SHIRE OF BOWEN
TOP OF THE WHITSUNDAYS

WHITSUNDAY SHIRE COUNCIL

MACKAY
CITY COUNCIL

SARINA SHIRE COUNCIL
DISCOVER Sarina

Belyando
Shire Council

NEBO SHIRE COUNCIL
DELIGHT IN OUR DIVERSITY

Mirani
SHIRE COUNCIL

"Working Together"

Institute of
Public Works
Engineering
Australia
Qld Division Inc

REGIONS · PARTNERSHIPS
COMMUNITIES · ALLIANCES

WHAT IS A SUSTAINABLE WATER UTILITY

Vikki Uhlmann

IPWEAQ
2003 STATE CONFERENCE
MACKAY

SUNDAY 5 — FRIDAY 10 OCTOBER 2003
WINDMILL MOTEL & RECEPTION CENTRE

C/-MACKAY CITY COUNCIL · PO BOX 41 · MACKAY · QLD 4740
TELEPHONE: 07 4968 4598 · FACSIMILE: 07 4968 4562
EMAIL: ipweaqcon@mackay.qld.gov.au

WW

HAT IS A SUSTAINABLE WATER UTILITY?

Vikki Uhlmann
PhD Researcher Advanced Wastewater Management Centre, University of Queensland, Australia.

Abstract

The goal of sustainability has received increasing prominence since it was first promoted in the Brundtland World Commission on Environment and Development report in 1987. However, despite the attention, the concept remains difficult to define and even more difficult to implement, particularly for water utilities facing greater than ever pressures to improve performance on a number of fronts. As part of a research program to develop a sustainability management tool, an operational definition of a sustainable water utility and a core set of sustainability indicators was developed based on the triple bottom line and input from a sample of Queensland water utilities. The definition itself provides a broad performance benchmark as well as a foundation from which sustainability indicators can be developed to measure progress in improving sustainability. Findings to date from case study trials of the sustainability tool indicate it is capable of providing a tangible starting point from which to take action.

Key Words: sustainability, water utilities, definition, triple bottom line, indicators, management

Introduction

The growing pressures on our water resources have led to a global trend in efforts over the last fifteen years toward increased sustainability of our water resource management.

Possible solutions have become a topic for much public discussion, with questions arising such as:

> Should people be able to use as much water as they can pay for?
> When should people get subsidized water?
> How much water is needed for environment?
> Who should benefit and who should pay? (Gleick 1998)

Traditionally water utilities have viewed themselves as being in the business, or according to some - separate businesses - of providing water and removing wastewater, with drainage provided by a different entity (Cairns 1993; Macoun 1995).

However while it is now accepted that an urban water scheme should meet the needs of the population on a sustainable basis (Alegre 2002), requiring a more holistic and less fragmented approach, water resources continue to be exploited without adequate safeguards (Moult and Haigh 2001).

This holistic perspective raises important challenges for the long-term sustainability of water utilities. For example, despite the progressive impacts of the Council of Australian Government (COAG) water reforms in Australia over the last ten years, a recent Senate Inquiry into Australia's urban water management found that consumption levels continue to be unsustainable while at the same time consumers are paying among the lowest prices in the world. Senate recommendations include raising the price to reflect the full cost of water (i.e. including externalities), development of conservation targets, water recycling, and the adoption of a national approach rather than the differing approaches of the States (Senate Environment

Communications Information Technology and the Arts Committee 2002).

The Victorian Water Industry Association has warned its members that they may in future be penalized by both the public & government for not behaving in a sustainable way (2002). There will be a need to demonstrate to stakeholders that the water industry is a sustainable one (Bridle 2001).

