# Submission to the Productivity Commission in Relation to its Issues Paper on Australia's Urban Water Sector

By

Professor R. Quentin Grafton

Director of the Centre for Water Economics, Environment and Policy (CWEEP)

Crawford School of Economics and Government

The Australian National University

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This submission responds directly to selected questions posed within the Productivity Commission Issues Paper that was released in September 2010.

*(1) What objectives should governments have for the urban water sector?*

Governments should have a range of objectives including the social, environmental and economic. An important economic aim should be to ensure the efficient pricing of urban water supplies to consumers and the cost effectiveness in the decision to undertake supply augmentation. Both aims are necessary to ensure the consumer surplus of urban water consumers is maximized.

*(2) What are the impediments to achieving those objectives?*

The primary impediment is the failure to place the maximisation of consumer welfare as a key objective in the governance of urban water supplies and demand.

*(3) Is there a strong case for reforming Australia's urban water sector?*

Given the very large efficiency losses associated with the imposition of water restrictions and the premature investment in large-scale supply augmentation in urban Australia over the past decade, there is a great deal of scope to improve outcomes for water consumers and taxpayers. The efficiency gains in periods of extended water restrictions from dynamically efficient water pricing could be as much as $150 household per year [Grafton and Ward 2008] and combined with the gains Australia-wide from optimally investing in supply augmentation could be worth billions of dollars [Grafton and Ward 2010]. These benefits are not currently being realized because of how water is priced in urban Australia. In particular, the absence of scarcity/flexible pricing is the primary reason for these large efficiency losses.

*(4) Which options for reform offer the largest benefits in metropolitan and regional urban areas?*

The reform option that offers the largest benefit is the introduction of scarcity/flexible volumetric pricing of water, also known as dynamically efficient water pricing. Such water pricing will increase consumer welfare relative to existing methods for setting urban water prices.

*(5) How should water supply and security objectives be framed? For example, should they be in terms of the frequency of water restrictions?*

Frequency of water restrictions as a water security goal implies that urban water consumers should expect to have water restrictions. If prices adjust flexibly upwards as storages decline then it is possible to manage without restrictions, except in extreme and unanticipated emergencies. The presumption in the 'frequency of water restrictions' as a key performance indicator is that volumetric prices are fixed or cannot be changed flexibly in response to water availability.

*(6) Are there any current government water policies that impede the achievement of the objectives that should be pursued for the urban water sector? If so, what impediments are there and how significant are they?*

Fixed volumetric pricing specified years in advance and independent of water availability is the major cause of water restrictions in Australia. Dynamically efficient water pricing would eliminate the need for water restrictions, except in unanticipated emergencies.

*(7) Is there scope to increase the efficiency of supply augmentation planning and decision making? If so, how significant are these opportunities? What is preventing them from being realised at present?*

The decision to undertake supply augmentation and the volumetric price charged to consumers are jointly determined. This is because the current volumetric price helps to determine water demand that, in turn, determines when supply augmentation is required. The only efficient way to supply augment, therefore, is when the volumetric price can be changed flexibly and be forward looking to account for the ability of a higher price today to postpone costly supply augmentation tomorrow. Calculations by Grafton and Ward [2010] indicate that the welfare losses in Sydney from not setting prices flexibly could exceed a billion dollars. These welfare costs are a direct consequence of pricing that did not flexibly adjust to water availability in Sydney storages.

In the case of Sydney, the volumetric price was set at too low a level before the decision to build the desalination plant was taken in 2007 because a failure to include a scarcity price resulted in a higher demand, and brought forward prematurely the need to invest in supply augmentation. The volumetric price was set at too high a level after the desalination plant was built because as soon as the decision was made to invest in supply augmentation, the incremental costs associated with the desalination plant became incorporated in the independent pricing authority's price determination that was set independently to the water available in Sydney's dams. However, the extra costs associated with supply could have been delayed. What is preventing improved efficiencies being realised in Sydney and other urban centres in Australia, is a system of pricing water that is independent of water availability.

*(8) Should supply augmentation planning be guided by a water security objective? Does this occur at present? If so, who sets the objective and how is it set?*

Supply security should guide the decision to supply augment, but so also should the maximisation of consumer welfare.

