

Development of Policies for Water Cycle Reform in Greater Melbourne and Sydney

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The authors were involved in developing and implementing policies for water reform in Melbourne and Sydney during the last two years. In particular the Victorian policy Living Melbourne Living Victoria responds to growing community concern about the narrow focus of water strategy in recent history and the need for more liveable cities. In contrast, the Sydney Water reform program responds to concern about the increasing costs of managing, operating and providing traditional infrastructure; and resistance of the industry to more decentralized alternative strategies such as water sensitive urban design (WSUD) and integrated water cycle management (IWCM).

This paper provides a narrative about development of systems analysis to support change programs, new policies, different governance arrangements and alternative solutions for a water monopoly and a state government. The often hidden transactions of a range of actors in the process are described to understand the key drivers that impact on alternative water strategies and policies.

1. GENERAL OVERVIEW

Urban settlements are subject to a continuum of change that is influenced by demographic, economic, political, environmental, cultural, and social factors – evolution of a metropolis will vary depending on dominant influences at the time. Greater Sydney and Melbourne regions have prospered and grown rapidly since European settlement.

The last decade has been a transformative period for both cities in response to the experience of drought, flood, fire, rapid population growth, urban sprawl and a change of government. The community and civil society of the cities have evolved to meet these challenges. For more than a century, water services in Melbourne and Sydney have been a model for water management throughout Australia. The citizens of these cities are in a unique situation to create metropolitan water cycle systems that respond to a range of future challenges including population growth, a highly variable climate and an aspiration for more liveable cities.

Australia's water supplies to cities have until recently been almost completely reliant on single sources of water derived from inland catchments fed by rainfall runoff. The long term viability of urban water systems dependent on single centralised sources of water is uncertain. During prolonged periods of drought this dependence on a single water sourcing method has resulted in concerns about water security. The combined pressures of population growth, a highly variable climate and the potential for climate change may create more serious problems in the future (Coombes and Barry, 2008). It is now recognised that more flexible strategies utilising multiple sources of water are a more appropriate response to the security of urban water supplies. By using available water resources from both the traditional centralised and decentralised supply sources in combination with a diverse range of water conservation strategies the resilience of a city's water supply will be greatly enhanced (PMSEIC, 2007).

Until recently, water management strategies in Australia were dominated by proposals for large regional infrastructure projects that commonly resulted in dismissal of smaller scale alternative infrastructure strategies and alternative business models. The response to the recent drought and the serious concerns about water security for metropolitan areas continued a preference for large scale traditional projects, including desalination plants and dam expansions. Most Australian cities were subject to severe water use restrictions and many interior towns suffered serious water shortages. The drought and associated water restrictions also affected the character of urban areas including managed open space, parks, gardens and

streetscapes. The character and amenity of cities was endangered. Water storage in regional water supply dams was at persistently low levels.

During this period of lower rainfall the debate within the water industry, consultant and academic circles largely centred on the search for traditional supply solutions. Water authorities and their consulting advisers argued that there was insufficient water available within the established catchment systems for our growing cities and the preferred solutions for urban water supply were desalination, long pipelines into previously untapped (for metropolitan use) rural water resources and large scale wastewater reuse for human consumption. Most of Australia's captured water resources are used by irrigated agricultural schemes. Water trading between cities and rural users was the subject of considerable debate.

Some experts also claimed that climate data from the most recent past pointed to a permanent step change in rainfall regimes. This was clearly evidenced from a range of advice (for example from the Australian Bureau of Meteorology) to key policy forums (such as the Prime Ministers Science Engineering and Innovation Council) of general "rainfall decline over the last century" and that "ongoing decline in rainfall was expected for most of Australia (PMSEIC; 2007 and PMSEIC; 2007a). Much of this speculation was derived from decline in rainfall and streamflow in the south west of Western Australia and the impacts of the recent drought. However this assumption could not be sustained as a general rule for metropolitan catchments on the basis of complete historical time series of rainfall data (Coombes and Bonacci Water, 2011; Coombes and Barry, 2008).

