Submission on the Draft Productivity Commission report on 'Australia's Urban Water Sector'

Integrated Resource Planning for Urban Water

Rigorous assessment of costs and benefits including real options

The Institute for Sustainable Futures commends the recognition given by the Productivity Commission (PC) to the 'Real options' approach for adaptive planning in the water sector.

Draft Recommendation 6.1 on page 114 states that:

"State and Territory Governments should adopt policy settings that allow the costs and benefits of all supply augmentation options to be considered using a real options (or adaptive management) approach".

The merits and some of the challenges of taking a 'real options' approach are discussed in the draft report on pages 119-127. Key features of the 'real options' approach described in this section include: the incorporation of uncertainty in planning, preparing for new infrastructure as a first step for risk management, actually committing to construction when that infrastructure is found to be necessary and adopting a least cost strategy.

The PC's draft report summarises work carried out by White et al. (2006) in the Review of the NSW Metropolitan Water Plan as an example of the application of the 'real options' approach in Sydney. This approach is incorporated in an overarching approach commonly referred to in the water industry as integrated resource planning (IRP). An IRP approach to water system planning includes comprehensive and rigorous assessment of all options, including supply options (dams, inter-catchment transfers, groundwater sources, desalination, indirect potable reuse) as well as demand-side options (including water efficiency initiatives such as appliance labelling and minimum performance standards, retrofitting programs, system leakage and pressure reduction, and business water efficiency programs including water audits and revolving loan funds).

This approach, outlined in more detail in Turner et al. (2011), can allow the identification of a portfolio of options that minimises cost to society while providing an agreed level of service to water consumers. It is considered best practice in the industry and is required and employed by economic regulators such as NSW IPART. The Institute has worked with a number of agencies and utilities to apply this approach, including:

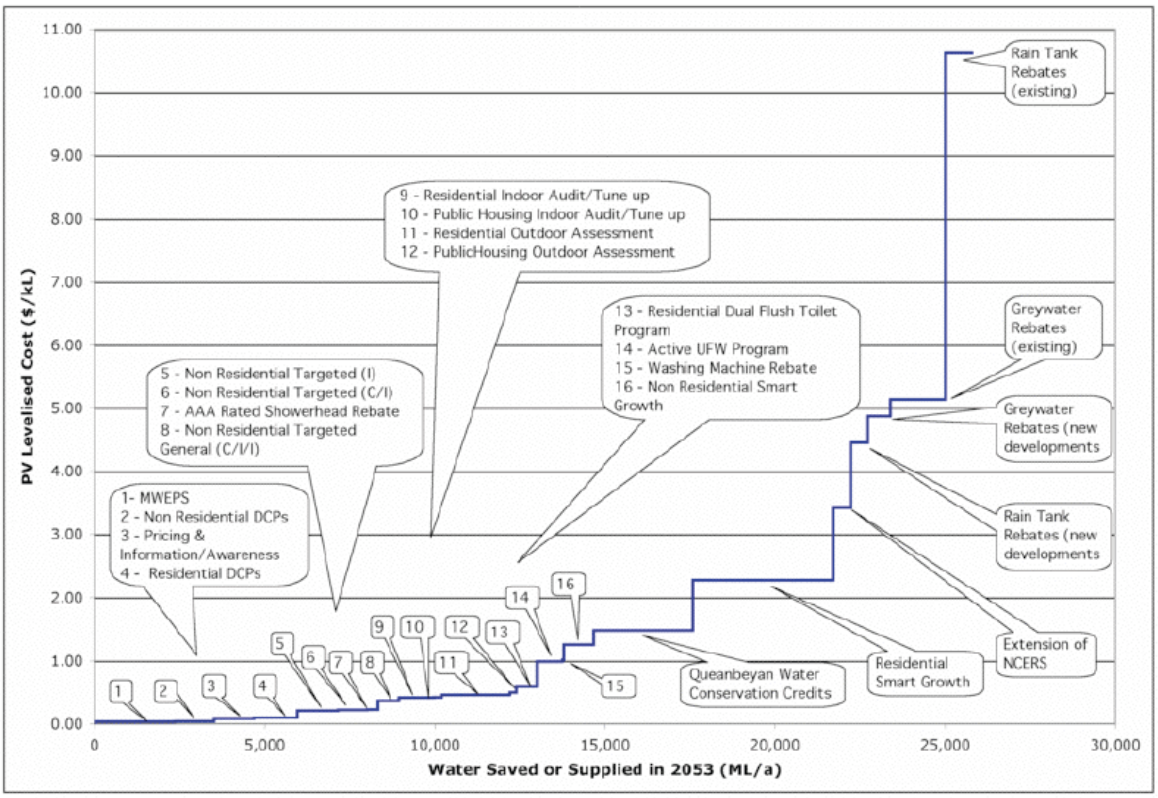
- Sydney Water Corporation (White et al. 2006)
- The Water Corporation of Western Australia (Turner et al. 2005)
- The NT Power Water Corporation and the Northern Territory Government (Turner et al. 2007)
- The ACT Government and ACTEW Corporation (Turner & White 2003)
- Brisbane City Council (Turner et al. 2003)

