The Allen Consulting Group

WELS Expansion — Domestic Irrigation Controllers

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Report to the Department of the Environment, Water, Heritage and the Arts

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Chapter 1
Introduction

This Chapter provides an overview of the policy framework that has resulted in this paper being developed.

1.1 Water in Australia

Water is essential for a country's economic development and social well-being. In Australia, access to water has dictated the way in which cities have grown, and the population density around coastal areas. It is therefore no surprise that water management has become a priority across all levels of government in Australia in the last two decades. In recent years, given the prolonged drought and the uncertainty resulting from climate change, attention to water management has become more urgent.

Water for the Future is the Australian Government's ten-year plan for water management that aims to secure the long-term water supply of all Australians. It identifies the following four priorities:

- taking action on climate change;
- using water wisely;
- securing water supplies; and
- supporting healthy rivers (Department of the Environment Water Heritage and the Arts 2008).

The *National Water Initiative* (NWI) is a vital element in this national framework. The NWI is a cross-jurisdictional blueprint for water reform. Underpinned by an Intergovernmental Agreement, the NWI commits its signatories to:

- prepare water plans with provision for the environment;
- deal with over-allocated or stressed water systems;
- introduce registers of water rights and standards for water accounting;
- expand the trade in water;
- improve pricing for water storage and delivery; and
- meet and manage urban water demands (National Water Commission 2009a).

The overall objective of the NWI is 'to achieve a nationally compatible market, regulatory and planning based system of managing surface and groundwater resources for rural and urban use that optimises economic, social and environmental outcomes' (National Water Commission 2009a).

It is into this overall policy framework that the Water Efficiency Labelling and Standards (WELS) scheme fits.

1.2 Water Efficiency Labelling and Standards Scheme

The establishment of the WELS scheme was identified in the NWI as a 'key action for the implementation of demand management measures for urban water reform' (National Water Commission 2009b). The WELS scheme labels a range of products for water efficiency, providing consumers with information so they can consider water efficiency in their purchasing decisions of certain products. It also has the power to impose minimum water efficiency standards (WES) where appropriate.

The Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) administers the WELS scheme, in partnership with state and territory governments. The WELS scheme is underpinned by the Australian Government *Water Efficiency Labelling and Standards Act 2005*, and supported by the *Water Efficiency Labelling and Standards Regulations 2005*, the *Water Efficiency Labelling and Standards Declaration 2005* and the *Water Efficiency Labelling and Standards Determination 2007.*

The WELS legislative framework gives the Minister the authority to select products for inclusion in the WELS scheme, and to set the applicable standards and requirements. The legislation also provides for registration and labelling of WELS products (including setting the fee to register a product) and enforcement (including the employment of WELS inspectors and procedures for penalising and prosecuting offences under the Act). The AS/NZS 6400 is currently determined as the WELS standards. AS/NZS 6400 specifies the methods of testing for water efficiency and is the guideline underpinning the star-rating scheme for WELS.[1]

Table 1.1 summarises products currently covered by the WELS scheme. Registration and labelling became mandatory for all new products from 1 July 2006[2]. Prior to this, registration and labelling had been available to industry on a voluntary basis until July 2006. At present, toilets are the only product to which a minimum WES has been applied.

[1] The AN/NZS 6400 standard is named as the WELS standard in the 2007 Determination. The Commonwealth Minister can change the WELS standard at any time by issuing a new determination.

[2] Manufacturers and retailers were allowed a 'grace period' until 31 December 2006 to sell existing plumbing products and until 31 December 2007 to sell existing whitegoods products. After the 'grace periods' were over, old stock that had not been sold had to be either registered or disposed.

Table 1.1

CURRENT SCOPE OF WELS SCHEME

Product	Registration	Water Efficiency Labelling	Water Efficiency Standard	Primary basis for rating (c)
Shower heads	Mandatory	Mandatory — stars (b)	No	l/min
Toilets	Mandatory	Mandatory — stars	Yes	Wtd l/flush (d)
Clothes washing machines	Mandatory	Mandatory — stars (b)	No	l/kg clothes
Dishwashers	Mandatory	Mandatory — stars (b)	No	l/place setting
Taps (a)	Mandatory	Mandatory — stars (b)	No	l/min
Urinal equipment	Mandatory	Mandatory — stars (b)	No	l/flush (e)
Flow Controllers	Optional	Optional	No	l/min

Source: (a) For use over a basin, ablution trough, kitchen sink or laundry tub. (b) Zero star label for models not meeting performance requirements. (c) See AS/NZS 6400:2005 *Water efficient products - Rating and labeling*. (d) Average of 1 full and 4 partial flushes (e) Secondary rating criterion is mode of activation.

In the 2008/09 financial year 1,676 product models were registered under the WELS scheme, bringing the total number of product models registered since its introduction to 12,088.

1.3 Expanding the WELS program

In November 2006, the Environment Protection and Heritage Council (EPHC) agreed to a long-term program of work to investigate the possible introduction of minimum water efficiency standards for existing WELS scheme products outlined in Table 1.1, and the potential inclusion of new products into the scheme. Products considered for inclusion in the WELS scheme were combination washer/dryers that use water in dryer mode[3], evaporative air conditioners, instantaneous gas water heaters, hot water circulators and domestic irrigations event controllers. The program of work also involves consideration of raising the existing minimum WES for toilets.

Products considered for possible inclusion into the WELS scheme were chosen based on the recommendations of a 2005 concept report prepared by George Wilkenfeld and Associates for DEWHA: *Expanding the Water Efficiency Labelling and Standards Scheme*. This report found that evaporative air conditioners, hot water circulators (on their own and interacting with water heaters) and condensing clothes dryers were products with the highest priority for inclusion into the WELS scheme.

