# Decisions for the Urban Drought:

# Paternalism or Participation?

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## Abstract

In response to one of the most severe and extensive droughts in recent history, water restrictions have been imposed across an unprecedented number of urban areas across Australia. Both in terms of drought responses and longer-term planning, in some situations the decision space has been portrayed as a polarised "restrictions vs infrastructure" trade-off, with restrictions of any nature widely portrayed as inherently limiting personal freedom and rights. Yet this apparently libertarian rhetoric not been matched by the reality of decision-making during this drought.

Drawing on extensive work conducted across Australia by the Institute for Sustainable Futures, this paper critically examines the influence of the following issues on decisions and the direct, indirect and externality costs of water supply:

- Community engagement strategies
- Publicly available and transparently communicated information
- Reliance and emphasis on quantitative dollar estimates of impacts and risks

This paper also discusses practical applications of an emerging deliberative framework for involving the community in decision-making processes which have profound implications for sustainable urban water futures.

## 1. Introduction

The effects of extreme climate variability, particularly drought, are evident across Australia's landscapes and through the histories, and stories, of its communities. Although drought is commonly synonymous with pressures on rural livelihoods and associated impacts on regional and national economies, in recent years a further image has emerged. The impacts of drought have extended directly into the backyards of urban cities and towns, where water use restrictions have been imposed in an unprecedented number of locations, and in some places at a severity not before experienced.

Different response decisions made by elected representatives and planners have varied enormously in terms of degrees of transparency and level of community involvement. In many locations, water supply planners – particularly those at the coalface of operations within utilities and planning sections of state governments – have responded commendably and with pragmatism, despite limited resources, to enormous pressures to ensure water supply adequacy to Australian cities and towns. However, in some other situations, highly political, divisive and time-pressured decision environments have resulted in decisions being made with what could be

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described as an essentially paternalistic approach. In a decision space widely portrayed as a polarised "restrictions vs. infrastructure" trade-off, such paternalism has been at times disguised as a supposedly libertarian intention to free citizens from the "burden of restrictions": restrictions of any type or severity have been implied to inherently limit personal freedoms and rights, irrespective of the costs and impacts of alternatives. Consequently, decisions during the urban drought have in some situations reflected decision-makers making assumptions about community preferences (including community attitudes towards risk) on behalf of the community, but without the community's informed participation or knowledge about decision objectives, effectiveness, costs or impacts.

Drawing on extensive record of research with a number of utilities and state agencies across Australia undertaken by the Institute for Sustainable Futures, this paper critically examines decision pathways taken during recent drought in urban areas, and the consequences of "paternalistic" approaches on the magnitude and distribution of the direct, indirect and externality costs of urban water supply.

Brief overviews are provided in sections 2 and 3, respectively, of paternalism as an approach to decision-making, and the history of planning responses to drought. In section 4, a stylised model of drought response pathways is described. Section 5 includes a discussion of best-practice decision-making processes for urban water, and section 6 presents case studies of recent drought response decisions in Sydney and south-east Queensland.

## 2. Brief overview of paternalism as an approach to decision-making

'Paternalism' is described as a style of government in which the state makes decisions on behalf of individuals, justifies the approach by stating that people will be better off or protected from harm, but conducts decision-making processes in a way that fails to protect individual choice and personal responsibility (Kelly 2004). "State paternalism" was identified by Australian political commentator Paul Kelly as one of the five fundamental founding policy principles of the Australian federation (Kelly 2001). Although Kelly's ideological conceptualisation of paternalism has been widely debated, paternalism (as arising from Australia's colonial history) has been associated, at times controversially, with government approaches to various aspects of public policy. For example, following the launch of the report *Australia's Health 2006*, the Federal Minister for Health and Ageing Tony Abbott controversially suggested (in relation to indigenous health) that "having rejected the paternalism of the past… a paternalism based on competence rather than race is really unavoidable if these places are to be well run." (Mark 2006, Abbott 2006).

Commentators have highlighted the risks of adopting a paternalistic approach to the effective management of natural resources. For example, Nancarrow and Syme (2002, p. 448) in assessing the process of determining compensation packages for farmers, made several observations about how to evaluate fairness to achieve outcomes reflective of community values and preferences:

> *Fairness, as perceived by both the community and the professionals assisting change, needs to be measured, negotiated, and understood if change is to be seen as being "beneficial" to the community as a whole… this use of fairness as a central concept in social impact assessment requires further debate. Without such an analysis it is likely that in the end, acceptable change will become a matter of professional judgment that can easily degenerate into well-meaning paternalism.*

Across Australian states and territories, the management of urban water supplies was, until recent decades, a responsibility borne entirely by governments, with water supply systems owned, designed, built and operated by government agencies utilities. In more recent times, at

least since the initial water reform process initiated by the Council of Australia Governments (COAG 1994), some limited components of the urban water system have been privatised (eg. water treatment in Sydney and water supply operation in Adelaide). However, corporatisation of utilities has been widespread, as has been separation of the utility and regulatory functions – although the establishment of independent economic regulators is not uniformly advanced in all states and territories. Since the National Water Initiative was agreed to and signed by the Australian Government and (most) states and territories at the Council of Australian Governments in 2006, the urban water industry has undergone a number of reforms with the aim of improving economic efficiency, with achievements subject to periodic reviews. However, to date there has not been a specific assessment of the extent to which drought responses decision processes, and water management decisions more broadly, effectively reflect community values and preferences.