But how do water utilities improve their sustainability? Much of the work on improving sustainability to date has been based on the assumption that any improvements are inherently more sustainable (Rijsberman and van de Ven 2000). It is argued though that without a systematic framework to guide improvements, sustainability cannot be achieved and fragmented approaches and uncertainty will continue and investment may be wasted (Gleick 2000). Many believe that a fundamental rethink is required regarding the way urban water is managed (Gleick 1998; Shamir and Howard 2000; Moult and Haigh 2001; Department of Natural Resources and Mines 2002). Such a framework or paradigm is envisaged as incorporating agreed sustainability principles, sound science and a set of agreed community values within which decisions can be made systematically.

Research program

The Sustainable Water Utilities Project is part of doctoral research being conducted at the Advanced Wastewater Management Centre, University of Queensland, and aims to:

- Develop an affordable, practical & user-friendly tool for use by water utilities in assessing and improving their sustainability.
- Address the following research questions:
  - How sustainable can an urban water utility be without a total catchment focus? Can stormwater be ignored by a water utility in managing its sustainability?
  - Are sustainability benchmarks needed, & if so how could they be developed and applied?

The research program is divided into 3 stages:

1. Development of sustainability management tool. Contributions from a number of fields – economics, engineering, environmental science, social sciences and sustainability – have been applied to urban water system management to develop an operational triple bottom line approach.

2. Water utility input. Feedback on the draft tool was obtained from a survey sample of utilities of varying sizes and coastal and inland locations via workshops/meetings held across Queensland in February 2003. The components of the tool were then refined.

3. Case studies to trial and refine tool are currently being conducted with two Queensland water utilities - Citiwater Townsville and Gold Coast Water – and State agencies/regulators.

Components of the sustainability management tool include:

- Model definition of a sustainable water utility
- Model selection criteria for sustainability indicators (SC)
- Model core set of sustainability indicators (SI)
- Multi-criteria analysis software for use in choosing between sustainability options.
- Model sustainability assessment & decision-making steps

This paper briefly describes the early findings to date from water utility input and the case study trials.

Elements of model definition of a sustainable water utility

The focus on sustainability began in earnest in 1987 with the Brundtland Commission Report

"Our Common Future" (1987), which defined ecologically sustainable development (ESD) as meeting the needs of the present without compromising the ability of the future generations to meet their own needs.

Over time the trend has moved toward an all-encompassing view of sustainability based on the triple bottom line (TBL), balancing social, economic and environmental needs (Elkington 1999; Bowden, Lane et al. 2001). The view taken is that the economy cannot exist outside of society and society cannot live outside of the environment (Chambers, Simmons et al. 2000).

TBL sustainability recognizes both the role of water services in socio-economic development of communities as well as the need for financial viability of these services, part of the Brundtland commission's requirement for sustainable development to meet the needs of both present and future generations.

So what would a sustainable urban water utility look like? Sustainability is an emerging field which draws from many others, including water resource management, in an attempt to create a holistic approach. It appears to be a unifying concept upon which agreement can be achieved in communities, which draws approaches together and against which solutions can be measured (Skaggs, Vail et al. 2002).

This multi-objective and multi-disciplinary approach is exemplified in the principles of the following international sustainable water paradigm defined by Gleick (2000):

1. Meet basic human needs for water for drinking and sanitation;
2. Meet basic ecosystem needs;
3. Give higher priority to non-structural alternatives to meet demand;
4. Apply economic principles more frequently and reliably to water use and management;
5. New supply systems must be flexible and efficient;
6. All stakeholders should be involved in decision-making. (p.131)

While developed countries have come to rely on much more than the 50L/p/d which Gleick showed would satisfy basic human needs (Gleick 1996), the overall principles still apply.