[3] Combination washer/dryers are already required to be registered and labelled for their washing mode. The program of work for the EPHC is investigating further labelling of combination washer/dryers that use water for their dryer mode.

1.4 This report

This report is a paper commissioned by DEWHA to analyse the appropriateness of including domestic irrigation controllers in the proposed expansion of the WELS scheme for labelling and minimum WES from a regulatory perspective. It uses the guidelines outlined by the Office of Best Practice Regulation as the framework for this analysis.

Chapter 2

Product description

This Chapter provides a brief description of the function of domestic irrigation controllers and summarises the key technical aspects that may result in unnecessary water usage.

Domestic irrigation controllers are 'logic devices which control water flow in domestic irrigation systems', such as a lawn sprinkler or drip irrigation system (Irrigation Australia and Hydro-Plan Irrigation Consultants 2008). These devices can control water flow according to varying levels of sophistication. Some use a simple timer switch to trigger and end water flow at set points in the day/week. Others can automatically adjust watering frequencies and duration on the basis of data collected by soil moisture sensors, rain sensors and weather data (downloaded from the internet). Domestic irrigation controllers also vary on their 'ability to retain instructions and recover from energy failures ... according to whether the controller is powered by batteries only, mains only, or mains with battery backup' (George Wilkenfeld and Associates 2005).

Figure 2.1 provides a summary of the types of domestic irrigation controllers currently available in Australia.

Figure 2.1

SUMMARY OF DOMESTIC IRRIGATION CONTROLLER TYPES

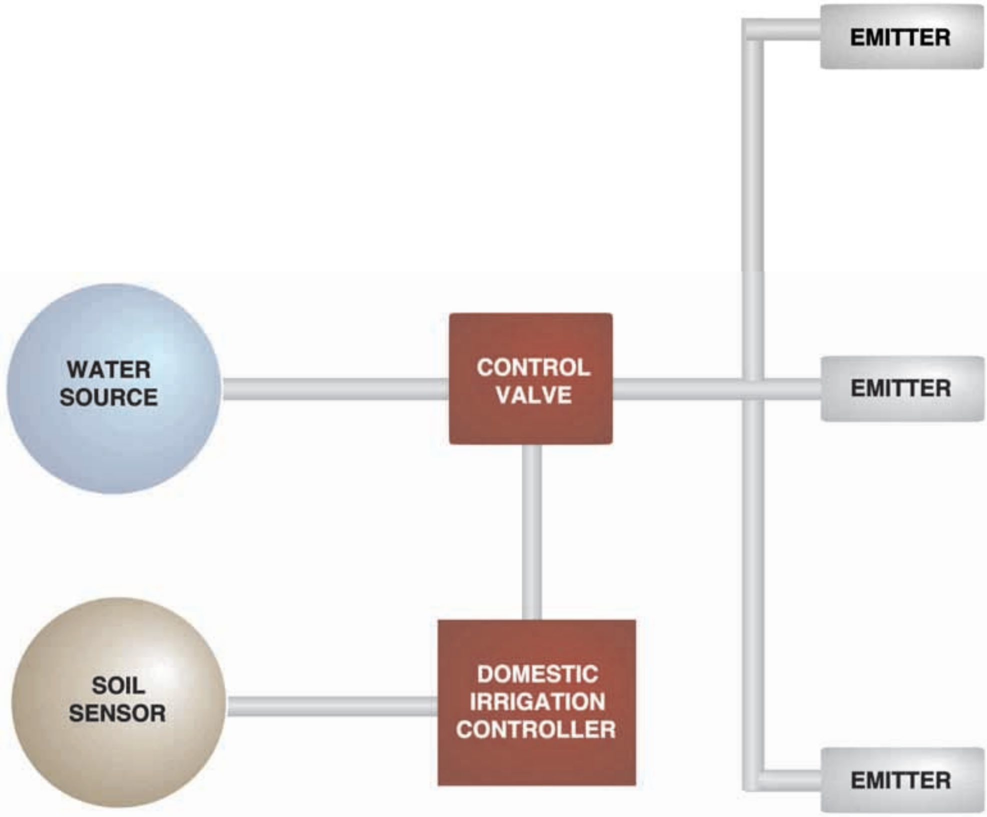
Domestic controller group	Brief Description
Tap timers – mechanical	Can be fitted to a garden tap to automatically turn off the flow on completion of the manually initiated irrigation event.
Tap timers – battery operated	Can be programmed to automatically start as well as stop.
Powered, stand alone controllers	Controllers can be mounted more conveniently, and valves can be concealed from view and powered reliably.
Multi-purpose, integrated	Controllers can control lighting and fountains, be integrated with security and a building management system, or be operated from a personal computer and the internet.
Multiple stations	Ability to irrigate different areas in a sequence, each area for a different duration. For example: • drippers for 3 hours then sprinklers for 20 minutes; and • back lawn then front lawn.
Multiple programs	Ability to irrigate different plants/soils/microclimates with different frequency. For example: • flowers every day versus lawn twice per week; • sandy soils in one cycle of 15 minutes versus clay soils in three cycles of 5 minutes every hour; and • shaded lawn once per week versus exposed lawn twice per week.
Sensor inputs	Ability to react intelligently when the status of one or more external inputs (eg rain, soil, flow sensors) indicate that it is appropriate to start/stop/override/reset according to pre-determined schedules.