In the case of outdoor water use restrictions, a distinct perspective has arisen amongst some commentators and decision-makers who strongly oppose restrictions, of any nature or level. The reasoning associated with this type of opposition to water restrictions is that they require planners to make assessments on behalf of all individuals about which water uses are discretionary and which water uses are essential. Proponents of this view argue that because water restrictions do not allow flexibility for individuals to choose how they use water to maximise marginal values, they cannot result in economically efficient outcomes (see, for example, Edwards 2006). However, analysis indicates that even without considering climate change, inter- and intra-year climate variability would require supply systems to be 'gold-plated' to reduce the probability of restrictions to near zero (Keating 2006) – and that these direct, indirect and externality costs of system infrastructure are ultimately borne by the community. Widespread support for at least lower levels of restrictions demonstrated by community attitudes surveys (see, for example, Roseth 2006, Taverner Research 2005, IPART 2004) suggests that in order to achieve outcomes which are, in reality, reflective of community preferences, decision-makers should invest resources in further examining restrictions before removing them from consideration as a drought response option.

## 3. Brief overview of planning responses to drought

Responding to drought in Australian urban areas is not a recent phenomenon. Water use restrictions in the form of hosepipe bans were first introduced as a drought response measure in Melbourne, Victoria, in the 1860s (Keating 1992). Since then, restrictions have been implemented in many subsequent droughts in Victorian cities and towns. Traditionally, droughts have also initiated the construction of large storages, with the view to ensure adequate supplies long-term throughout future droughts (Melbourne Water 2006, Sydney Water 2003). It is worth noting that, during the first half of the 20$^{th}$ century, medium-term climate records were only just being established, allowing for reasonable projections of supply availability.

In contrast to supply-side or demand-side actions implemented *prior* to drought, planning (between droughts) for what actions to undertake *during* a future drought has generally taken greater priority only in more recent years, although this varies between locations. For example, in Victoria, restrictions regimes were first formalised in 1975, when the then Melbourne and Metropolitan Board of Works and the State Rivers and Water Supply Commission producing an eight-stage set of restrictions (Melbourne Water 2006). In Victoria today, drought responses are coordinated state-wide by the Department of Sustainability and Environment, which has established guidelines for drought response by water retailers across the state including the establishment of restrictions rules, triggers and target savings, and an emphasis of reviewing drought response plans following experience with each drought (DNRE 1998). In Sydney, New South Wales, there were no water shortages between 1960, when the Warragamba Dam construction was finalised, and the 1992-1998 drought. During this drought, the combined

responses of education, restrictions and increased supply (transfers from Shoalhaven) were developed and implemented as adaptive strategies. Following the 1992-1998 drought, Sydney Water developed a Drought Response Management Plan for the years 2001-2011 which included five mandatory restrictions levels, triggers and targeted demand reductions (Sydney Water 2003). The Plan also detailed provisions for the establishment of a Drought Expert Panel to advise on contingency measures to be introduced to supplement Level 5 restrictions.

In some locations, planning ahead of time for responding during drought has not previously been a priority, due to the historical absence of extreme droughts. For example, in the Brisbane River in south-east Queensland, severe flooding occurred in 1974, when 14 lives were lost and about 8000 homes were affected. Throughout history, moderate flooding has been a frequent phenomenon in Brisbane, as recently as March 2001 (BOM 2001). Wivenhoe Dam, although constructed with the primary objective of securing water supplies for the Brisbane region, also has a key flood mitigation role, and in 2003 SEQ Water examined the potential to increase this function.

Perth and Adelaide have had a different historical pattern of restrictions due to significant differences from the three eastern seaboard cities. This arises from the alternative sources of water available to both these cities. In the case of Adelaide, in drought years the use of Murray River water increases to as much as 90%, and similarly in Perth the use of groundwater substitutes for scarce surface water in large measure. However, these two sources are constrained by, respectively, River Murray flows and allocations, and groundwater allocations respectively. Hence both these jurisdictions have been subject to restrictions of varying severity.

## 4. A stylised model of drought response pathways

Over the course of recent droughts, the water utilities and state government agencies responsible for water supply system management have responded in various ways. A stylised model of these response pathways and outcomes is illustrated in Figure 1. These pathways show that, as drought progresses, decisions are made at various points, including about whether to respond according to or differently from a pre-determined drought plan, and whether the stated objective of the response is to manage supply-demand balance during the current drought – or to implement changes for long term supply-demand balance, or to manage future droughts. Ultimately, the responses may or may not be effective at meeting the stated objective, and may or may not reflect society's values.