A key element for the management of water supplies during the last decade of drought was the use of traditional demand management that combines traditional water restrictions with marketing of water saving measures, water efficient appliances and targets for maximum household water consumption. More advanced behaviour change programs were directed at households in Perth. All major cities attempted persuasion campaigns via large scale advertising and various incentive measures that were based on rebates for water saving appliances. Large numbers of households responded to the drought and water restrictions by organising their own supply response by acquiring rainwater tanks and greywater systems. Governments responded by offering small financial incentives for water saving measures.

It is clear that the local and small scale actions of citizens ensured that the majority of Australian cities did not exhaust urban water supplies. For example, Melbourne residents reduced water use by up to 50% using rainwater harvesting, water efficient appliances, reuse of greywater and changes in behaviour. A similar response was commonly experienced across Australia. All of these outcomes, however, did not influence discussion amongst decision makers that was dominated by the search for traditional supply responses in favour of extending storage facilities and augmenting supplies by new technical solutions such as desalination.

It is now acknowledged that voluntary water conservation by the Australian community has made a substantial contribution to demand reductions precisely when the need for conservation was greatest (Aisbett and Steinhauer, 2011). The details of this response have been largely ignored in shaping a water supply strategy for the future. Ironically, the very system that had failed to anticipate the recent drought was activated to provide the response to the future in form of large scale infrastructure solutions.

Clearly on balance there were sufficient water resources available within Australian cities and a stressed and concerned community had managed to exploit some of these water resources during the recent drought. The explosion of demand for rainwater tanks took the supply industry by surprise and water authorities demonstrated reluctance in accommodating these outcomes within their own strategies for the management of scarce water resources. Do the experiences of the recent drought including these unplanned outcomes indicate a systemic failure of centralised planning and supply? It can be said that an important contributor to urban water shortages has been inadequate institutional arrangements for the management of our urban water resources (Productivity Commission, 2008).

Urban water services are mostly delivered by statutory monopolies with State government's as sole shareholders. Dividends are commonly paid to state government and the governance boards (selected by State government) of these monopolies are charged with protecting economic viability and compliance with a statement of obligations. Revenue is earned from selling water, treating wastewater and providing a narrow range of related services. Alternative water management options and water conservation is in direct competition with water monopoly processes (Daniell et al., 2011). Similarly, the narrow structure of the urban water monopoly framework also creates direct and indirect economic dependence on water monopolies throughout the water sector. This process acts to create a sameness of opinion about alternatives within the water sector and reinforces substantial institutional inertia (Brown and Keith, 2008).

The authors were involved in developing and implementing evidence based policies for water reform in Melbourne and Sydney over the last two decades. In particular, the more recent Victorian policy Living

Melbourne Living Victoria responds to growing community concern about the narrow focus of water strategy in recent history and the need for more liveable cities. In contrast, the Sydney Water reform program responds to concern about the increasing costs of managing, operating and providing traditional infrastructure; and resistance of the industry to more decentralized alternative strategies. This paper provides a narrative about development of change programs, new policies, different governance arrangements and alternative solutions for a water monopoly and a state government.

2. METHODS

An integrated systems approach was employed to analyse water cycle and economic Options throughout the Greater Sydney and Melbourne regions commenced during the last decade (more recently by Coombes and Bonacci Water, 2011; 2011a and 2012). These more recent processes were commissioned by Sydney Water Corporation and the Victorian government. The Options were determined to generate debate and understanding of the response of the water cycle systems within Greater Sydney and Melbourne to alternative strategies and futures, and to subsequently inform decision making for water policy.