It is argued that an outcomes-focused or performance-based definition best represents a sustainability management framework for water utilities, with performance systematically measured against its goals and objectives. Accordingly, the above principles can be categorized as water resource management outcomes (1 & 2) and objectives (5) and strategies for achieving them (3, 4 & 6). The following principles from the integrated water resource management field (IWRM) and other disciplines can be similarly categorized, and together begin to form the basis of an operational definition of a sustainable water utility:

1. Equitable access to basic services;
2. A holistic view of water resources, which focuses on whole-of-catchment and total water cycle management (TWCM);
3. Efficient use of resources and closed cycles of resource use;
4. Limiting pollution levels to within environmental carrying capacity; protection of biodiversity;
5. Use of least cost planning approaches (LCP) (White & Howe 1998; Gleick, Singh et al 2001);
6. Acknowledgement of externalities and transparent internalization of these factors
7. Collaboration between responsible agencies and with the community (VicWater 2002);
8. Acknowledgement of multiple and competing social and economic as well as environmental objectives, and the need to balance these through systematic tradeoffs (Roe and Dutton 1986);
9. Establishment of improved and integrated policy, regulatory, and institutional frameworks (USAID 2003);
10. Use of adaptive and flexible solutions to address complexity and uncertainty in planning environment (Holling 1978; Loucks 2000).

The model definition incorporating goals or desired outcomes, and objectives and strategies was then provided as a starting point for customization in the case study trials.

Model core set of sustainability indicators

Sustainability performance indicators must represent a thorough understanding of the urban water system so it is important to begin with the right conceptual framework (Newton, Flood et al. 1998; Lundin 1999), such as the model definition.

In 2002, the Victorian Water Industry Association (VicWater) developed the Triple Bottom Line Reporting Guidelines for use by its members in their annual reporting (Victorian Water Industry Association 2002). The result was a sustainability assessment approach based on the TBL and with a SI set focused on urban water systems. Over sixty indicators were customized for use by water utilities in their annual reporting, in addition to a small number of existing utility indicators.

Unfortunately, for many of the utilities surveyed in this research, sixty indicators were beyond their resources to monitor, analyse and report. So for water utilities improving their sustainability reporting, careful selection of key indicators which best suit their needs and are affordable and practical but still reasonably representative of sustainability, becomes a priority.

A model core set of sustainability indicators was chosen by application of a rigorous set of selection criteria to VicWater's indicator set. The set was refined following comment from the survey sample of water utilities and was once again provided as a starting point for customization in the case study trials.

Findings

Survey findings

An operational definition of a sustainable water utility is an important first step in assessing and improving sustainability. Many of the elements of the model definition drawn from multiple disciplines were approved by the water utilities surveyed, with the practicalities of total water cycle management and the full recognition of utility-related externalities remaining significant points of difficulty.

The utilities surveyed believed the model definition table, including its sustainability strategies, would be a useful checklist in improving their sustainability, but that it is also important to gain support from regulators for any sustainability management approach developed. Performance reporting is already required by many State agencies, with most requiring the use of different indicator sets. If a core set of sustainability indicators collated and improved these existing indicators, this would avoid duplication of effort but would need regulator approval before it would be taken up by utilities. Assuming this could be achieved, the critical requirement remains ensuring the agreed core indicator set measures the goals and objectives of the definition.

Case study findings

Appendix 1 displays the draft sustainability definition and core set of indicators developed by Citiwater to date. Note that the triple bottom line can be clearly seen in the desired outcomes, and that not all objectives and strategies have been allocated to achieving specific outcomes as this detracts from the holistic and integrated approach needed for achieving sustainability.

Responses from Citiwater staff indicate that:

1. The most useful elements of the tool are the model definition, followed by the model set of SI, and the selection criteria for choosing them;
2. The model definition is "very useful" in making the concept of sustainability meaningful and have operational value, and in helping achieve a common agreement about sustainability within the utility;

3. The link between the definition of sustainability and the SI set developed by participants was assessed as “somewhat clear” to “very clear”;
4. The core SI set developed in the case study trial is an improvement on the utility’s current set despite being slightly skewed towards economic issues, and should be used for reporting and as a communication tool with the public;
5. The set could also be used by other utilities;
6. Participation in the development of the SI set is key to developing ownership;
7. Stormwater should be included in water cycle management by utilities;
8. The tool enables a better or broader understanding of sustainability and of the value of stakeholder involvement and is seen as “somewhat” to “very useful” in potentially achieving state regulator/agency support.