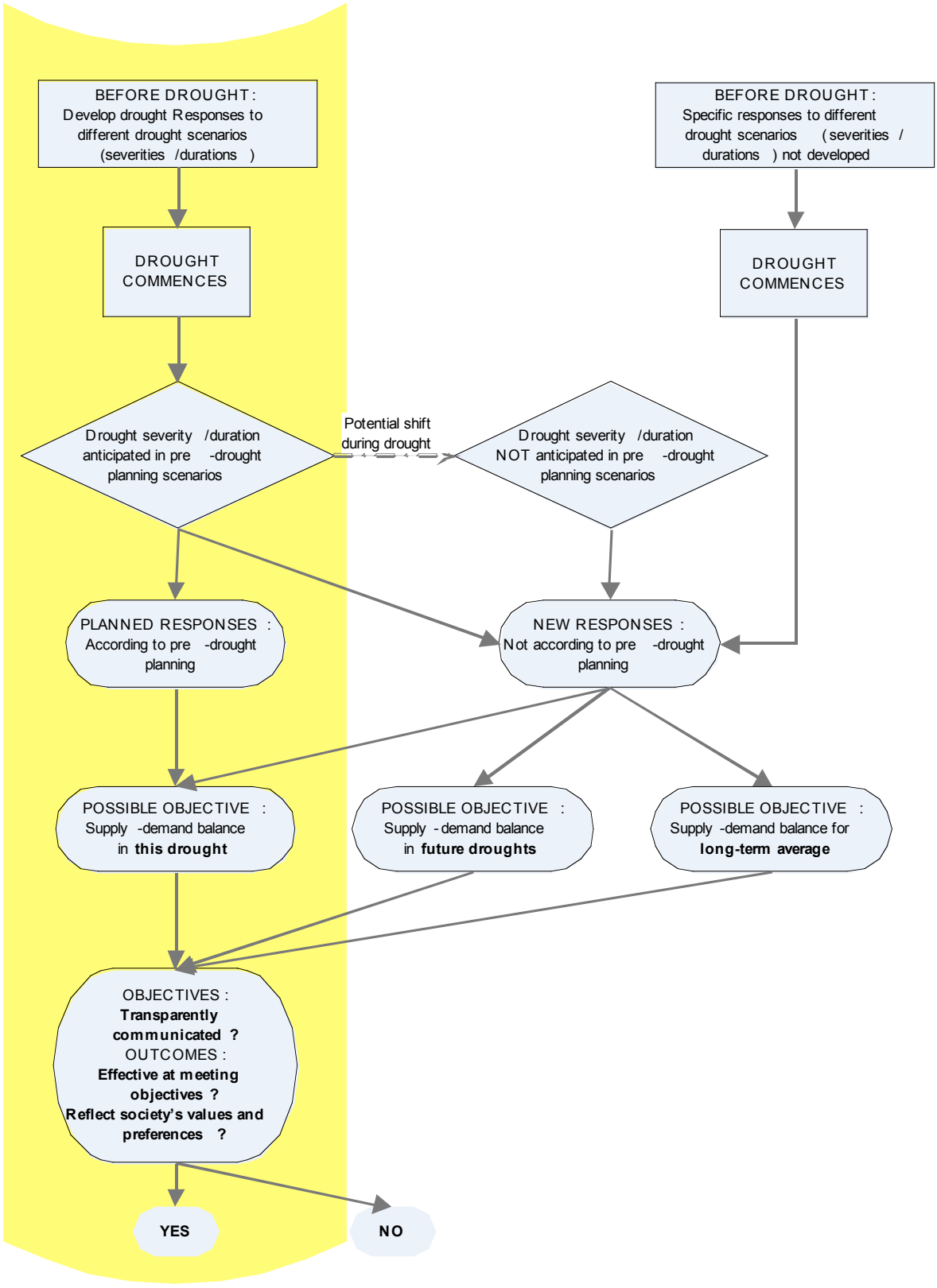


Figure 1 Stylised drought decision pathways

The response pathway in which pre-planned responses are followed over the course of the drought is shaded in yellow. In following this pathway, once a drought commences, the decisions are made according to those established prior to drought in the drought response plan. For example, various restrictions levels may be introduced (with targeted savings) as dam levels[i] fall to pre-determined trigger levels. If water storages fall further, other planning decisions may be triggered to examine further "contingency" measures. The extent to which this pathway results in effective or value-reflective outcomes will depend on the information and processes undertaken in the drought response planning stage.

Decisions made at various points might result in different response pathways – and can reflect different levels of community engagement as well as transparency in communication. Key decision points include: whether to respond according to the drought response plan or whether to undertake alternative or additional responses; whether the response is designed to manage supply-demand balance *during the current drought*, or during future droughts (or otherwise). Following different decision paths, key outcomes are: whether the responses chosen would, in reality, be effective in managing supply/demand balance during this drought; whether the responses would be effective in managing supply/demand balance during future droughts, and whether the responses lead to outcomes which reflect society's values and preferences. Some examples are provided in Table 1.

Table 1 Examples of participatory and paternalistic approaches to drought decisions

| Decision or outcome | | Examples of decision approach | |
|---|---|---|---|
| Type | Example | Participatory/transparent | Paternalistic/black box |
| A) Responses to drought differ from those planned. | Restrictions reduced in severity. | Updated assessment of community preferences reveals changes towards restrictions attitudes (with experience). | Assumptions made that community preferences towards restrictions changed. |
| | New supply alternatives introduced instead of restrictions. | New technologies become available and their costs and benefits are assessed appropriately, reflecting community values. | New demand or supply alternatives or technologies become available over the course of the drought and introduced because of political reasons. |
| | Restrictions increased in severity. | Assessment of community values and evaluation of other drought-response readiness options indicates that restrictions are cost-effective response, for current circumstances. | Restrictions introduced at a level without evaluation of community values or transparent communication of alternative options, and their comparative impacts. |
| B) Types of responses are rainfall dependent (i.e. will not be effective at meeting supply-demand balance during this drought). | Stated objective is to manage supply during this drought but responses are rainfall-dependent. | n/a | Poor technical assessment.<br>Deliberate misleading of public in terms of objectives. |
| | State objective is to manage future droughts. | New climate change information, tested with community | Poor/misleading technical assessment.<br>Assume public climate change risk averse. |
| | Stated objective is to manage long-term supply/demand balance. | New climate change information, tested with community | Assume public is climate change risk averse. |
| C) Responses do not match society's values. | | Adaptive process required. | Over-reliance on erroneous cost figures.<br>Incomplete assessment.<br>Costs and benefits not incurred by same people.<br>Who bears the costs of options not communicated. |

## 5. Best-practice decision processes

This section describes a number of components of what might be considered as best-practice decision-making processes for urban water. These processes help to ensure that decisions take consideration of options that reduce the total cost to the community, minimise the impact of externalities and account for community preferences.