*(9) Who makes supply augmentation decisions at present? Is there clear process, accountability and transparency for decision making?*

The decision to supply augment, ultimately, rests at the level of government responsible for the governance of water that is, typically, state or territory governments. This has resulted in less than transparent decisions and poor decision-making. For instance, the there was not a competitive tender process in Queensland when the contract was awarded to build the desalination plant on the Gold Coast. In Victoria, the details of the costs of the desalination plant and related infrastructure costs were not made publicly available after the successful tender was awarded. Full documentation of the costs and benefits of decisions made in terms of supply augmentation should be made available to the general public for scrutiny.

*(10) How do current water and wastewater pricing arrangements perform against the efficiency, equity/social and other relevant objectives? Is there scope to improve the efficiency of pricing? How would this best be achieved?*

Price setting of urban water in Australia is typically set by an independent regulator or agency. The independence of these agencies is necessary but is not sufficient for dynamically efficient water pricing. This is because the price regulators typically set their prices to prevent 'monopoly' pricing but this, by itself, does not maximise consumer welfare. A stylised representation of how the volumetric price charged to water consumers is given in Equation (1):

$$\text{Average Incremental Cost} = \frac{\text{Least cost investment to equate demand and supply (\$)}}{\text{Incremental output from capacity expansion (kL)}}$$

This is supposed to represent long-run marginal cost pricing. However, there is no unique long-run marginal cost as it depends on the highly variable inflows of water into catchments and dams. If pricing were economically efficient then the price charged to consumers *prior* to the decision to supply augment should account for the added cost of supply augmentation. Unfortunately, such pricing does not occur in Australia for urban water volumetric prices vary only with the costs associated with existing or just augmented capacity, interest rates or inflation, and ignore the affect of weather on current and future supplies.

Sub-optimal volumetric pricing that is not dynamically efficient generates other welfare costs beyond the supply augmentation decision. This is because to help balance current demand and supply with volumetric prices that are too low, mandatory water restrictions are typically imposed. This imposes substantial costs on consumer welfare relative to a dynamically efficient volumetric price that would have ensured the same level of demand and remitted revenues, in excess of supply costs, back to consumers in the form of lower access fees [Grafton and Ward 2008].

