Australia's largest water and wastewater service provider, providing water, wastewater and some stormwater services to the greater Sydney area, distributing and retailing bulk water supplied by the Sydney Catchment Authority. Sydney Water operates as a statutory state-owned corporation under the *Sydney Water Act 1994*. This Act enables the provision of water services to a community of approximately 4 million, emphasising the importance of protecting public health, equitable access to its services, and contributing to the state's economy. The Act sets as a principal objective of protecting the environment by conducting operations in compliance with the four principles of Ecologically Sustainable Development (ESD) established by the 1992 Australian Inter-governmental Agreement on the Environment. Sydney Water has interpreted these as follows:

- Precautionary Principle - Reduce the chance of serious or long-term environmental problems, even if we are not sure that these problems will occur.
- Inter-generational and intra-generational equity - Reduce the effects of activities on the environment that the community, now and in the future, relies on to meet its needs and expectations.
- Conservation of Biological Diversity and Ecological Integrity - Maintain or enhance the range of native plants and animals and the health of natural areas.
- Improved Valuation and Pricing of Environmental Resources - Improve the way that we undertake valuation of environmental costs and benefits and use this information when making decisions.

Sydney Water is committed to the Australian goal for ecologically sustainable development: "development that improves the quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends". Its policy is to implement the principles of ESD by integrating environmental, social and economic considerations in the business and through the development of long term strategies and plans that are informed by community consultation.

Sydney Water has developed 29 ESD indicators to assist in identifying overall cumulative environmental and social impacts and is moving towards integrated ecological, social and financial reporting (triple-bottom-line reporting). Measuring performance against the ESD indicators assists the Corporation in assessing whether strategies and plans are effective and provides feedback to decision-making processes. In developing an approach to implementing ESD and the Corporation's ESD indicators, Sydney Water has undertaken community consultation specifically targeting customers, shareholders, regulators, environmental and community groups.

The development of Sydney Water's ESD indicators during 1999/2000 and reporting performance against them in 2001/02 was a significant step for implementing ESD across Sydney Water. The indicators are grouped into the three areas for consideration:

- ecological integrity and/or biodiversity;
- social and public health; and
- economic.

Sydney Water recognises that measuring sustainability and triple bottom line reporting is a rapidly developing field and is undertaking a range of activities aimed to produce the Corporation's first triple bottom line report and to achieve continuous improvement. In particular the current indicators give greater emphasis to environmental impacts over social and economic impacts. This can partially be attributed to the nature of the corporation's core business but is also the result of a historical emphasis on the ecological basis of sustainability within the Australian institutional context. Data collection against each of these 29 indicators commenced in July 2000, and public reporting commenced in October 2001 with the publication of the 2001 Towards Sustainability Report.

Performance against any one of the ESD Indicators only provides data in one sustainability parameter and does not truly indicate sustainability. For example, a reduction in pollutants or discharges to the environment may result in an increase in energy consumption. If the results for all considerations in this process are not measured or reported, the integration of social and environmental benefits can not be shown to be balanced against the expenditure required to achieve this, or possible decreases in other environmental factors. Faced with the task of communicating the combined social, environmental and economic impact measured by the indicators, Sydney Water sought a methodology that would allow at least some measure to be cumulatively reported.

The challenges faced by any methodology aimed at cumulating indicators of sustainability are considerable. The methodology must be:

- sufficiently robust to attract wide credibility (especially from technical and scientific audiences);
- provide a means for stakeholders and the community to understand what the performance against ESD indicators means in terms of cumulative impacts and progress towards ESD; and
- transferable (at least in principle) to allow benchmarking with other industry leaders.

Perhaps most importantly the methodology must provide a metric into which other incommensurable sustainability indicators can be translated and cumulated. For example, Sydney Water's ESD Indicators include measures of greenhouse gas emissions (tonnes of CO₂ equivalent); waste generation (tonnes of waste generated, disposed to landfill and recycled) and user pays (percentage of total water and sewerage revenue based on usage charges).

Ecological Footprint methodology

Scanning of international best practice revealed a case study of a promising methodology – the Ecological Footprint. Hence, a pilot Ecological Footprint calculation using input-output analysis was undertaken to establish its suitability of report combined progress towards sustainability. The results of the pilot Sydney

Water Ecological Footprint were reported in the Corporation's 2001 Towards Sustainability Report. A range of methodological issues have become apparent including the scope of sustainability measures capable of being included within the footprint; the robustness of the methodology; and the relevance of the methodology to organisational process.

Whilst the Ecological Footprint can highlight areas where the Sydney Water can improve policies and practices to reduce the Corporation's footprint, such as procurement, its primary use is as a communications tool for Sydney Water. Ecological footprint is one of many inputs into the strategic planning and management process and into its environmental reporting. The Ecological Footprint will therefore only be one 'driver' of the organisation's planning towards sustainability as it has the potential to neglect other environmental and social objectives of the organisation.