Conclusions

The triple bottom line has provided the basis for a systematic framework for defining and assessing sustainability. Utilities participating in this research have indicated that the emergent goals, objectives and strategies operationalize the definition and provide a useful starting point for the systematic development of indicators. It is hoped the case study trials will provide an opportunity to test the remaining components of the sustainability management tool, and its ability to generate regulator support for the approach.

References

Alegre, H. (2002). “Performance indicators as a management support tool”, *Urban water supply handbook.* L. W. Mays. New York, McGraw-Hill: 9.3-9.76.

Bowden, A. R., M. R. Lane, et al. (2001). *Triple bottom line risk management: enhancing profit, environmental performance, and community benefits.* New York, J. Wiley.

Bridle, T. (2001). "Is the water industry truly sustainable?" *Water* (December 2001): 7.

Cairns, L. (1993). “One water cycle or many disparate little businesses?” *Proceedings AWWA 15th Federal Convention*, Gold Coast, Queensland, AWWA, Canberra, ACT.

Chambers, N., C. Simmons, et al. (2000). *Sharing Nature's Interest: Ecological Footprints as an Indicator of Sustainability.* London & Sterling, Vancouver, Earthscan.

Department of Natural Resources and Mines (2002). *A guide to implementing total management planning,* Queensland Government. 2002.

Elkington, J. (1997). *Cannibals with forks: the triple bottom line of 21st century business.* Gabriola Island, BC; Stony Creek, CT, New Society Publishers.

Elkington, J. (1999). "Triple bottom line - reporting for the third millennium." *Australian CPA* March 1999.

Gleick, P. H. (1996). "Minimum water requirements for human activities: meeting basic needs." *Water International* 21: 83-92.

Gleick, P. H. (1998). "Water in crisis: paths to sustainable water use." *Ecological Applications* 8(3): 571-579.

Gleick, P. H. (2000). "The changing water paradigm: a look at twenty-first century water resources development." *Water International* 25(1): 127-138.

Gleick, P. H., A. Singh, et al. (2001). *Threats to the Worlds Freshwater Resources.* Oakland, California, Pacific Institute for Studies in Development, Environment, and Security: 64.

Greene, D. (1997). *Towards sustainable engineering practice*, Institution of Engineers.

Holling, C. S. (1978). *Adaptive Environmental Assessment and Management.* Toronto, John Wiley & Sons.

Janssen, R., M. van Herwijnen, et al. (2000). DEFINITE: *DEcision support system for a FINITE set of alternatives.* Amsterdam, Institute for Environmental Studies, Amsterdam, Netherlands.

Loucks, D. P. (2000). "Sustainable water resources management." *Water International* 25(1): 3-10.

Lundin, M. (1999). *Assessment of the Environmental Sustainability of Urban Water Systems.* Department of Technical Environmental Planning. Goteborg, Sweden, Chalmers University of Technology.

Macoun, T. W. (1995). “Sustainability and the Water Industry.” *Proceedings of National Environmental Engineering Conference,* Melbourne.

Moult, R. and M. Haigh (2001). "Sustainable water resources - the management solution." *New World Water* 2001: 146-149.

Newton, P., J. Flood, et al. (1998). *Environmental Indicators for National State of Environment Reporting: Human Settlements.* Canberra ACT, Department of Environment.

Rijsberman, M. A. and F. H. M. van de Ven (2000). "Different approaches to assessment of design and management of sustainable urban water systems." *Environmental Impact Assessment Review* 20: 333-345.

Roe, P. A. and I. M. Dutton (1986). “Preliminary Environmental Assessment in

Water Resources Planning and Assessment." *Proceedings of National Environmental Engineering Conference*, Melb.