### 5.1 Integrated Resource Planning

Integrated resource planning, a planning framework based on utility least cost planning, was developed in the 1980's in the electricity industry (Meier, Wright & Rosenfeld 1983). The logic is very simple: water, like electricity, is a derived demand. People do not demand water itself, but rather the services that water provides, such as clean clothes, clean bodies, sanitation, landscaping (Howe and White 1999). These services can be provided with varying degrees of relative (water use) efficiency, and even with different levels of water quality or reliability. The early recognition in the electricity industry, borne out empirically in the water industry, is that is mostly cheaper, faster and more effective to reduce demand by improving the efficiency of water use. This means that society-wide cost-effective outcomes can be met by investing on the *demand-side*, that is in the very appliances, fixtures, processes and practices of water use, rather than solely on the *supply-side*, that is the dams, pipelines, groundwater sources that has been seen as the traditional domain of utilities.

In practice this means a shift in utility planning. It means that the suite of options available to meet the supply-demand balance is extended to include options that reduce demand in a permanent and reliable manner, as distinct from water restrictions, which represent a temporary reduction in water use achieved by influencing the behaviour of water users. Typical demand-side measures include:

- Retrofitting water efficient appliances and fixtures in existing houses and businesses;
- Providing rebates to encourage preferential purchase of water efficient appliances such as washing machines;
- Planning controls that require new buildings and new developments to embody best-practice efficiency levels;
- Regulations that require new appliances and fixtures to have high levels of water efficiency;
- The use of widespread educational, advisory services, improved metering billing and pricing to provide encouragement and incentives to improve the efficient use of water;
- Direct investment in leakage and pressure management in the water supply system.

A key principle of integrated resource planning is the equivalence of demand-side and supply-side measures in terms of their contribution to the supply-demand balance. This extends to ensuring that these different types of options are evaluated in equivalent terms, for example, from the combined economic perspective of the utility and customers and indeed other relevant parties for whom costs and benefits are incurred (White 1998).

The extended process of integrated resource planning involves an iterative process of developing, analysing and aggregating options to form portfolios of options, or scenarios, such that the supply-demand balance is met over the planning horizon at least cost to the community. The 'least cost' should take into account the environmental and social impacts

associated with the options selected, for example the increase or reduction in greenhouse gas emissions and the impacts of the options on aquatic and terrestrial ecosystems.

The process of integrated resource planning, while most often utilised in planning for the long term supply-demand balance, can be generalised to provide insights for planning drought responses. For example, as indicated in the case studies in section 6, the estimations of yield of the water supply system are affected by what restrictions regime is planned. Planning for a less frequent and less intense restrictions regime in the future will decrease the system yield. Therefore, as restrictions are a key input to the supply-demand balance, they are also a key determinant of the relative cost effectiveness of options to meet that balance over time. The same concept applies to the assessment of 'supply readiness' drought response strategies – that is, to the consideration of those options (supply or demand side) that can be constructed, implemented or activated depending on the storage levels in the system. These options could involve 'readiness to construct' emergency groundwater supplies or inter-catchment transfers, or even indirect potable reuse capacity, as well as accelerated demand management options (e.g. toilet replacement programs). In the analysis and comparison of such options to define a least cost portfolio, the unit cost of such contingent options needs to take into account the fact that the implementation or operation of such options is dependent on inflows. Therefore estimates are probabilistic quantities and should be weighted accordingly to determine the cost, the net contribution to yield and therefore the unit cost.

## 5.2 Assessing costs and benefits

In designing the "least-cost" portfolio of supply and demand options (to meet a supply-demand balance), there are a number of considerations which should be taken into account when assessing the costs (or benefits) of options and their alternatives. A number of industry guidelines are currently being developed, for example by the Water Services Association of Australia and the CRC for Water Quality and Treatment, to guide urban water planners in best-practice costing for sustainable outcomes in urban water systems – where "best-practice" refers to getting the best outcomes, overall, for society. Key principles, which apply to economic valuation more generally, include: clearly specifying the objective and boundaries and the analytical (economic decision) framework; including as wide a scope of possible of impacts to be assessed, including externalities, but avoiding double-counting; and assessing the limitations (and implications) of various valuation techniques. It is also essential to undertake other non-quantitative assessment methods, particularly when not all impacts can be easily (or meaningfully) monetised, including, at one end of the spectrum, the deliberative valuation methods discussed in section 5.3.

**Clearly specify objectives and the analytical framework**

In designing portfolios of urban water options, it is essential to clearly specify the objectives of the decision space. Objectives that could all be broadly described as "meeting supply-demand balance" might differ in terms of time frame, or whether the focus is for average years or through drought. A stated objective might also be to meet a specific demand reduction target. Defining the objectives and boundaries will help decide whether attitudes towards risk and uncertainty also need to be assessed.

In general, the clear specification of objectives can also underpin the choice of the most appropriate 'economic analytical framework', for assessing costs (and/or benefits) in a way that results in the best outcomes for society (that is, maximises net benefits to society). The conventional economic decision-framework applied is cost-benefit analysis, which theoretically leads to economically efficient outcomes, because it includes evaluation of both the costs and benefits of different policies, programs or projects. Ideally, all costs and benefits would be quantified in monetary terms ('monetised').