Source: (Irrigation Australia and Hydro-Plan Irrigation Consultants 2008)

Domestic irrigation controllers can form part of a domestic irrigation system, though they are not essential for primary function of the system. At its most basic, a domestic irrigation system will comprise of piping and emitters (such as sprinklers or drip emitters). More complex domestic irrigation systems can also include an irrigation controller, control valves, air release valves, flushing valves, rain sensors and soil moisture sensors. Figure 2.2 provides an example of a domestic irrigation system with an irrigation controller and a soil moisture sensor.

Figure 2.2

EXAMPLE OF A DOMESTIC IRRIGATION SYSTEM



Source: (Adapted from: Irrigation Australia and Hydro-Plan Irrigation Consultants 2008)

2.1 Water wastage issues

There are two water wastage issues associated with domestic irrigation controllers. The first of these relates to use failure. Specifically, water that is wasted due to user error in installing or programming a domestic irrigation controller. One of the most common types of user error in this regard is turning the water outlet on full after connecting it to a domestic irrigation controller. The resulting high water pressure can, in some cases, force the controller to dislodge. If this dislodgement is not detected in a timely fashion, significant water wastage can occur.

There is little quantitative or qualitative information about the extent of water wastage associated with user error in installing or programming a domestic irrigation controller.

The second water wastage issue relates to irrigation efficiency. That is, the ability of a domestic irrigation system to deliver ‘enough’ water to the root systems of targeted plants to ensure the continued health of those plants. ‘Enough’, in this context, is dependent on existing soil moisture and the hydration needs of the targeted plants.

The efficiency of a domestic irrigation system can be ‘impacted by many factors including off-targeting, run-off, evaporation, deep percolation and leakage’ – all of which can reduce the volume of water delivered to the root systems of the targeted plants (Irrigation Australia and Hydro-Plan Irrigation Consultants 2008). A domestic irrigation controller can affect the irrigation efficiency if it allows too much or too little water into the irrigation system, which, in turn, delivers too much or too little water to the targeted plants.

Stakeholders noted that the user is the key factor in determining whether a domestic irrigation controller allows too much or too little water into an irrigation system (e.g. if the user programs the controller incorrectly, or forgets to adjust watering schedules to take into account seasonal differences).

Technical aspects of a domestic irrigation controller that can influence its irrigation efficiency include:

- the ability of the controller ‘to receive and act on information about soil and weather conditions’ (George Wilkenfeld and Associates 2005). Colorado Springs Utilities (2009), for instance, maintains that ‘Smart irrigation controllers, including soil moisture sensors, can reduce irrigation water use by an average of 16 per cent’;
- the ‘form of power and backup’ of the controller (a blackout or battery failure could cause a controller to over- or under-water) (George Wilkenfeld and Associates 2005); and
- the ability of the controller to customise watering schedules to the needs of different plant types and seasonal variations in rainfall.

2.2 Australian market for domestic irrigation controllers

There is little public information about the market for domestic irrigation controllers in Australia. Stakeholders consulted as part of this paper noted that, while they collected information about the domestic market, they were unwilling to share this information due to commercial and confidentiality concerns.

An ‘upper bound’ of the domestic irrigation controller market in Australia is provided by Irrigation Australia (2006), which estimates that the urban irrigation industry in Australia comprises 2,657 businesses, 13,770 employees, and has an annual turnover of approximately $3 billion. These estimates cover not only irrigation equipment manufacturing (controllers, piping, emitters, etc.), but also irrigation installation and associated advisory services.

Domestic irrigation controllers are manufactured internationally and in Australia. The major domestic suppliers include Toro Irrigation, Hunter Industries, Irritrol and Rainbird. Consumers generally buy domestic irrigation controllers through authorised resellers (such as Bunnings and Reece) or directly from the supplier. The cost of domestic irrigation controller ranges from $20 to $1,000, depending on the sophistication of the controller (DIY Irrigation 2009; Wet Earth 2009).

Most irrigation controllers are not required by regulation to be installed by a licensed professional, with the exception of those controllers that are powered by 240 volts (and must be installed by a registered electrician) (Irrigation Australia and Hydro-Plan Irrigation Consultants 2008). It is advisable, however, that consumers seek the advice of a professional (either from the supplier, a reseller, or a garden/irrigation advisory firm) about the installation and use of their irrigation controller, in order to maximise the efficiency of their irrigation system.

It is difficult to identify an estimate of useful life that is applicable to all domestic irrigation controllers, given the variation in sophistication and material quality between different controller types. Hunt, Lessick. et al (2001), in their study of an evapotranspiration (ET) irrigation controller, estimated that the controller's useful life was 10-15 years. Similarly, Smith (1996) notes that '[i]rrigation systems are most commonly thought to have an economic life of 10 years, but the useful life may be much longer.' It is likely that less sophisticated domestic irrigation controllers will have a useful life below these estimates (e.g. two to five years).

Existing programs

There are no current programs that seek to regulate the water use or efficiency of domestic irrigation controllers in Australia. There are already a number of rebate schemes that seek to promote efficient use of water in the garden including through the use of domestic irrigation controllers. These include:

- South Australia: $50 when consumers spend $150 or more on specified water efficient garden goods including irrigation system controllers and soil moisture sensors or rain sensors (SA Water 2009).
- Victoria: $30 when consumers spend $100 or more on water saving products including garden tap timers and soil moisture and rain sensors (Victorian Department of Sustainability and Environment 2009).
- Northern Territory: up to $50 on water saving products including garden tap timers (Australian Conservation Foundation 2009).
- Western Australia: $300 or up to 50 per cent of the installation cost of Waterwise irrigation systems and $20 for approved rain sensors (Western Australian Department of Water 2009).
- Australian Capital Territory: up to $50 on water saving products including tap timers, irrigation system controllers and moisture/rain sensors when consumers undertake a free assessment of their garden's watering needs and ways to use less water (ACT Government 2009).