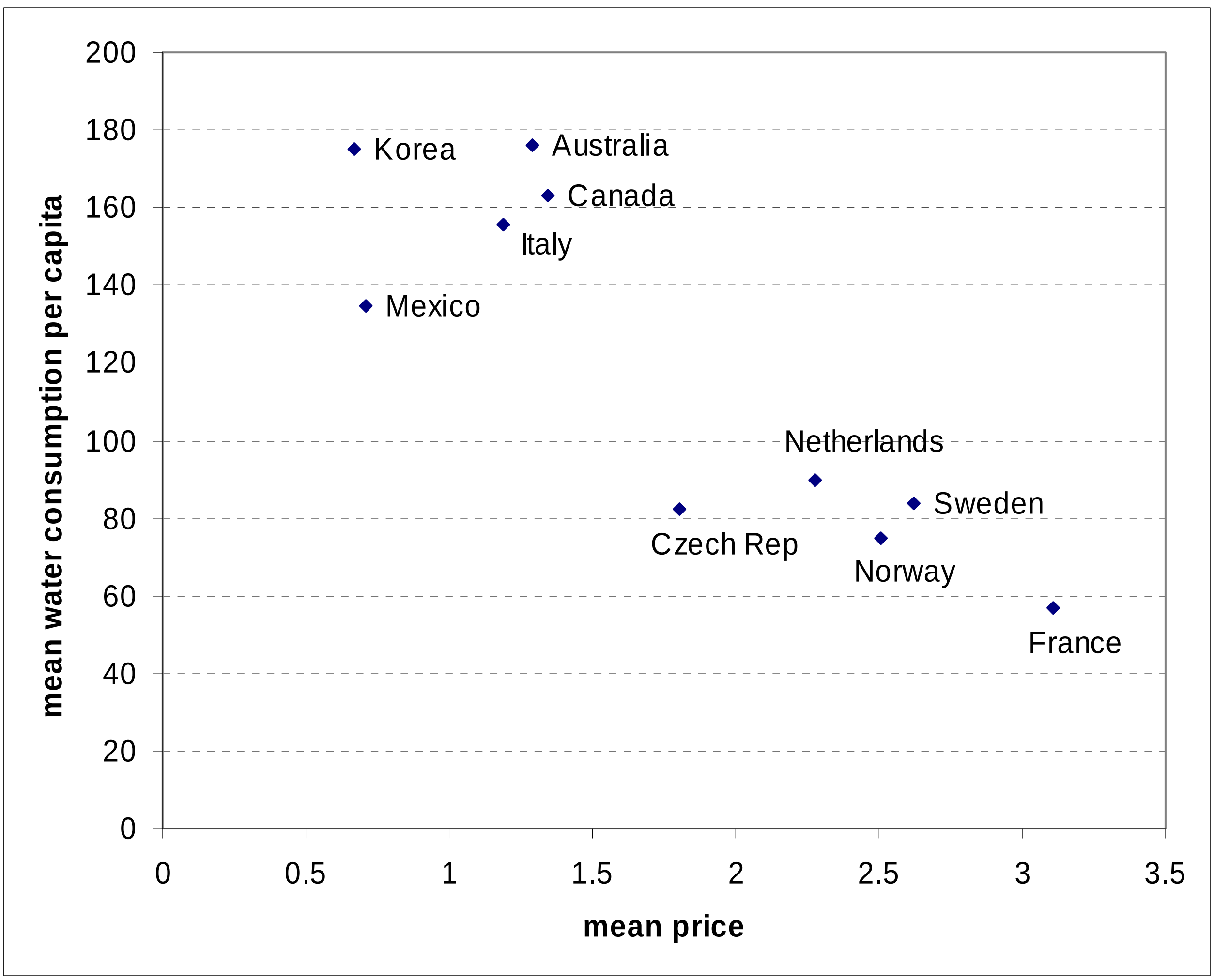
*(11) Should more flexible (scarcity-based) pricing be introduced to assist in managing demand in the face of the variability of rainfall-dependent supply?*
*To what extent are efficiency gains in the supply of water and wastewater services dependent on pricing reform (that is, on obtaining better price signals to guide supply augmentation investment)?*

Flexible/scarcity pricing, also called dynamically efficient pricing, involves the setting of current period prices to account for current supply capacity, desired future supply capacity and supply variability. Current prices affect future supply augmentation because desired future supply capacity depends on current and future demand. Thus, the current volumetric price charged to water consumers must be forward looking to account for its effect on future supply capacity. Consequently, a failure to account for the effect of the current volumetric price on future demand, and consequently future supply capacity, will result in sub-optimal investment (time and size) in supply augmentation.

*(12) How responsive to changes in price is the demand for water for residential (indoor and outdoor use) and commercial/industrial use?*

Please see below the ‘raw’ relationship below between household water consumption and average water price in ten OECD countries, including Australia. This figure may be interpreted as a long-run relationship between the average water price and consumption. It clearly shows the negative relationship between the average price of water and average household consumption. Grafton et al. [2010] provide detailed analyses of the effects of the average price of residential water demand taking into account a wide range of household characteristics (size, income, etc.) and reported environmental attitudes. Their results show that the average volumetric price charged to households is the most important policy lever that influences residential water consumption.

**Household water consumption per capita plotted against the calculated mean water price in Ten OECD Countries**




Source: Grafton et al. [2010]

*(13) Are elasticities different in the short run compared to the long run (due to consumers having more time to become aware of price changes and respond to them)? What is the evidence on the price elasticity of demand for water?*

Two meta-analysis studies of water demand have found that residential consumption does respond to price changes, but is price inelastic. In particular, Espey et al. [1997] used 124 elasticity estimates to obtain a median short-run price elasticity of demand of -0.38 and a median long-run price elasticity of demand of -0.64. Dalhuisen et al. [2003] combined 296 price elasticity estimates to derive an overall mean price elasticity of -0.41. Dalhusien et al. [2000] also find that households are more responsive to price changes the more time they have to adapt to price increases. Grafton and Kompas [2007] estimate a short-run price elasticity for Sydney of -0.352 while Hoffman et al. [2006] estimate a price elasticity of demand equal to -0.507 for Brisbane.