However, in practice, not all costs or benefits can be quantified, let alone monetised in a way which meaningfully represents society's values, using available techniques and data. O'Connor (2000) suggested a 'monetisation frontier' as a conceptual boundary delimiting those goods and services which are appropriate to monetise – taking into account practical, moral and ethical considerations. Difficulties with meaningful monetisation is the particularly true for the overall 'benefit' to society of urban water planning – a benefit which arises through keeping the demand and supply of water in balance. This benefit, predetermined and accepted as necessary by the broader community, would be difficult (in practical terms) to monetise. A pragmatic approach to assessment when key benefits are difficult to monetise is to apply cost-effectiveness analysis (Office of Best Practice Regulation 2006). This is the analytical framework which is best used to assess what portfolio of supply and demand options is the least cost at meeting the specified supply-demand balance objective.

**Consider a wide scope of impacts**

To compare different options (or portfolios of options), a wide range of impacts should be considered. These should include the direct costs and avoided costs[ii] to a range of different stakeholder groups – utilities, governments and consumers. However, when aggregating costs incurred by different stakeholder groups, it is necessary to exclude 'transfer payments' – that is, costs that are incurred by one stakeholder, but are then transferred in the form of benefits to another stakeholder . An example of a transfer payment is foregone revenue, such as that which results due to some demand management options. Reduced water use may lead to revenue losses for a utility, but these costs flow to customers as a benefit in the form of reduced water bills – thus should not be included in aggregate analysis (White 1998). In contrast, externalities, which are those costs which are incurred by third parties who are not directly involved in a transaction (Tietenberg 1992), should also be included in a society-wide assessment of impacts. These externalities could include those costs on communities affected by changes to river health, public health, ecosystems or greenhouse gas emissions.

**Understand the limitations to economic valuation (monetisation) techniques**

There are a range of valuation techniques that can be used to assess the monetary value of an impact. These techniques can apply to monetise impacts relating to "marketed" goods or services (for example, construction costs associated with a supply option) or "non-marketed" goods or services (for example, the loss of amenity and recreational value to households affected by restrictions on garden watering).[iii] These techniques, if applied carefully, can provide useful figures to compare the impacts associated with different supply or demand options.

However, there are practical difficulties with valuation, as well as philosophical and ethical considerations. For example, with biodiversity valuation, many different value perspectives can legitimately be taken, which affect the outcome of the valuation process (Nunes & Van den Bergh 2001). The validity of a monetary estimate is therefore limited by the assumptions which need to be made in order to apply the technique. Some of these limitations may apply across all techniques (for example, assumptions about social discount rates) whereas other limitations may be specific to different types of techniques (for example, in stated preference techniques, whether those involved respond as citizens or consumers (Sagoff 1998)). Understanding these limitations will enable better design of the valuation study. The sensitivity of the final calculations to these assumptions – and hence the overall validity of the estimates – should be clearly detailed and transparently communicated.

Furthermore, extrapolation of monetised figures from one context to another should be undertaken with care to ensure the approach leads to valid estimates. For example, in estimating the cost of restrictions, the results of a contingent valuation study will be highly dependent on many design factors. If participants are asked to respond to an situation of

restrictions of a specific frequency, duration and severity, extrapolating their 'willingness to pay' dollar amounts to assess the costs associated with restrictions of other frequency, duration and severity (for example by assuming a linear relationship) is unlikely to provide very meaningful or useful estimates.

**Non-monetary assessment**

Although there may be a number of limitations applying to the estimation of monetary values associated with a wide range of impacts, the magnitude of these impacts can often be critical to final decisions on what portfolio of options to progress. Therefore a range of qualitative approaches – surveys, polling, multi-criteria analysis, participatory methods and deliberative forums (see 4.3) - should be used in parallel with monetisation techniques to assess impacts, and can be incorporated at various stages of the assessment process.

## 5.3 Deliberative valuation

There have been significant developments in the theory and practice of *deliberative democracy* in recent years. This field, also referred to as strong democracy (Barber 1985) or discursive democracy (Dryzek 1990), distinguishes a strong form of community engagement with a more shallow, tokenistic processes of consultation. These weaker processes often arise when decisions are made and then sold to the community. They are also evident where the role of citizens is heavily circumscribed through limited terms of reference ('where would you like this dam/ powerline/ waste facility?' rather than 'how will we best meet our water, energy, materials service needs?'). Many weak consultation processes have now become enshrined as statutory requirements, through submission and reply (e.g. in environmental impact assessment) or in the form of stakeholder dialogue, where it is primarily special interest representatives that are involved in the decision-making processes.

Processes that reflect principles of deliberative democracy have been labeled deliberative inclusive processes (DIPs) (Carson and Hart 2005) and embody three characteristics:

- *Representativeness*, or inclusiveness, which means that they involve a representative cross-section of the population - usually through some form of random selection, such as in genuine jury processes (Carson & Martin 1999).
- Informed dialogue or *deliberation*, preferably with free access to appropriate sources of information and expertise, with sufficient time to hear a range of perspectives, to engage in dialogue and inquiry on the issues and make informed judgements; and
- A level of *influence* over the decision making process, which means that the processes have been established and the participants empowered in such a way that means the results can make a difference to the course of action or public policy.