- Other agencies and utilities across Australia including: SA Water Corporation, Rous Water, Riverina Water, Barwon Water, Central Highlands Water, Yarra Valley Water, South East Water, the (then) WA Water and Rivers Commission.

We have also applied this approach internationally for the Sultanate of Oman Ministry of Water Resources (Salalah), and the Centre for Development and Environment in the Arab region (Alexandria). This runs counter to the claim in the Productivity Commission draft report that there has been little evidence of CBA being applied in the assessment of water efficiency. In addition to this work in the form of detailed ex-ante assessment in many jurisdictions, there is a large body of work in ex-post monitoring and evaluation of savings from water efficiency programs[1].

In all these cases it has been found that there was significant under-investment in water efficiency options, and the potential for cost-effective improvement in the efficiency of appliances, fixtures, processes, conveyance and water-using practices represented one of the largest, cheapest and quickest 'sources' of new water in the area. This is illustrated by the following figures, which represent work undertaken in the ACT. These represent a very typical shape of such supply curves, in terms of the relative magnitude of the costs and yield of supply and demand-side options.

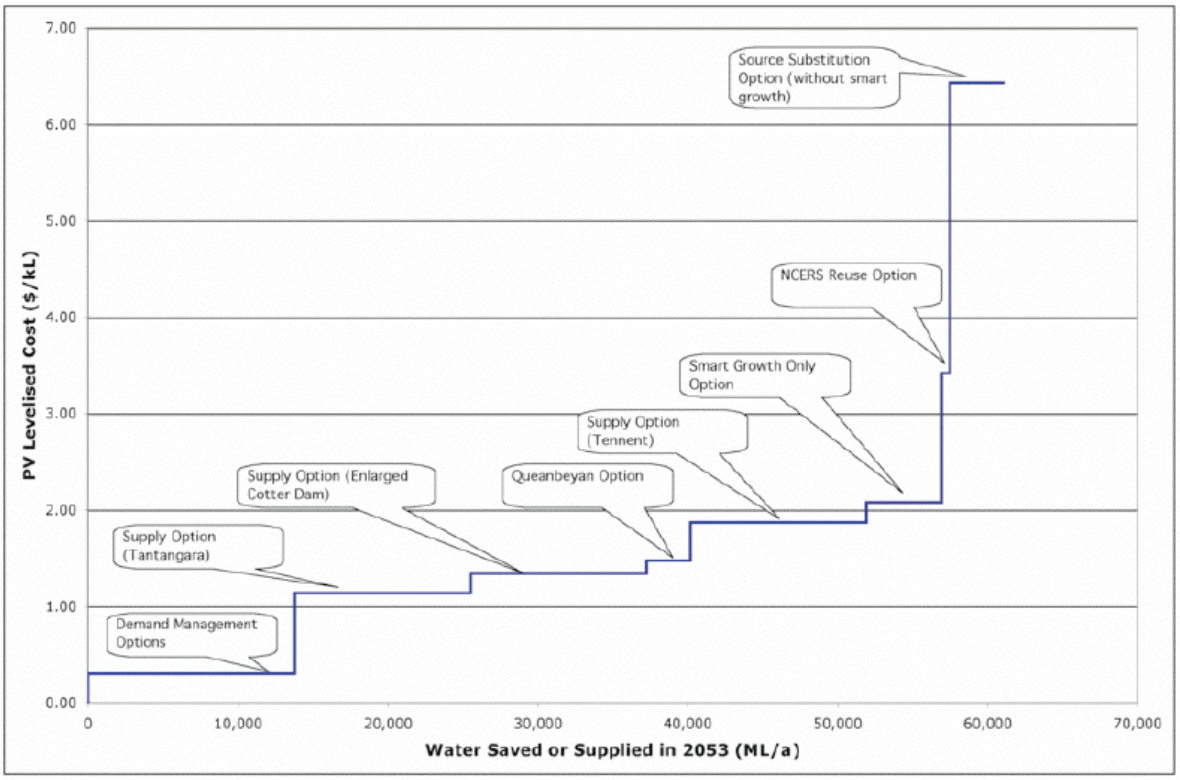
Figure 4-5 Supply Curve in 2053 (excluding Supply Options)



(Turner and White 2003:33)

[1] See http://www.urbanwaterirp.net.au/index.php?option=com_content&view=article&id=52&Itemid=66 and references therein [accessed 23 May 2011] and also Turner et al. (2007b).

Figure 4-7 Simplified Supply Curve in 2053 (including Supply Options)



(Turner and White 2003:34)

The National Water Commission has recently funded a major three year project[2] under the Raising National Water Standards program, to develop and promote integrated resource planning to urban water utilities, including the further development of the Integrated Supply Demand Planning Model, which can be used to assist planning and to compare the economic costs and yield of options in a portfolio to meet water security needs. The approach associated with the integrated resource planning framework is consistent with the COAG urban water planning principles[3].