The finding that the price elasticity of demand can be greater in the long run (and can be substantially larger) is especially important for water authorities and utilities when they evaluate the effectiveness of raising the volumetric price of water on water consumption [Nauges and Thomas. 2003, Arbues et al., 2004].

*(14) What impact has the imposition of restrictions and other non-price demand management measures had on the price elasticity of demand for water?*

Many water authorities promote installation of water-saving devices, such as efficient toilets and showerheads. While it seems intuitive that water-saving devices should reduce household consumption, this may not necessarily be true in all cases. This is because an increase in water efficiency of a device effectively reduces the unit cost of the produced service and, thus, could theoretically cause an increase in consumption. Olmstead and Stavins [2009] provide a review and summary of studies on water savings devices. The empirical evidence is mixed. For example, a study of low-flow showerhead retrofits in Colorado found no significant influence on consumption, while studies in California and Florida found modest savings. Similarly, several studies of efficient toilets find associated water savings, while Renwick and Green [2000] report that rebates for water-efficient toilets had no significant impacts.

The connection between environmental attitudes and water consumption is policy relevant because advertising campaigns have frequently been used to reduce consumption by promoting water conservationist attitudes. Domene and Sauri's [2005] study of Spanish water consumption is one of the very few to examine the influence of attitudinal variables on water consumption, and finds a significant association. In a study that uses household data from England, Gilg and Barr [2006] also find that water saving behaviours are positively associated with respondents' status as owner occupiers, whether they have a tertiary education, are members of community groups and are 'committed environmentalists'.

*(15) Are water restrictions and other non-price demand management measures, inclining block tariffs and postage stamp pricing equitable?*

Cross-subsidies in residential pricing are typically applied such that consumers pay the same price for water regardless of differences in supply or delivery costs to households. This 'postage stamp' pricing is contrary to efficient pricing, but is widely practised because many consumers would view it as unfair if they were to pay a higher volumetric price than another consumer for what appears to be an identical product delivered by the same supplier.

An increasing block-rate pricing structure is sometimes justified for equity reasons if water consumption is determined by income and price alone. However, empirical studies show that the number of people in a household increases water consumption [Hanke and de Maré 1984; Lyman 1992]. Thus, an increasing block tariff price structure has the unfortunate consequence that large and poor households, who may have little discretionary use about water they can use, pay a higher price for water than small and high-income households [Bithas 2008; Dahan and Nasan 2007]. An increasing block tariff also fails to satisfy a fairness test that the total water bill of each household is proportional to their share of water consumption [Loehman 2007]. Increasing block tariffs area also economically inefficient if consumers differ in their preferences because it results in households with different marginal benefits of water consuming the same volumes of water while facing the same marginal price [Train, 1991 pp. 223-224].

*(16) What influence (positive or negative) might wider reform of price and/or non-price demand management measures have on equity?*

Surprising as it may appear, the use of flexible/scarcity pricing may be more equitable than the current fixed price system based on so-called long-run marginal cost. This is because dynamically efficient pricing ensures, ex ante, that the average volumetric price over time is the lowest it can possibly be. Further, receipts in excess of supply costs when supply availability is low during droughts provides an opportunity to return excess revenues back to households in a progressive way. By contrast, under the current fixed price system when costly supply augmentation occurs consumers can be faced with a much higher water bill to recover the capital costs of the supply augmentation.

*(17) Have the non-price demand management measures implemented by policy makers been effective?*

The evidence is that mandatory water restrictions, at least those involving substantial curtailment of outside watering, can reduce water demand. Evidence from Sydney [Grafton and Ward 2008] indicates that such restrictions help reduce aggregate demand by about 15%.