In the case of urban water, there are significant trade-offs in the decision-making process, in terms of the frequency and intensity of water restrictions, investment in new supplies or demand management, and the environmental, social and economic impacts of the choice of options and portfolios. Processes that fail to recognize the importance of non-monetary aspects of such decisions (such as standard cost-benefit analysis), or utilize without question the results of aggregation of individual preferences (as in contingent valuation) will result in decisions and investment that fail to serve the community or the future.

The incorporation of deliberative processes in the decision-making can help to reduce these shortcomings. This can be as a supplement to existing processes, or as processes that help to prioritise or screen options (Spash 2001). Deliberative inclusive processes can be linked directly to cost-effectiveness analysis and multi-criteria analysis to allow participants to exercise judgement and score or rank options in a qualitative way, such that options are filtered or

screened from a portfolio. The iterative and interactive application of such a method by participants in a deliberative space is one means of breaking down the complexity of such decision making processes (White et al. 2006a). These processes can operate in a way that ensures maximum information s brought to bear, bust resist the 'illusion of the algorithm', in which quantitative methods are used inappropriately to reach conclusions on preferred options with no recourse to collective wisdom generated through informed dialogue.

## 6. Lessons from urban Australia

This section critically examines the drought decision-making pathways in two locations – in Sydney, the decisions leading to the planning of a desalination plant; and in south-east Queensland, the decisions leading to the progression of the Traveston Crossing Dam..

### 6.1 Desalination plant, Sydney, New South Wales

> *The Premier of New South Wales, Morris Iemma, says the Government will build a desalination plant at Kurnell, even if the drought breaks.*
>
> (ABC News August 19 2005)

> *Desalination plant dumped: it was stinker with voters, to be frank.*
>
> (Sydney Morning Herald 8 February 2007: p1)

In 2000, following the drought that led to restrictions in Sydney from 1994-96, Sydney Water undertook research and planning which led to the Drought Response Management Plan 2002-2012 (Sydney Water 2003). This Plan described a series of processes that would be put in place in the next drought, including a 5 stage set of restrictions that would be implemented at various storage levels. The last two stages, IV and V, were to be triggered at 35% and 25% storage levels respectively, and require reductions in demand of 30% and 50% respectively, from average monthly unrestricted demand levels. In late 2002, voluntary restrictions were introduced as the first stage of this process, as Sydney entered the drought which is still in place.

Sydney's water supply system differs from many other locations in Australia. It has a relatively high storage level per capita, and yet the system has a propensity to spill or be subject to prolonged (several years) drought. In 1998 for example, following the 1994-1996 drought period, the storages filled to spilling over a period of weeks. The highly variable hydrology, and the lack of large scale alternative supplies such as groundwater (as in Perth) or piped river water (as in Adelaide) are reasons stated by water planners for the conservatively high level of reliability placed on the system. The reliability level (which is the percentage of time *on average* that restrictions are in place) has been set at 97%, compared to 95% in other cities such as Melbourne. This reliability level, which effectively represents a social contract between the water supplier or the state Government, and the community of water users, represents a significant decision. By way of example, a shift in the agreed reliability level from 97% to 95%, would increase the available supply by up to 50 GL/a (on a base of about 570 GL/a) while only increasing the frequency of restrictions on average from 3.6 months in ten years to 6 months in ten years (White et al. 2006b). These factors have implications for supply-demand planning, and provide a context for what has occurred in that decision-making realm since 2004.

In 2004 the NSW Government released a Metropolitan Water Plan, which amongst other objectives, aimed to incorporate the requirement for environmental flow releases for Sydney's water storages to improve river health, and meet water security objectives. As part of that Plan, and in response to reducing water storage levels, the NSW Government announced that it would allocate funding to investigate desalination as an option for future consideration as a drought response measure. In August 2005 the newly appointed Premier of NSW announced that the desalination plant would be built 'drought or no drought'. In February 2006, this decision

was reversed following the first phase of a review of the Metropolitan Water Plan, led by one of us (SW). The NSW Cabinet announced that the desalination plant would be integrated into an emergency 'readiness strategy' only to be constructed if dam levels dropped below 30%. The revised 2006 Metropolitan Water Plan also included a range of other elements and decisions including a major increase in investment in water efficiency measures and water recycling, as well as shelving plans for construction of a major augmentation to enable increased water transfers from the neighbouring Shoalhaven River catchment (NSW Government 2006).

During the Review process, it became clear that the NSW Government had removed Level IV and V restrictions from consideration, with no clear decision-making trail or public involvement in the process. The Review's conclusions (White et al. 2006b) stressed the importance of revisiting this decision. This included the need for a greater level of community engagement in the process of making decisions about the reliability level, which determines the frequency of restrictions. It also called for a review of the appropriate depth of restrictions, which would require scrutiny and review of whether to maintain at least Level IV restrictions within the suite.

In February 2007, with dam levels dropping, the NSW Government announced that tenders would be called for construction of the desalination plant. An election was scheduled for late March 2007, and following the election the Government (returned at the election) indicated that the plant would be constructed regardless of supply level, a return to the position that pertained in the period August 2005 to February 2006. In the run-up to the election both the Government party and the main opposition party refused to entertain the idea of further restrictions beyond Level III, despite storage levels dropping briefly beneath the trigger level (35%) for Level IV restrictions as outlined in the Drought Response Management Plan (Sydney Water 2003).