In addition, some local governments offer rebates for investment in water saving garden products.

2.3 Standards

In their examination of the suitability of domestic irrigation controllers for inclusion in the WELS scheme, Irrigation Australia (Irrigation Australia and Hydro-Plan Irrigation Consultants 2008) note that:

> "There are no Australian standards which are applicable to all domestic irrigation controllers. Further, we could find no standards from any country which were close enough to even consider as a vehicle for development towards a supporting standard for the extension of the WELS Scheme."

Domestic irrigation controllers that are powered by 240 volts are subject to AS/NZS 61558.2.6:2001 *Safety of power transformers, power supply units and similar*.

Chapter 3

Methodology

The Allen Consulting Group utilised a range of approaches to collect data for this paper. These included:

- reviewing literature; and
- teleconferences with stakeholders.

3.1 Sources reviewed

A review of available literature was undertaken. For a full list of documents referred to during this study please see Appendix A.

3.2 Stakeholders consulted

Consultations were undertaken with suppliers, industry associations, technical experts, regulatory bodies and governments. Table 3.1 provides a list of the stakeholders consulted for the paper (including method of consultation). Consultations were also pursued with Standards Australia in its capacity as the administrator of WaterMark and with SAI-Global Pty Ltd (SAI-Global) as one of the major certifiers under the WaterMark scheme. Unfortunately, given the state of flux associated with the governance of this structure, it was not possible to make contact with anyone at SAI-Global who that could discuss the issue of rating domestic irrigation controllers.

Table 3.1

STAKEHOLDER CONSULTATIONS

Name	Institution	Method of Consultation
John Gransbury	Irrigation Australia and Hydro-Plan Irrigation Consultants	Telephone, email
Dr Basant Maheshwri	CRC for Irrigation Futures and WaterMark	Telephone, email
Dr Geoff Connellan	University of Melbourne	Telephone, email
Robert Aitken	Toro Irrigation	Telephone
Peter Brunt	Toro Irrigation	Telephone, email
Jeremy Cape	Irrigation Australia and CapeAbility Consultants	Email
Julian Gray	Water Mark	Telephone

Source: (Allen Consulting Group)

Chapter 4

The nature and extent of the problem

Best practice regulation aims to address failures pertaining to market outcomes at minimum cost to consumers and industry.

In order to make a case for government intervention, it must first be established what problem the proposed regulations are seeking to address. This is necessary in order to develop options (whether regulatory or not) that can directly address the problem, and establish an objective framework within which the relative performance of options can be compared.

This chapter considers the extent to which there is a need for government intervention to reduce water consumption in the residential sector related to domestic irrigation controllers. This assessment finds that:

- water management is a priority in Australia, across all levels of government;
- allowing variations in price to clear the market for water is problematic since water prices tend not to reflect water scarcity, or the value that users place on water availability;
- water restrictions are a costly method of responding to 'excess' demand;
- there are a number of water efficient and water saving products that can reduce household demand for water without adversely affecting social welfare or household utility in the way that quantitative restrictions do; and
- uptake in the sale and installation of these water efficient and water saving products is affected by a range of market failures.

It also finds that some domestic irrigation controllers could provide water savings if used and fitted properly. However, these savings are largely dependent on the operator being educated on the appropriate use of the model (i.e. how and when the product is used as part of the irrigation system) and also the inherent features and sophistication of the model itself. As such, there is no way to meaningfully regulate the water efficiency of domestic irrigation controllers.

4.1 The market for water

Drought conditions in many areas of Australia over the past several years, combined with the prospect that future climatic conditions could lower further water availability, have led to renewed interest in the way residential water is managed.

In the current market for residential water, governments operate as planners, suppliers, distributors and retailers of water. They make supply investments and manage available water with limited knowledge about the value that some users place on the resource.

On the demand side, water is essential for wellbeing, and is an input into almost all activities — economic, social and environmental. Given this, demand for water is closely linked to population growth, and the sustainability of cities in the long run hinges critically on access to suitable water. On the supply side, the prolonged drought, the uncertainty inherent in climate change, and the network of catchments, dams and ground and surface water sources all affect the extent to which this growing demand can be met, and at what cost.

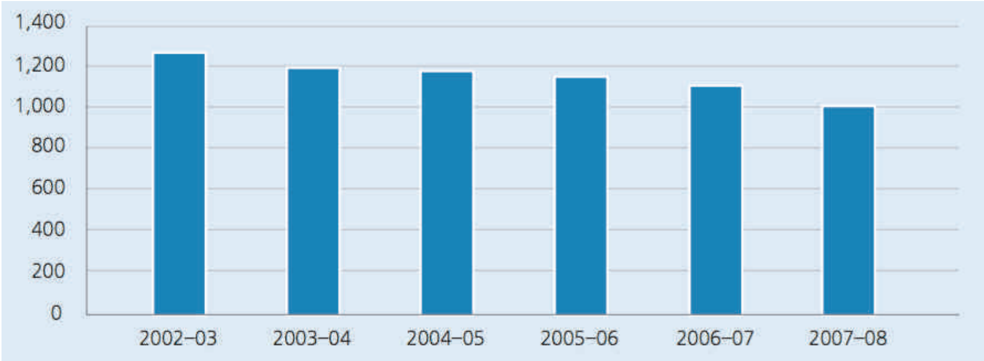
Key problems with the water market include:

- the costs generated by infrastructure investments that augment supply (eg. water recycling, desalination plants, additional or larger catchment and storage facilities) are independent of supply conditions;
- the pricing of water is based on operating costs and a return on assets and, as such, does not reflect the scarcity of water in times of shortage; and
- water markets are not well developed or responsive to demand conditions — particularly in urban areas:
  - a recent survey of relevant econometric studies by the Australian Bureau of Agriculture and Resource Economics (2008) shows price elasticities for residential water in Australia range from minus 0.15 (very unresponsive to price variations) in the ACT to minus 0.94 (relatively unresponsive to price variations) in Perth; and
  - NSW's Independent Pricing and Regulatory Tribunal argues that 'the demand for residential water is so inelastic that the price could be subject to wide gyrations if it were the sole means of balancing supply and demand in a drought' — something that could lead to adverse outcomes in lower income households.

Instead of using price to manage demand for water, demand is managed by placing restrictions on water usage. For the past six years the majority of Australian urban centers have experienced water restrictions (Business Council of Australia 2006; Water Services Association of Australia 2009). These have been effective in reducing total and per capita water usage. Figure 4.1 indicates that total residential water supplied has decreased by 21 per cent since 2002–03. This is despite, over the same time period, the number of connected properties growing by 9 per cent, or around 500,000 properties. These figures imply that the average volume of water supplied to residential customers by those utilities has fallen by 37 per cent in six years (National Water Commission and Water Services Association of Australia 2009).

Figure 4.1

VOLUME OF RESIDENTIAL WATER SUPPLIED (GL)



Source: (National Water Commission and Water Services Association of Australia 2009)
Note: The National Water Commission and Water Services Association of Australia do not identify from which utilities the above data are drawn, except to note that they originate from utilities that accounted for 80 per cent of residential water supplied in 2007-08.

While water restrictions have been effective in reducing water consumption in times of scarcity, they come at a considerable cost to the community. Several studies estimated the economic cost of water restrictions for different Australian cities. The findings from these studies are presented in Box 4.1. Due to the differences used to develop these estimates it is not appropriate to compare them directly. However, they do suggest that economic costs increase with the severity of the restriction. It should also be noted that none of these studies include all of the potential costs of water restrictions, such as:

- the deterioration of lawns and gardens, which have a replacement cost;
- costs of purchasing and installing new watering systems as changes occur in allowed methods of watering;
- the need to adopt labour-intensive methods of watering when watering is permitted, which incurs time costs;
- loss of sleep and/or leisure as a result of setting alarms to arise and water gardens in permitted time periods;
- having to water in the dark;
- canceling or rearranging other activities in order to water gardens at permitted times;
- inability of children to play under garden sprinklers and to use water toys;
- carrying ‘greywater’ in buckets from showers to outdoor plants;
- the need to drive cars to a car wash to clean them; and
- increased damage to buildings, other structures and pipes through cracking (Productivity Commission 2008).

In a recent discussion paper the Productivity Commission estimated the full economic cost of water restrictions in Australia amounted to billions of dollars (Productivity Commission 2008). This, of course, is far above the dollar cost of the water that households would have purchased if water was still in abundant supply. This valuation also illustrates the onus that householders are likely to place on ‘freeing up’ water from within a restricted supply regime.

Box 4.1

ESTIMATES OF THE COSTS OF WATER RESTRICTIONS FOR HOUSEHOLDS

Sydney: Using a Marshallian consumer surplus approach, Grafton and Ward (2007) estimated the welfare cost per Sydney household in 2005 at about $150 above the cost of achieving the same level of water use with higher water prices. This reflects the effect of prescriptive water restrictions in preventing households using a given volume of water for the purposes they value most highly.

Perth: Assuming typical preferences for ‘greenness’ and valuing time spent holding hoses at its opportunity cost, Brennan, Tapsuwan and Ingram (2007) estimated the annual costs of water restrictions at $67 per household for restrictions that allow watering twice a week using sprinklers, and $347 (opportunity cost of time equal to 33 per cent of mean wage) to $870 (opportunity cost equal to mean wage) for bans on the use of sprinklers. The costs were lower for people who placed a lower value on greenness, and higher for those who valued it more highly. The baseline is no water restrictions and the same water price (and hence higher water use) as with restrictions.

Canberra: Hensher, Shore and Train (2006) used choice experiments to estimate Canberra households’ willingness to pay to avoid water restrictions. They found respondents were unwilling to pay to avoid low-level restrictions, including restrictions that allowed watering only on alternative days. To have stage one or two restrictions rather than stage three, four or five restrictions, respondents were willing to pay an average amount of $109, $130 and $268 per year, respectively, given that restrictions were applied once in every ten years.

Source: (Productivity Commission 2008)

4.2 Potential benefits of improved water efficiency measures

Current methods of managing water scarcity, including water restrictions or investing in new infrastructure (such as desalination plants, water recycling systems and additional water storage areas), impose costs on the community. Recognising the need for alternatives to these measures, governments have sought to improve the efficiency of residential water use by introducing alternative strategies such as encouraging the uptake of water efficient products. This promises to reduce demand for water in individual households and at the communal level.. This approach to reducing demand for water does not necessarily require consumers to change the way in which they use water (through appliances such as washing machines) — ideally the consumer has the option (though sometimes at a higher up front price) of using less water to deliver the same result. The consumer, therefore, experiences no direct impact on utility — while at the same time, their use of water is reduced.