The Productivity Commission Draft Report suggests that there has been an *over-investment* in water efficiency. This is very far from being the case. As this body of work indicates, there is significant *under-investment* in water efficiency in the Australian urban water industry.

There has been some confusion in public discourse related to the difference between water restrictions and water efficiency. In our work, and comments above, we make a clear distinction between these two different measures.

Restrictions are a temporary regulation of water using behaviour that are factored into (what should be) an agreed level of service between utility and customers.

'Water efficiency', sometimes also called 'demand management' refers to initiatives that provide permanent water savings by improving the way water is used in homes, factories,

[2] See http://www.nwc.gov.au/www/html/495-integrated-resource-planning-.asp?intSiteID=1 and http://www.urbanwaterirp.net.au/ [accessed 23 May 2011].
[3] See http://www.environment.gov.au/water/policy-programs/urban-reform/nuw-planning-principles.html [accessed 23 May 2011].

shops and offices. These are distinct from 'water restrictions', which are short-term measures to temporarily change behaviour to reduce consumption in drought conditions when storages are low. While these are short-term measures, they can have a noticeable impact and reduce amenity, with browning parks and gardens and reduced recreational areas. In contrast, water efficiency initiatives seek to create long-term structural changes to ensure that water is used as efficiently as possible into the future, while maintaining amenity. Such initiatives may include: reducing the pressure and leakage in the water supply system, retrofitting water fixtures, labelling of appliances, regulations on minimum standards for appliances, regulation regarding household water targets (such as BASIX in NSW), business programs with water audits and changes to practice etc., maintenance programs, education and behaviour change programs.