There are major impacts associated with a decision to pre-emptively construct such a desalination plant. The additional, and unnecessary, cost burden on the community could run to more than one billion dollars. Desalination is one the most energy and carbon intensive means of producing water, with carbon dioxide equivalent emissions of 4-5 tonnes/ ML of water produced (relative to less than 0.3 tonnes/ ML for existing Sydney water supply, or 1-2 tonnes/ML for recycled water.

Over-arching all of this is the existence of a set of value trade-offs with regard to the strategies that could be adopted to meet water security. These are complex and multi-dimensional, including consideration of: the acceptable level of restrictions; inter-catchment transfers and associated social costs; the environmental impacts of large scale surface water augmentation; desalination with its attendant greenhouse emissions as well as cost.

Any reasonable technical, scientific and cost benefit analysis of this decision leads to a conclusion that pre-emptive construction of a desalination plant and removal of Level IV and V restrictions are not elements of an appropriate strategy. However, more importantly, there has been no involvement of the community in the decision-making process on these matters, which makes the decision even less robust and more paternalistic.

## 6.2 Traveston Dam, Mary River, South-East Queensland

> *Children being born in 2006 will still be benefiting from the hard work we are doing now in half a century. If the worse drought on record has made anything clear, it is that we need big water storages to get us through the hard times. The proposed dams at Traveston on the Mary River and the proposed dam on the Logan River meet this need. Traveston has been chosen because it is the only site remaining in south-east Queensland that will allow us to build a megadam…*
>
> (Hon. Peter Beattie, Premier, Statement to Parliament, 23 May 2006).

The alluvial plains of the Mary River, in south-east Queensland, form the basis of the site of a proposed three-stage Traveston Crossing Dam to supply water to the Brisbane region. The Mary

River catchment region is the largest catchment that drains into the Great Sandy Strait, a Ramsar site, and supports substantial agricultural, local water supply, tourism, fisheries, and ecological values. Many of these values will be affected if the dam progresses to construction. Some values have already been negatively affected, particularly due to land acquisitions that have progressed despite the fact that a full social and environmental impact assessment has not yet commenced

**Overview of recent drought decisions in south-east Queensland**

Until recently, the south-east Queensland region was generally characterised by summer rainfall and occasional flooding. However, the current drought, which has persisted over the last five years, has been described as more severe – both in terms of rainfall deficit and duration - than the 'Federation Drought' (April 1893 to April 1903), previously the worst drought on record in the region (State of Queensland 2007).

Water use restrictions, first introduced individually by local councils, have been a widespread response to declining storage levels in the SEQ region. Stage 1 of the South East Queensland Regional Water Supply Strategy[iv] identified that inconsistencies in the application of water restrictions across the SEQ region were confusing to residents. The Stage 1 Strategy recommended a region-wide restrictions regime, with established frequency, severity and duration criteria, and developed based on community attitudes surveys (The State of Queensland and Brisbane City Council 2004). Voluntary level 1 restrictions were introduced on 13 May 2005 with consistent rules across 13 local councils.

In 2005, SEQWater[v], the State Government and Local Councils developed a Contingency Plan (released in September 2005) for responding to the current drought. A four-level set of restrictions, with corresponding trigger levels (linked to volumes in storage) and target savings, was proposed as part of this plan, although specific rules were not detailed (SEQWater 2005). Level 2 mandatory restrictions were introduced across the SEQ region on 3 October 2005. The Contingency Plan also reviewed a number of supply options including desalination, indirect potable reuse, groundwater extraction and dam recommissioning; and demand management options including pressure and leakage management. This plan, however, clearly made the distinction between those responses which would be effective in supplying water during drought (which would meet the objectives of the Plan), and other rainfall-dependent infrastructure developments for long-term supply:

> *The scope for augmentation of surface water storages, as a contingency measure to assist with drought management is limited. Not only are the timeframes for the project development and construction of these types of sources of the order of 5 to 10 years (for dams), but also sufficient rain must fall to fill them. If this rainfall does occur, it is highly probable that other storages in the region will receive replenishing inflows.*

Meanwhile, the Queensland State Government progressed the development of Stage 2 of the SEQ Regional Water Supply Strategy. The Stage 2 Interim Report[vi], released in November 2005, outlined three timeframes for projects and planning: 2005-09 (short-term contingency planning), 2010-2020 (medium-term) and 2021-2050 (long-term) (The State of Queensland 2005). "Mary River water storage improvements" were listed as a potential option, amongst others, for investigation as a long-term measure. However, there was no description or discussion of any specific dam, at Traveston Crossing or otherwise.

Since the end of 2005, the Queensland State Government has rapidly progressed decisions towards the construction of a dam at Traveston Crossing, Mary River. The Queensland Water Commission (QWC)[vii] was established in March 2006 as a statutory authority to implement the recommendations by the South East Queensland Regional Water Supply Strategy. The QWC also assumed many of the roles previously held by SEQ Water, including the design and

implementation of restrictions, as well as selecting criterion about reliability of service (frequency and duration of restrictions) for the entire supply system. In the following months, the Premier of Queensland Hon. Peter Beattie announced, first to the media on 27 April 2006 (ABC 2006) and then to the State Parliament on 25 May 2006 (Queensland Legislative Assembly 2006), that Traveston Dam was a preferred site for a new dam.