Significant water savings can be achieved through encouraging consumers to switch to more water efficient products. The amount of water used by products that are designed to perform the same task can vary widely. For example, at least 25 per cent of indoor residential water use is a result of toilet flushing (this proportion tends to increase during drought situation when water restrictions are in place). The amount of water used by toilets that are sold today ranges from an average flush volume of 5.5L to 3L. Even the most water inefficient toilet available today is about 50 per cent more efficient than those available on the market 25 years ago (Institute for Sustainable Futures 2008). If a person uses the toilet seven times a day, the amount of water saved over the course of a year as a result of switching from a very inefficient toilet to a very efficient one is 6.4kL per person. Even larger water savings will be made if the consumer is switching from an older style toilet to a water efficient modern toilet (Institute for Sustainable Futures 2008).

The uptake of water efficient appliances and the subsequent reduced demand for water by households has a number of benefits, including:

- reducing the likelihood of water restrictions being imposed and reducing the severity and longevity when they are imposed;
- contributing to efforts to ensure a secure water supply without recourse to new supply infrastructure;
- a reduction in water usage — this reduction is unlikely to compensate the household for the initial investment required to purchase a more water efficient appliance, but becomes more important against the backdrop of expected increases in future water prices; and
- psychic income to consumers associated with voluntary efforts to take a more socially responsible approach to water consumption and conservation.

Hence, improved water efficiency through investment in more water efficient products presents an opportunity to reduce consumption without impacting on quality of life and to generate savings through the avoided costs of water restrictions and small household water bills. Appropriate water efficiency labelling provides a basis for assessing and comparing the relative efficiency of water using appliances, and is the starting point for accessing the benefits identified above.

4.3 Market failures that may impede the purchase of water efficient products

The preceding discussion highlights the potential benefits of investing in more water efficient products in Australia.

In order to determine the best course of action, if any, for government to address a problem, RIS analysis needs to identify:

- first, whether market failures exist; and
- second, whether there is a need for change.

Market failures exist when there is a divergence between the marginal social costs and benefits and the marginal private costs and benefits of investing in conservation. In the presence of this divergence, there is a *prima facie* case for government intervention.

Market failures are typically considered to fall within the following three categories:

- Public goods — public goods are those which are non-rivalrous and non-excludible, significantly limiting the incentive for private providers to supply these goods and resulting in an undersupply or no supply at all without government intervention;
- Externalities — externalities occur when a transaction results in a cost or a benefit for a party that is not directly involved; and
- Information asymmetries — information asymmetries occur when one party in the market, usually the buyer, does not have sufficient information about the good they are considering purchasing, or the actions of the seller, to make a decision in their best interest.

Public goods

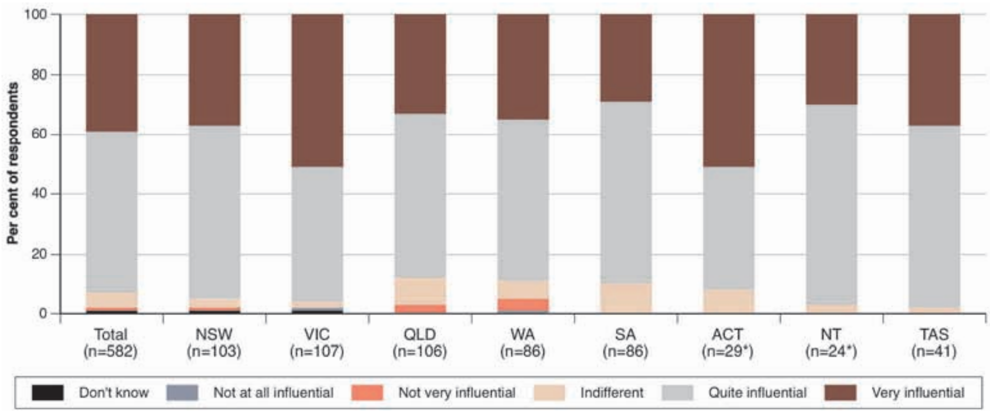
Public goods are often under supplied or not available at all in unregulated markets because there is not sufficient private benefit generated by these goods for private providers. Information is one such public good.

Testing to ascertain the relative water efficiency of products within the market is too expensive for an individual consumer to collect. As such, if industry does not supply this information, either voluntarily or in response to a mandatory scheme, consumers do not have a reasonable recourse to acquire it. Once information on water efficiency has been generated it can be shared at low cost. The subsequent value of the information to each individual will be lower than the cost of generating it. The cumulative benefit, however, to all consumers of the information — where a sufficient number of consumers value the information — can be powerfully beneficial.

Market research indicates that for a considerable proportion of the community the provision of water usage information at the point of sale is influential in encouraging investment in water efficient products. A recent study on the impact of the water efficiency labels that are applied to products captured by the WELS scheme indicated 93 per cent of those surveyed considered the information either very or quite influential in their decision-making process (Quantum 2008). Figure 4.2 illustrates the results of this survey in more depth.

Figure 4.2

IMPACT OF WATER EFFICIENCY LABELLING ON PURCHASING DECISION



Source: (Quantum 2008)

This survey is supported by another study conducted by BIS Shrapnel (2008) which found that consumers considered the water efficiency label of a product second only to the cost of a dishwasher or washing machine when making a purchase. Hence, for a large proportion of Australian society the provision of information at the point of sale is sufficient for them to voluntarily consider and account for some or all of the social cost associated with inefficient water use when investing in new water using appliances. As the surveys also imply however, not all consumers are motivated by the cost to the community of their water usage and there are limits to the extent of the social cost they are willing to voluntarily bear.