This process involved a range of interactions with stakeholders including structured workshops, meetings and private conversations with members of the broader water industry and others in Sydney and Melbourne. These investigations included holistic and inclusive processes that was facilitated by formal communication processes, unofficial conversations, and sharing of data and information. These processes included more than 250 interviews, meetings, workshops and discussions.

3. DISCUSSION AND NARRATIVE

A forensic investigation and systems analysis of the entire water cycle for a metropolis is a significant task. Open and transparent engagement with stakeholders via wide ranging consultation and explanation resulted in a comprehensive and robust process. The authors of this paper questioned themselves throughout the entire process to ensure the highest quality analysis was conducted. Hundreds of questions were also fielded from many different organisations and individuals that assisted with understanding of “what is it that we were doing, how it worked and why we got the answers that we did”. This Section provides a narrative of these processes with the aspiration to enlighten the reader, share part of the journey of the investigations and provide a taste of the rich and robust discussion that is generated by a policy development process.

Comprehensive understanding of biophysical and economic systems supported by high quality data and engagement with key stakeholders is necessary to successful completion of a robust systems analysis. Application of systems analysis to sectors and locations where such an approach has not previously been undertaken can present significant challenges. The challenges for an investigator include obtaining the necessary understanding of the system in a sector that is unfamiliar with this form of investigation.

The process of engaging in this type process can be highly demanding of the involved staff and require intense commitments of time from organisations. This impact is particularly likely for organisations that do not regularly interrogate their data for analytical or policy development purposes. In many cases organisations have to understand the different requirements and develop the necessary processes to prepare data to satisfy the specifics of a forensic analysis. The process of preparing operational and historical data for the rigours of this type of analysis is often not easily accommodated within the normal operations of water authorities or related bureaucracies. The more traditional types of analysis common to the water sector is reliant on discreet assumptions that in most cases limits the understanding of the dynamics of a specific system.

The process for developing alternative water policy for Sydney and Melbourne represents a useful case study that details evolution of the investigations and the attitudes and behaviours that emerged. It also provides an important insight to the behaviours, attitudes and responses of the water sector to alternative water cycle management strategies. Such an analysis is dependent on detailed inputs such as demographic profiles, and linked systems that account for water supply, wastewater discharge, stormwater runoff and environmental considerations.

The analysis technique employed in these investigations has been designed to handle the dynamic nature of water systems and variations in the quality and quantity of data. This systems approach has been applied previously in a wide range of regions including the Hunter and Central Coast regions of NSW, Sydney, all of

NSW, Melbourne and Perth (Coombes et al., 2002; Coombes, 2007; Coombes and Barry, 2008; Coombes and Lucas, 2006). Information and understanding from a wide range of sources, disciplines and geographic scales was incorporated into the analysis. This process involves a range of stakeholders including water authorities, State Government agencies, regulators, Australian Government institutions and international organisations. The analysis technique used in this investigation provides a robust and replicable process to overcome the many issues that emerge from developing new understanding of long established challenges.

This investigation included a broad range of human interactions, with the individual responses of employees and organisations proving difficult to manage, especially for an outside consultancy. The specific areas of concern related to the quality and the detail of data requirements that were essential inputs for the systems analysis and required in a timely manner. The process of identifying and collecting this essential data exposed a weakness of the water industry – it appears that adequate spatial and temporal understanding of metropolitan water and sewage systems has not been previously established. Given that these investigations have revealed that the urban water industry was essentially dependent on the transport of water and sewage, this insight implied that operation of water authorities was not optimum or based on logistics that would apply to the transport industry.

There also seemed to be a lack of capability within most organisations in handling these types of requests in a timely and effective manner. This issue was more significant for collection of historical data. As this data will be a foundation of any future reform of systems and operations there is need to address this issue. This investigation discovered the issues relating to collection and maintenance of data more by accident than by design. But there is a wider issue here which will need to be addressed – the limited availability and use of spatial and temporal data is a barrier to development of innovative strategies and establishment of competition. It has to be stressed that the policy process from these investigations and the required system analysis introduced technical and methodological approaches to which most authorities had not been exposed in the past and some of delivery issues may be related to a hesitation of staff to enter new territory.