The use of restrictions as a drought response measure increases the effective yield of a water supply system. Hence they should be regarded as a supply-side option (impacting on the yield of the system) as indicated in the table below. In Sydney for example, if restrictions were taken off the table as an option then the yield of the water supply system would be reduced from (about) 600 GL/a to 360 GL/a. The capital cost of making up for this de-rating of yield would be approximately $5 billion if met by supply-side options, or $2 billion if met by demand-side options.

Supply-side (influences yield)	Demand-side (influences demand)
New dams, pipelines, groundwater, desalination	**Improve system efficiency (leakage, pressure management)**
Changed environmental flow regime	**Improve water use market** – metering, billing and pricing – education and advisory services
Reuse schemes for environmental flows	**Improve residential water use efficiency (incentives, retrofit, regulation)** – appliances and fixtures – landscapes and irrigation
Indirect potable reuse into storages	**Improve business water use efficiency (incentives, retrofit, regulation)**
Changed drought response strategies – restrictions regime – emergency supply readiness – drought pricing	**Substitute potable use (on-site or larger scale)** – raintanks and stormwater – greywater and effluent reuse – groundwater

It is worth noting that water efficiency or demand management measures can also be used in a readiness (real options) approach. Our work in Sydney (for the Cabinet Office) and in Melbourne (for DSE) during the recent drought showed that the application of accelerated demand management (e.g. the rapid roll out of major programs to retrofit efficient equipment, reduce leaks and pressure, improve business water efficiency) could significantly extend the time until water supplies reached dead storage, which can extend the time for critical large capital investment decisions for commissioning pipelines or desalination.

When are restrictions appropriate?

The Draft Report outlines a clear list of the potential costs of restrictions on consumers and businesses. These types of negative impacts are comprehensive and similar in range to those identified by in a 2008 Review of Water Restrictions policies conducted for the National Water Commission NWC Report[4] (Institute for Sustainable Futures and ACIL Tasman 2009).

We agree that restrictions impose costs and that these costs should be rigorously considered in the process of planning for and managing urban water systems. Nevertheless, we argue that evidence of costs to date is not a basis to exclude temporary restrictions, or all types, from all future consideration in planning for and managing urban water systems including drought management. Based on extensive ISF research and practical experience working alongside the urban water industry and stakeholders (including community and businesses), we argue that *temporary restrictions should continue to be considered amongst potential options* when planning and managing urban water systems.

This far from implies that restrictions should be included in drought management plans in all circumstances, nor that the analysis and design could not be done much better going forward. Rather, our point acknowledges the range of changing climatic and other conditions across Australia; uncertainty about climate change (coupled with emerging new levels of knowledge); and changing demand and supply patterns. The costs of restrictions (and hence how they compare to other options) is specific to place and time, and hence requires detailed system-specific analysis. To exclude any type of option from potential consideration for implementation in the future – whether supply augmentation, recycling, water efficiency, *or temporary restrictions* – would, by definition, potentially lead to economically inefficient outcomes.

The Commission does note the strong community support for restrictions in managing water systems during drought, but then argues that the modelling overwhelmingly provides evidence that restrictions impose undue costs on the community. We would welcome more detailed analysis of the extensive body of surveys and other investigative mechanisms, that has been undertaken by a number of water utilities, governments and research organisations, that explore community and business views on restrictions and the drought – including this strong support for restrictions. There is a significant body of theoretical and empirical research[5] that supports the legitimacy and advantages of extending the decision-making basis to include citizen's preferences, thereby including alternative analytical approaches beyond economic modelling This is particularly the case in situations of uncertainty, which may substantially impact the accuracy of the modelling results at all stages of analysis (e.g. what is the shape of the demand curve under drought conditions, when consumer preferences change?)