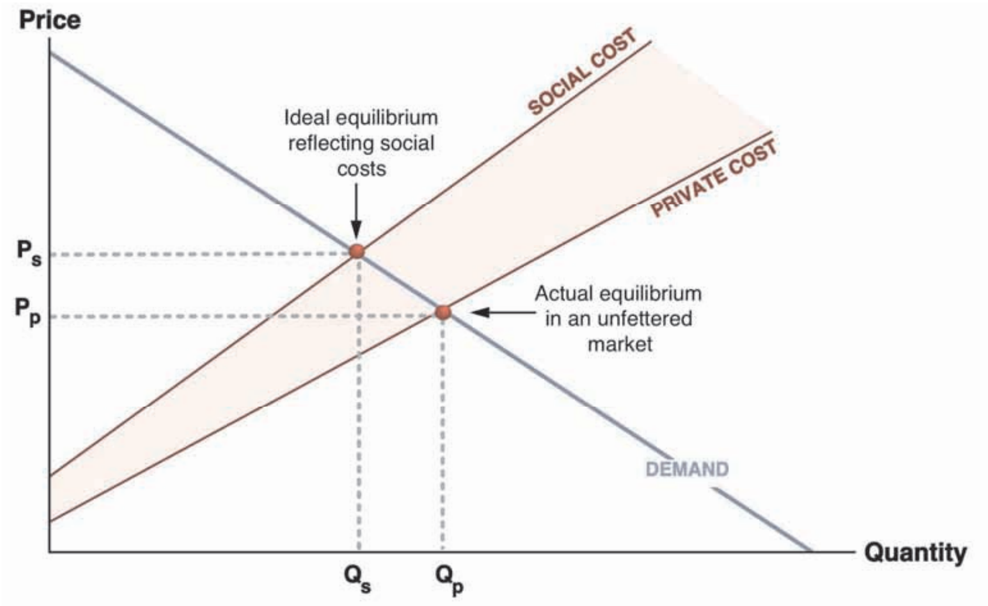
Externalities

Externalities occur when a transaction has an impact on a party that is not directly involved. In the case of residential water in Australia, the price of water is a function of the cost of infrastructure and does not reflect the scarcity of the resource. This generates an external cost, as a consumer in the market does not bear all of the costs of consuming water. The use of water by one consumer reduces the available supply of water for all and may lead to over-consumption. Over-consumption results in reduced security of supply for all and to government applying water restrictions that impact on the way everyone uses water. Thus a poorly functioning market, as with water, results in poor coordination of efficient supply and consumption decisions. Choices that alleviate demand pressures can also alleviate the problems associated with this aspect of market failure.

Figure 4.3 illustrates the gap between the private cost and the social cost that results from this kind of externality and the resulting over-consumption. If the consumers only take into account their own private cost, they will end up at price P_p and quantity Q_p, instead of the more efficient price P_s and quantity Q_s, P_s and Q_s reflect the idea that the marginal social benefit should equal the marginal social cost. Under this paradigm, production should be increased only as long as the marginal social benefit exceeds the marginal social cost. The result is that a free market is inefficient since at the quantity Q_p, the social benefit is less than the social cost, so society as a whole would be better off if the goods between Q_p and Q_s had not been produced. In this instance, the problem is that people are buying and consuming too much water.

Figure 4.3

IMPACT OF NEGATIVE EXTERNALITIES ON CONSUMPTION



Source: (Allen Consulting Group)

Information asymmetries

The lack of information, or the existence of barriers and costs associated with obtaining that information, can lead to sub-optimal market outcomes. In order to achieve an efficient outcome, markets rely on all parties having sufficient (but not necessarily perfect) information to make decisions in their best interests. In some cases, information is not just imperfect, but is asymmetric. Information asymmetries occur when one party in the market, usually the buyer, has less information than another – usually the seller. It is a further complication to the public good dimension of information provision because it recognises that some suppliers (with inferior goods) may be reluctant to provide information that is not favourable to their product.

This information asymmetry problem can create a situation of 'adverse selection'. Adverse selection occurs when a buyer is not able to differentiate between high quality and low quality goods in the market at the time of purchase, and perhaps also not until a significant period of time after purchase. In the presence of this uncertainty, high quality products can be driven out of the market.

This phenomenon is known as the 'market for lemons', first noted by Akerlof (1970), who explained how the pressure of competition, in the presence of information asymmetries, may cause quality to deteriorate to such low levels that the market may fail to exist. This concept is most commonly described using the example of a used car market, where there are both good quality cars and poor quality cars ('lemons'). Purchasers know that there is a risk that they will purchase a 'lemon', but they have no reasonable means of identifying the 'lemons' from the high quality cars until they have driven the car for several months after purchase (in the absence of any other third party assistance). This scenario can lead to a less than efficient social outcome because:

- buyers do not have sufficient information to make a rational informed decision about quality of a good, and therefore risk inadvertently purchasing a 'lemon';
- as a result, consumers will offer a price which is less than what they would be willing to pay for the high quality product, as they are uncertain as to the quality of the product that they will receive; and
- this, in turn, drives higher quality goods out of the market (as the price is too low to make a positive return).

The result is that consumers, by favouring a lower price given the risk of purchasing a 'lemon' inadvertently increase their chances of purchasing a 'lemon', as at the lower price only 'lemons' will be sold. At the extreme, only the lowest quality products will be sold, and all higher quality products will be removed from the market. Warranties can alleviate, but not totally correct, this problem because they themselves suffer from enforcement costs. These problems (and transaction costs) are a fact of life. But that does not mean policymakers should not continuously explore options for reducing these costs and their impacts.