3.1. Contractual, confidentiality and procurement issues

Alternative and independent investigations of water policies are often subject to lengthy and onerous contractual negotiations. This process limits the ability of investigators to undertake the investigation and obtain important information throughout the process (like any other external auditor may need to do). The overly bureaucratic nature of and approach to contract negotiations is a primary concern. A lack of willingness to jointly solve the obvious problems caused by government procurement rules creates substantial time delays.

It is also important to highlight that the majority of useful information protected by confidentiality requirements contained little or no confidential information that would pose a commercial risk upon release. A similar comment about the Australian situation was during the Australia-US Climate, Energy and Water nexus project at the Crawford School of Economics and Government at the Australian National University (Carter, 2011).

These processes are vastly inconsistent with the view that metropolitan water resources are a public good and the community has a right to have access and to view this information. These barriers carry substantial transaction costs. More importantly these occurrences create an impression that government processes that aim for change and innovation face much larger obstacles within government entities than standard projects that fit established patterns.

3.2. Availability, quality and consistency of data

These investigations provided the first holistic, integrated and linked systems analysis of the entire water cycle for Greater Sydney and Melbourne. The unique spatial and temporal process of combining information from water authorities and agencies with climate, population and demographics, built form and infrastructure has revealed a range of technical and practical challenges. Availability, quality, and consistency of data varied significantly with the organisation responsible for the data and throughout Greater Sydney and Melbourne. Data was found to have highly variable characteristics that are dependent on the unique attributes of the each spatial location (such as the age of infrastructure or the entity responsible for providing services and collecting information).

The metropolitan water authorities are responsible for the collection and management of data related to the supply of water, disposal of wastewater and management of stormwater across Greater Melbourne. Melbourne Water Corporation is responsible for bulk water and wastewater services and stormwater management (in conjunction with Local Government). City West Water, South East Water and Yarra Valley Water are geographical retail monopolies with responsibility for providing water and wastewater services.

The statutory framework for management of retail water monopolies in Melbourne relies on “competition by comparison” that was intended to improve the level of services and deliver better value for money. This investigation revealed that this framework has realised a range of sub-optimal outcomes that related to duplication or gaps in management of the water cycle infrastructure as discussed below.

In contrast, the Sydney system includes a single bulk water provider, the Sydney Catchment Authority and a single water retail authority, Sydney Water, involved different challenges.

Each water authority has a different approach to management, collection and use of data. Some authorities have invested in upgrading and improving data management systems. However the provision of long sequences of accurate historical information was a challenge. The operation and management of water and wastewater networks differs between water authorities. Some authorities have retained operational responsibility for their information management systems and have retained significant corporate knowledge within the organisation. In contrast, other authorities have outsourced the operation of data management systems leaving a paucity of knowledge about the detail of water cycle systems within the jurisdiction of the monopoly.

There was also considerable uncertainty about observations across the jurisdictions of water authorities and networks shared by water authorities. There is a requirement for consistent naming conventions for the monitoring gauges with clear delineation of boundaries and areas of responsibility, and consistent values with networks. This investigation also revealed considerable problems with monitoring resulting in a classification of “non-revenue water” – water authorities are billed for water that simply flows through their network to other jurisdictions due to inaccuracies with monitoring processes. As a consequence, the water authority does not receive revenue for this perceived water supply.

It was common for water authorities to have access to a limited historical record. All authorities were either unable to or found it difficult to provide continuous long term records of water use and wastewater generation. It was clear that water authorities had not previously attempted analysis and understanding of the behaviour of water demands or sewage discharges at this spatial and temporal scale throughout Sydney and Melbourne.