The calculation of Sydney Water's Ecological Footprint by a team of researchers at the University of Sydney and the University of New South Wales has enabled the organisation to better understand and communicate its environmental performance in the provision of water, wastewater and stormwater services. It has also permitted greater transparency into some of its less observable impacts. Through subsequent calculations, the Ecological Footprint will allow Sydney Water and our customers and stakeholders to gain a greater understanding in how it is progressing towards environmental sustainability through the determination of trends and changes across a number of different aspects of its environmental performance:

Communication and education

The ability of the Ecological Footprint to aggregate a number of different aspects of the organisation's environmental performance into a single, easily understood indicator, and its usefulness as a communications tool was seen by Sydney Water as the main advantages in using the Ecological Footprint as an indicator of its progress towards sustainable water service provision. In particular its ability to engender a sense of personal responsibility amongst its customers in their use of water was seen as one of the major strong points of the EF. For instance by communicating the results of its pilot Ecological Footprint on a per-customer-served basis, in addition to the whole-corporation results, it is aimed to educate Sydney Water's customers that they have a significant role to play in reducing the size of Sydney Water's footprint and hence its impacts on the environment.

As an example, the use of scenario calculations proved to be a useful tool, where the results from Ecological Footprint calculations were used to illustrate that small changes in water consumption habits such as the installation of water-saving showerheads can result in quite significant reductions in customer's personal Ecological Footprint. These results support the key messages delivered by Sydney Water's 'Demand management' and 'Water conservation' programs which are aimed at achieving the ambitious target of a 35% reduction in per-capita water usage by 2010 based on 1990 levels.

Decision-making

The Ecological Footprint analysis using the improved method developed at Sydney University showed that by far the largest part of Sydney Water's Ecological Footprint are associated with off-site, indirect impacts, arising from the production of inputs into Sydney Water's operations through a multitude of upstream supply chains. These off-site, indirect impacts in Sydney Water's overall environmental impact highlight the importance of procurement policies that take into account all upstream processes. Sydney Water therefore needs to look carefully for opportunities to reduce its overall impact by modifying the inputs that its operations require. This may involve a reduction in the material intensity of its operations, where feasible from a public health and economic perspective, and where it will not affect the ecological and recreational amenity of waterways receiving treated wastewater discharge. Any concerted shift to the de-materialisation of its operations to reduce the Corporation's impact may involve specific investigations regarding suppliers' use of resources, emissions, energy, waste, generation of greenhouse gases, and closed-loop handling of materials.

The most important *single* component in Sydney Water's Ecological Footprint are the greenhouse gases emitted by coal-fired power stations supplying electricity directly to Sydney Water. These emissions were responsible for nearly a third of the organisation's overall impact. This indicates that energy use should be a major consideration for Sydney Water in its future planning and decision-making. As a consequence, for Sydney Water to make significant inroads into further reducing the impacts caused by energy use, it will need to significantly reduce its requirement for energy in its operations or alternatively shift from its current reliance on using electricity sourced from the burning of fossil fuels.

Sydney Water has already taken steps to minimise the impacts associated with its use of energy and the generation of greenhouse gases from its sewage treatment plants. It is doing this through several different initiatives. It currently purchases 2.5% of its energy needs as 'green power' from the electricity grid and also generates around a further 4% of its overall energy needs as renewable energy through co-generation plants located at two of its sewage treatment plants. Investigations are also being undertaken to determine the feasibility of installing more co-generation plants at its sewage treatment plants as well as small-scale hydro-power stations within the water distribution system. A detailed concept design report has also been completed for a proposed 5MW hydroelectric facility to be located at the end of the pipeline that transfers water from Warragamba Dam (supplying ~80% of Sydney's water needs) to the Prospect Water Filtration Plant. The conversion of sewage 'biosolids' into energy, utilising waste to energy technologies, is a further initiative that Sydney Water is investigating to offset some of the greenhouse gas emissions associated with its current reliance on energy sourced from the burning of fossil fuels. It is also continually looking to improve the energy efficiency of its operations through the regular undertaking of audits at existing buildings, sewage treatment plants, water filtration plants, water pumping stations and sewage pumping stations that are responsible for a large proportion of the organisation's energy needs. The installation of energy-efficient motors at one of Sydney Water's water pumping stations has already resulted in a 10% reduction in energy usage. Energy monitoring and reporting

procedures have also been established within Sydney Water to allow the easier and more systematic identification of improvement opportunities in the organisation's use of energy. To accelerate the development of the potential renewable energy generation opportunities mentioned above, Sydney Water is proposing to enter into a long-term strategic alliance with an energy service provider who will also assist the organisation in developing an effective energy management program.

Finally, Sydney Water has a large portfolio of assets and infrastructure. The Ecological Footprint analysis showed that this land makes the third largest contribution to the footprint of Sydney Water. Although the presence of concrete and metal infrastructure in form of depots and administrative buildings makes this an inevitable contribution to the Ecological Footprint of Sydney Water, there are lessons to be learnt for future strategic planning. Minimising the disturbance of sites and the rehabilitation and restoration of degraded sites affected by Sydney Water's activities are two important initiatives that the organisation can continue to take in future to reduce environmental impacts.

The road ahead

The ability of the Ecological Footprint to incorporate other ESD Indicators would have significant benefits to Sydney Water, and other water services providers, in terms of assessing and communicating the organisation's progress towards sustainability. The inclusion of downstream impacts would enable a better comparative analysis to the less observable offsite impacts caused by the inputs into Sydney Water's operations. Improvements such as these would undoubtedly result in improved environmental and social outcomes through a more holistic, integrated analysis of future options, and help the organisation in achieving its goal of becoming a sustainable water services provider.

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