Adverse selection in products that use water

Adverse selection is most common for those products where it is difficult for consumers to ascertain quality at the time of purchase (and even for some period after purchase), and where they do not have sufficient prior experience on which to base their decision. There are a number of characteristics of water efficient products that increase the risk of adverse selection in the market for products that use water:

- water efficiency is a difficult attribute to identify without specialist advice;
- many products that use water do so in a way that is not obvious or measurable by the user in the absence of information or labelling. Also, with some products, once they are installed, consumers may forget or not pay any attention to the water usage associated with each usage or event; and
- products that use water often have a long useful life and the products available are likely to have undergone significant technical change. As such, the purchaser cannot rely on significant previous personal experience to determine the quality of the good.

In markets where there are information asymmetries, adverse selection can drive down the degree of water efficiency that voluntarily occurs.

4.4 The problem

In this instance the problem is defined as unequal access or the absence of, information on water use and efficiency of domestic irrigation controllers. In order to assess the extent of this problem it is necessary to quantify the variation in water efficiency performance between different models.

4.5 Water efficiency performance of domestic irrigation controllers

At this point in time, there are no substantial or independent research on the amounts and/or contributors of water wastage within a domestic irrigation system. However, domestic irrigation manufacturers cite the following statistics:

- households typically over-irrigate by up to 300 per cent (Aquaspy 2009);

- weather/soil moisture sensitive systems can improve efficiency by:
  - 16 per cent (Colorado Springs Utilities 2009);
  - between 20 and 70 per cent (Aquaspy 2009); and
- drip delivery systems are estimated to use between 10 and 33 per cent of water used by flood irrigation and sprinkler systems respectively (Zwar 2004).

Consultations undertaken as part of the preparation for this consultation paper indicated that there are likely to be variations in the level of water efficiency that may be achieved in domestic irrigation controllers (as is evidenced by the variation in price and complexity of the models). However, there is currently no meaningful way to rate them. It was strongly suggested by multiple stakeholders that it is unlikely that a test and rating scheme could be developed for domestic irrigation controllers. Reasons for this include:

- water use depends on whether a garden is mulched, the types of garden beds, plants and soils in the garden;
- domestic irrigation controllers rely on significant human intervention and as such are particularly susceptible to water wastage from misapplication of the technology (one industry stakeholder noted that rating irrigation controllers would be akin to rating shovels – the size of the hole depends on the person using it);
- all domestic irrigation controllers have the same function, however, the technology they employ to do this can vary widely;
- the is no such thing as a standard domestic irrigation system or configuration; and
- even the most sophisticated and potentially efficient controllers are only components in a system that can have multiple points where it wastes or saves water.

These factors can combine to affect water efficiency in a number of ways. For example, appropriate application of mulch in a garden can mitigate evaporation losses by up to 70 per cent (Brisbane City Council n.d.). It is therefore feasible that an irrigation system in a garden without mulch is operating efficiently (i.e. providing the plants with sufficient water to survive without over-watering them) but that the garden is nonetheless using far more water than would be necessary if the garden had been mulched.

At present there is no confidence within the industry that it is possible to develop a test that could meaningfully rate the impact of a domestic irrigation controller on the water efficiency of a domestic irrigation system. The Allen Consulting Group therefore supports the findings of the George Wilkenfeld and Associates report: *Expanding the Water Efficiency Labelling and Standards (WELS) Scheme: Final Report* that:

> irrigation products are *not* suitable for inclusion in WELS, because there is no reliable way to assess their relative impact on water use.
>
> (George Wilkenfeld and Associates 2005)

4.6 Water restrictions

Efficient use of water for domestic irrigation requires an appropriate quantity of water to be applied as a specific point in time. At present, many areas of Australia are subject to water restrictions that only allow watering at specific times and using specific watering devices. The following are examples of the current restrictions in place for watering gardens.

- Melbourne is currently under level 3a water restrictions, meaning residents can not water their lawn and plants may only be watered two days per week using a manual dripper system, hand-held hoses fitted with trigger nozzles, watering cans and buckets between 6am and 8am or automatic dripper systems between midnight and 2 am.
- Toowoomba is currently under level 5 water restrictions, meaning residents are prohibited from all outside watering using town water with any watering device.
- Perth is currently under stage 4 water restrictions, meaning residents can only water their lawn or garden from the reticulated supply twice a week.

These restrictions will impair or prevent the use of the more sophisticated units, which use sensors to assess the most opportune time and quantity of water to be applied. An alternative approach to a rating style program to encourage the uptake of these more efficient models is to exempt them from watering restrictions.

Chapter 5

Conclusion

Under best practice regulation guidelines, government intervention can be justified when:

- there is an inherent failure in the market's ability to deliver fair and equitable outcomes; and
- the benefits from correcting the failure are greater than the costs associated with doing so.

In this instance, there is not sufficient evidence to suggest there is an inherent failure in the market's ability to deliver fair and equitable outcomes. Sydney Water's education program (Love Your Garden) showed that the biggest cause of wasted water in the garden was the practices of the homeowner. Domestic irrigation controllers can provide water savings, however, these savings are largely dependent on the operator being educated on the appropriate use of the model as part of the irrigation system – rather than the inherent features of the model. It is entirely possible that the same level of garden water efficiency and irrigation efficiency can be achieved using multiple configurations and practices. They are not suitable for inclusion in the WELS scheme because the impact of the type of domestic irrigation controller used is heavily dependent on a range of factors outside the influence of the manufacturers. As such, any rating scheme that focuses on domestic irrigation controllers is unlikely to reflect the water efficiency of the model in practice.

Appendix A

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