The variances and inconsistencies highlighted in this investigation indicated that it has been (until now) very difficult to develop a strong spatial understanding of the performance of water cycles throughout major cities. As such, prior to this investigation it has not been possible to identify the actual costs of providing services to discrete spatial locations throughout Sydney and Melbourne. This is an important finding that indicates that it was improbable that past discussions about the benefits or otherwise of decentralised strategies may not be accurate.

It was commonly claimed that regulation and policies for provision of water services have not encouraged or stipulated spatial understanding of the performance of the water cycle throughout cities. In any event, this investigation and interaction with stakeholders has provided a compelling argument for a better spatial understanding of the performance of the water cycle to enable improved decision making and planning for water services.

3.3. The use and control of information

An issue associated with the collection and management of information about water systems is the manner in which the information is shared and made available to third parties, collected, stored and maintained. This investigation has identified a series of deficiencies in this regard.

The commonplace actions of individuals that act as “gatekeepers” of information within the water sector must to be reviewed as a priority. Transparent protocols and procedures must be developed to facilitate equal and transparent access to data for all stakeholders. Clearly, operation of publicly owned water monopolies should embrace efficient and transparent processes, and allow balanced consideration of all alternatives.

Access to information determines the evenness and equality of the water sector – equal access to data and consistent knowledge throughout the sector allows innovation and competition in the development of water cycle strategies. A significant bias and asymmetry currently exists for those that manage the system and collect data - a dominant understanding exists and this results in strong control that limits innovation, development of alternative solutions and new ideas.

It is commonly claimed that the public own water authorities. However this is not the case. Water authorities are officially Government Business Enterprises or GBE's. In practical terms this means that these authorities are not part of the public service nor are they private organisations. In Victoria, for example, the Treasurer is the single shareholder of water authorities and the Water Minister has approval of some operational processes.

In practice water authorities are in fact owned and run by the bureaucracies and engineers that work within the water authorities and operate the system. This issue is simply confused and clouded by large amounts of regulation and legislation.

3.4. The planning for future needs and consideration of alternatives

Development of alternative water cycle Options requires an understanding of the current approach to planning, consideration of options and determination of preferred alternatives. The Sydney and Melbourne water systems have generated a wealth of data over the past century. This data is of great value for analytical exercises that are the basis of policy development and decision making. However the value of this great resource of knowledge is limited when data are not managed or maintained. Given the multitude of organisations with responsibility for parts of the entire system, a clear convention for data management should be developed.

This study has confirmed that traditional water planning processes remain focused on separate and siloed analysis of the key elements of the water cycle - water, wastewater and stormwater. The interactions and synergies between the elements of the water cycle are not adequately considered. The planning and operation of the system is currently limited to a macro (whole of system) or micro (individual plant, pump or pipe) scale considerations. Stakeholders commonly failed to understand the need for systems analysis and the value of analysing the water cycle as a holistic system that includes wider society and environmental systems. Some members within the monopoly water industry believed the process was unnecessary, unreliable and a waste of time whilst other professional (such as town planners and environmental managers) considered more holistic analysis was essential to the policy development process.

This insight was indeed revealing in the context of current water cycle planning processes and recent decisions for large scale augmentations of water resources for Metropolitan Sydney and Melbourne. Discussion with water authorities and stakeholders revealed that historical investigations have been restricted to the specific piece of infrastructure and a narrow definition of costs and benefits. Whole of system impacts beyond a preferred physical asset are often not considered. For example the time cost of money, or the financial saving of deferring investment are often not considered.

The challenge of extending the infrastructure network to new Greenfield suburbs is an example. The cost of new infrastructure at the end of the system was considered. However increased loadings on the capacity of existing infrastructure required to transfer water and wastewater to and from the new area were not counted. This process does not consider the reduction in capacity of the overall network that may include locations with limited capacity. This insight implies that the full costs (and benefits) of projects for water cycle management are not considered. This is likely to create a bias towards augmentation using large scale infrastructure in decision making about future water cycle planning.