Equally important questions are: Whether such restrictions are also efficient? And are there alternatives that can achieve the same reductions in water demand, but at a lower cost to consumer welfare? Grafton and Ward [2008] provide convincing evidence that dynamically efficient water pricing is preferable to mandatory water restrictions if the goal is to minimise welfare costs.

*(18) What kinds of costs have these measures imposed on consumers? What is the evidence on how large these costs are?*

Mandatory water restrictions are not costless and in 2004-05 were estimated to cost about $150 per household in Sydney relative to the use of dynamically efficient water pricing

[Grafton and Ward 2008]. The Productivity Commission [2008, p. 28] used the analysis of Grafton and Ward to estimate that mandatory water restrictions in Australia generated annual welfare costs of around $900 million per year.

*(19) How might the design and implementation of non-price demand management measures be improved if policy makers elect to use them in the future?*

Combining voluntary non-price demand management measures, such as campaigns to have shorter showers, appear to be more effective when coupled with higher average water prices. Grafton and To [2010] show using household data from 10 OECD countries that the largest overall effect on increasing the probability of respondents undertaking water saving behaviours is whether households incur a volumetric water charge. These charges increase the probability of: *i)* turning off the water while brushing teeth; *ii)* taking a shower instead of a bath; *iii)* watering the garden in the coolest part of the day; and *iv)* collecting rainwater and recycling waste water.

*(20) To what extent is there scope for competition and/or contestability in the different elements of the urban water supply chain?*

Contestability in the provision of water services has the potential to provide efficiency gains equivalent to the benefits from flexible/scarcity pricing. A possible approach is outlined by Sibly and Tooth [2008].

*(21) Is there a strong case for urban water reform to be pursued?*

Current governance arrangements are generating large losses in welfare to consumers and taxpayers. Alternative arrangements, such as flexible/scarcity pricing, are available that can, and should be, implemented that will generate efficiency gains and equity benefits.

*(22) Can you provide any quantitative or qualitative evidence or analysis of the efficiency gains from reform that might be achieved in the Australian urban water sector?*

Grafton and Ward [2008] have shown gains from flexible/scarcity pricing in Sydney in 2004/05 versus mandatory water restrictions were in order of $150 per household. Grafton and Ward [2010] show that flexible/scarcity pricing that would have led to the postponement of the construction of Sydney's desalination plant in 2007 could have generated savings in excess of a billion dollars.

*(23) Are the current governance arrangements for the urban water sector efficient?*

Current governance arrangements are neither efficient nor equitable. Until, and unless, volumetric prices are set flexibly and are forward looking to account for supply variability and the effects on supply augmentation then the current governance arrangements will not be efficient.

*(24) What are the weaknesses of these arrangements, and what are the consequences of these weaknesses?*

The chief weakness is the lack of flexibility in pricing in response to changes in water availability. Dynamically efficient pricing could be instituted within the existing governance arrangements if the criteria for setting prices by independent pricing tribunals and authorities were changed to ensure volumetric prices were set in a dynamically efficient manner, as outlined in Grafton and Ward [2010].

*(25) Should independent price regulation be used more widely in the Australian urban water sector?*

Independent price regulation is preferable to prices set, or influenced by, political processes. Unfortunately, independent pricing does not necessarily mean efficient water pricing. Until, and unless, dynamically efficient water pricing is applied consumers and taxpayers will continue to incur substantial welfare costs.

*(26) What are the priority areas of reform (that is, where are the greatest efficiency gains evident and early action practicable)?*

Three issues should be addressed and understood in the context of urban water reform. First, the expected welfare losses associated with a fixed and regulated volumetric price and sub-optimal investment in supply augmentation can be very large and may even exceed the annual water bill of households. Second, the current use of a fixed, regulated volumetric price in an environment of supply variability as we have in Australia is likely to result in premature investment in supply augmentation. Third, costly supply augmentation such as desalination plants, will result in substantial and permanent increases in the volumetric price charged to consumers. This will impose the biggest relative burden on low-income and large households. By contrast, dynamically efficient water pricing whereby prices rise in periods of short supply and fall in periods of adequate supply, offers an efficient (lower average volumetric price over time) and also equitable (if coupled with reduced fixed fees with greater assistance to low-income households) alternative to current practice.

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