Senate Environment Communications Information Technology and the Arts Committee (2002). *Australia's urban water management.* Canberra, Commonwealth of Australia.

Shamir, U. and C. Howard (2000). "Management of urban water: editorial." *Journal of Water Resources Planning and Management* (May/June 2000): 114-117.

Skaggs, R. L., L. W. Vail, et al. (2002). Chapter 15: "Adaptive management for water supply planning: sustaining Mexico City's Water Touche Ross (1994). *Sustainability indicators research project: report of Phase 1,* Luton/Touche Ross/ UNA Sustainable Development Unit/New Economics Foundation/Local Government Management Board.

Supply." *Urban Water Supply Handbook.* L. W. Mays. New York, McGraw-Hill: 15.3-15.24.

USAID (2003). *What is IWRM?* USAID. 2003.

Victorian Water Industry Association (2002). *Triple Bottom Line Reporting Guidelines for the Victorian Water Industry.* Melbourne, VicWater.

White, S. B. and C. Howe (1998). "Water efficiency and reuse: a least cost planning approach." *Proceedings of the 6th NSW Recycled Water Seminar*.

World Commission on Environment and Development (1987) *Our Common Future.* Oxford, England, OUP.

Appendix A

Goals/desired outcomes	Objectives/ sustainability criteria	Strategies for achieving objectives	Core set of 13 sustainability indicators
1. Meet human needs	1. Provide specific reliable water "services" to meet stakeholder needs and CSO's. 2. Protect public health 3. Inform & educate internal and external stakeholders and involve them in the decision-making process.	1. Use range of demand & supply-side strategies. 2. Meet public health standards & requirements. 3. Involve stakeholders (agencies & community).	1. Water quality 2. Customer satisfaction 3. OH&S (no. workers injuries?)
2. Meet ecosystem needs	4. Achieve environmental outcomes	4. Optimize closed water cycle management (including stormwater) 5. Maximise renewable resource use	4. Total water use (water budget) 5. Achievement of water conservation target (kl/p/a)
3. Remain financially viable & contribute to socio-economic development.	5. Use human, environmental and financial resources effectively and efficiently to achieve organisational objectives. 6. Remain commercially viable 7. Account fully for enviro-socio-economic costs/benefits	6. Internalise "externalities" from outset 7. Trade off objectives systematically 8. Apply multi-disciplinary approaches. 9. Use adaptive management approach 10. Manage risk 11. Balance social, economic & environmental objectives of triple bottom line. 12. Use transparent reporting practices 13. Progressively develop flexible water systems that are resilient to social, environmental & economic changes. 14. Be a reflective learning organization.	6. Direct energy use (unit?) 7. Penalties for environmental non-compliance 8. Operating revenue ($/class) 9. Extent to which customers pay full cost of water (%?) 10. O&M costs ($/class) 11. Employee expenses ($/per property or ML?) 12. Return on assets & return on equity (%) 13. Indirect economic impacts (unit?)

Table 1 Draft Citiwater sustainability definition and core set of sustainability indicators

Biography

Vikki Uhlmann has qualifications in psychology as well as a Master of Administration. Her Masters Thesis was conducted in 1991 with the Office of the Cabinet when she helped produce *"Consultation: a resource document for the Queensland public sector"* (released February 1994). She has worked in government and non-government sectors as well as the commercial sector, running her own management consultancy, Nexus Australia, for well over 10 years. She has experience across a wide range of both social and physical sciences in infrastructure planning (water and wastewater, traffic and transport, power generation and transmission and land use planning) and policy development. Vikki has project-managed more than 60 projects throughout her career.

Vikki has been conducting the Sustainable Water Utilities Project since March 2001. These days she prefers to call herself a "sustainability consultant".

Postal Address: Vikki Uhlmann, AWMC, University of Queensland, St Lucia, Qld 4072
E-mail: Vikki.Uhlmann@bigpond.com