3.5. The aspirational support of a sector

One of the most significant outcomes of these investigations to create alternative water policies was the large number of individuals who demonstrated significant good will and willingness to generate change across the sector. The authors were provided with considerable advice, information, understanding, ideas and encouragement throughout the processes. Many contributors demonstrated a real desire to see an

evolution in the planning and provision of water cycle services for Greater Sydney and Melbourne. This was a very heartening experience and encouraging for the success of future reform.

4. CONCLUDING REMARKS

This investigation included a broad range of interactions, ranging from individual responses of managers at different levels in the water sector to widely differing organisational responses. This process exposed vastly different levels of capabilities that proved to be difficult to manage. The issues of variable quality of data and information will have to be taken seriously and will require attention as future evidence based policy decisions will depend on the quality of available data.

Engagement and conversations with stakeholders across the sector met with mixed success. It was a wholly positive experience for those that engaged in and contributed to the process. However, the full benefits of the process and consequent opportunities were not realised for those individuals and organisations that were reluctant to contribute. The time delays and costs created by contractual or confidentiality issues generate significant transaction costs throughout the industry. These hidden transaction costs are a substantial barrier to third parties seeking to engage in the sector. Moreover, this process may result in otherwise viable and successful projects being considered to be unviable.

The narrow structure of urban water monopoly frameworks for Melbourne and Sydney also creates direct and indirect economic dependence on water authorities throughout the water sector. This process acts to create a sameness of opinion about alternatives within the water sector and reinforces substantial institutional inertia. The investigations have clearly identified significant spatial variation across Greater Melbourne and Sydney for a wide range of parameters. It is not possible to generalise the parameters or performance at any location to describe the behaviour of another area of Greater Melbourne or Sydney.

The variances and inconsistencies in data highlighted in this investigation indicate that it has been very difficult to develop accurate spatial understanding of the performance of water cycles for cities. As such, it has not been possible to identify the actual costs of providing services to discrete spatial locations throughout Greater Sydney and Melbourne or to accurately comment on the viability of alternative options (including decentralised options).

Regulation and policies for provision of water services have not encouraged spatial understanding of the performance of the water cycle throughout both cities. These investigations and interaction with stakeholders has provided a compelling argument for a better spatial understanding of the performance of the water cycle and associated systems to enable improved decision making and planning for water services

The commonplace actions of individuals that act as “gatekeepers” of information within the water sector must be reviewed as a priority. Transparent protocols and procedures must be developed to facilitate equal and transparent access to data. Clearly, there is a need for a comprehensive database of key data from publicly owned water monopolies that will allow analytical work across the entire water sector.

The full costs (and benefits) of projects for water cycle management are not currently considered. This is likely to create a bias towards augmentation using large scale infrastructure in decision making processes and substantial missed opportunities of optimum policies. However, it will require detailed work across the whole metropolitan sector to clearly identify those policy options. Access to the relevant data will be an essential element of this work. The following recommendations are proposed:

1. Implement flexible design guidelines that are underpinned by the latest knowledge, understanding and integrated systems processes. The new guidelines must consider the impacts of multiple water sources, water efficiency and local variability on the design of infrastructure.
2. Implement a high quality monitoring and data management system for the water, sewage and stormwater networks in each city. This system should be implemented and managed independently and in partnership with all water authorities to ensure consistency. The “whole of Metropolis” monitoring and information management systems should also include observations of stormwater runoff volumes and quality.
3. Implement a competitive process for management of water resources throughout cities. An essential element of this process is the structural separation of planning, approval and operational processes

involved in delivering water cycle services from the operation of water monopolies. At a minimum this will involve assigning water cycle planning and approval functions to an independent authority.

4. Provide open, transparent, and freely accessible information about the performance of water cycle systems throughout cities to all stakeholders and the community. This information should be managed by an independent authority in each city and be available in a common location and format.

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