We welcome the Commission's real options assessment. We note that the Commission draws its conclusions based on analysis against three discrete scenarios "low flows", "medium flows" and "high flows", based on analysis of historical data. In reality, effective planning for urban water supply systems requires stochastic analysis (and multiple simulation scenarios) of hydrological conditions – due to the characteristic variability and uncertainty. Case studies

[4] Institute for Sustainable Futures and ACIL Tasman 2009, Review of Water Restrictions, prepared for the National Water Commission.

[5] See for example numerous references in: White, S., Fane, S., Giurco D. and Turner, A., 2008. *Putting the economics in its place: decision-making in an uncertain environment*. In: Christos Zografos & Richard B. Howarth (Ed.), Deliberative Ecological Economics, Oxford University Press.

– albeit based on historical stochastic analysis – in our work for the NWC suggest that there might be a role for restrictions in planning for urban water systems in specific urban locations. If this type of approach were undertaken by the Commission, we would welcome further elaboration and the provision of details in the technical appendices.

Further, since the modelling results are key to the Commission's conclusions, in terms of the statement "Nationally, water restrictions are likely to have cost in excess of a billion dollars per year from the lost value of consumption alone", we are very interested in further elaboration by the Commission on the modelling and evidence on which the $1 billion figure is based.

Best practice regulation for maximising economic benefits

We would make the following observations and recommendations regarding the way forward, based on over 15 years experience working with utilities and regulators in the application of integrated resource planning.

1. There is a need to ensure that the state economic regulators apply a consistent and coherent framework to investment decisions by water utilities. We would recommend that this be based on an integrated resource planning approach as this is the only way to ensure that there is sufficient investment in demand-side options such as improved water efficiency. A mechanism for removing the regulatory disincentive to investing in cost-effective water efficiency should be implemented, such as a form of revenue regulation or incentive payments. Appendix A shows a real (at the time) example of the problem of the way 'foregone revenue' is considered that limits a water utility, in the absence of an appropriate regulatory framework, from investing optimally in water efficiency.

2. There is a need to ensure that utilities and government agencies facilitate processes that can elucidate citizen preferences, in an informed and deliberative way, with regard to levels of service. There is an apparent contradiction between the extremely high levels of support for restrictions in the community, and the results of the few contingent valuation studies. The superior approach would involve engaging the community (through, for example, a deliberative poll, citizen's assembly, consensus conference or the like[6]) in setting levels of service based on an informed comparison of the costs, benefits, implications and alternatives, including scarcity pricing as an option. During the last drought, the levels of service were tightened in many jurisdictions, with an associated de-rating of secure system yields, without any consultation with consumers, in a move that resulted in the expenditure of billions of dollars on supply infrastructure (Chong & White 2007, White et al. 2008).

3. The Commission's draft report focuses on aspects of water supply. The configuration of the sewerage system in cities is a key driver of the costs of the whole water supply and sanitation task, and this is changing as the traditional economy of scale is being challenged. While there are still returns to scale in terms of sewage treatment and wastewater recycling, there is a strong basis for questioning whether there is a return to scale from transport of wastewater in the traditional

[6] For a discussion of these methods and their benefits see for example Carson and Hart (2005).

(conventional large diameter gravity sewers in a centralised network) method. This raises the potential for third party service provision within a network of distributed systems (a mesh) and the difficulties that are currently associated with promoting this approach. While the NSW Water Industry Competition Act has been a great advance in enabling this, there are still significant regulatory costs associated with implementing networked distributed solutions. Water and sewerage companies and governments, need to be working closely with developers in identifying potential pilot solutions to increase levels of confidence and streamline processes.

Professor Stuart White
18 May 2011

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Appendix A

A worked example showing the relationship between water efficiency program costs, foregone revenue, reduced bills and avoided costs. This illustrates the need for appropriate regulatory arrangements (eg revenue regulation or similar) to reduce the disincentive for utilities to invest in measures which have an overall economic benefit from the combined perspective of the utility and its customers (maximising producer and consumer surplus). These numbers were realistic for the WA Water Corporation at the time (2004).