In June 2006, a preliminary desk-top review by consultants GHD ranked the Traveston site as fourth in terms of cost-effectiveness for meeting long-term the supply-demand balance behind three other supply options (GHD 2006). This review was not intended to, and did not, canvass demand-side options. However, at the town of Gympie in 5 July 2006, The Hon. Peter Beattie officially announced the Traveston Dam. Stage 1 of the Traveston Crossing Dam was described as a project currently under investigation in *Water for South East Queensland: A Long Term Solution*[viii], released by the Queensland Government in August 2006. In October 2006, with level three restrictions in place and level four restrictions likely, the *Water Amendment Regulation (No. 6)* was tabled in parliament, with the stated aim of implementing an emergency strategy to secure the essential water supply needs in the region (Queensland Legislative Assembly 2006c). The amendment, which emphasises urgent response to the current drought, included specific provisions for building of the Traveston Crossing Dam at Mary River.

Throughout these decisions, the community – particularly those communities in the Mary River region directly affected by the proposal – have expressed ongoing and increasing dissatisfaction with the lack of transparency about what information and analysis was used to support decisions about the Traveston Crossing Dam; and with the lack of community engagement in these processes. On February 2007, the Australian Government Senate referred the matter of future water supplies for South East Queensland, including in particular the proposed Traveston Crossing Dam, to the Rural and Regional Services and Transport Committee for inquiry (Parliament of Australia 2007).

Many elements of the decision pathway followed in the lead-up to the Senate Inquiry have been characterised by paternalism in decision-making. In particular, there has been limited transparency and community engagement in: establishing and communicating the reasons for Traveston Dam; analysing its effectiveness in supplying water when needed; and ensuring community values are reflected in the decision. These issues are examined below.

**WHY A DAM? Confabulated reasoning behind Traveston Dam**

> *If the worse drought on record has made anything clear, it is that we need big water storages to get us through the hard times.*
> (Hon. Peter Beattie, Premier, Statement to Parliament, 23 May 2006).

As detailed above, a dam on the Mary River was first listed (but not detailed) as a possible option to meet 'long-term supply needs' (2021-2050) in the Stage 2 Interim Report of the South East Queensland Regional Water Supply Strategy, released in November 2005. However, since then, various possible reasons for Traveston Dam have been suggested. These reasons include:

1. As an emergency measure to supply water *during this drought*.
2. As a measure to ensure sufficient water, in the *medium- to long-term, on average*.
3. As a measure to ensure sufficient water *during future droughts*.

***Traveston Dam as an emergency measure to supply water during the current drought***

As noted above, SEQWater's Contingency Plan clearly suggested that augmenting storage volumes during this drought would not, by definition of being rainfall-dependent, be an effective approach to deal with water shortages during this drought. Nevertheless, there is evidence that dealing with water shortage in the *current drought* has been promoted as a reason

for Traveston Dam. On 11 October 2006, the *Water Amendment Regulation (No. 6)*, which contains specific provisions for implementing the dam at Traveston Crossing, was tabled in parliament as a 'water supply emergency regulation… to ensure the security of essential water supplies for the SEQ region' (para. 8.82.1). This regulation states that 'a potential shortfall in supply will exist if there are limited rainfall events within the next 3 years and the requirements of this part are not implemented' (para. 84.4). The Hon. Anna Bligh MP, in a statement about the regulation to Parliament on 31 October 2006, clearly reinforced the intent of the regulation, and the planned program of works that it established (including Traveston Dam), as one of emergency response during the current drought (Queensland Legislative Assembly 2006b):

> *In the face of the worst drought on record in the south-east corner, our government took decisive action by declaring an emergency water situation. On 8 August, the Premier introduced a Water Amendment Regulation, which set out an ambitious and comprehensive program of coordinated measures to secure the water supplies of our region.*

The Queensland Water Commission, in its monthly reports that track progress of projects under the regulation (including Traveston Crossing Dam) stated that the reason for the regulation is to deal with the current drought (QWC 2006):

> *In response to the current water supply emergency in South East Queensland, the Minister for Water announced the making of a Regulation to secure the essential water supply needs of the region.*

***Traveston Dam as a measure to ensure supply-demand balance in the future***

To design an effective supply system, a distinction must be made between reasons 2 and 3 above – although it is possible, in theory, that both might be simultaneous and acceptable reasons for augmenting storage volumes. Reason 3 implies that the measure, on average, will be needed to meet the supply-demand balance *in an average year* – and this would be determined by evaluating the long-term average annual *yield* of the measure. In contrast, reason 3 means that the measure will be effective in contributing to supply-demand balance *in future droughts*. A measure that is effective at meeting reason 2 will not necessarily be effective at meeting reason 3, and vice versa.[ix]

Nevertheless, these two possible reasons for Traveston Dam have been frequently conflated. For example, the Queensland State Government, in its submission made by the Queensland State Government to the Senate Inquiry, argued that recent experiences with restrictions and the current drought should be avoided in the future, but cites long-term *average yield* to justify the claim that Traveston Dam would enable this objective to be met (Queensland Government 2007, p. 5):

> *A single solution to the long-term water needs of SEQ does not exist... there is a clear need to secure and develop high yield surface water storages. These new storages will address the balance between water supply and demand, and to allow sufficient contingency to ensure that in times of drought, Queenslanders to not have to suffer through difficult water restrictions in the future. Traveston Crossing Dam's location was selected as a preferred site as a result of a comprehensive review of all available surface water options. It is clearly the highest yield surface water supply option available in SEQ.*

**WHAT WATER? Stating vs. justifying the effectiveness of Traveston Dam**

> *Children being born in 2006 will still be benefiting from the hard work we are doing now in half a century…The proposed dams at Traveston on the Mary River and the proposed dam on the Logan River meet this need…*
>
> (Hon. Peter Beattie, Premier, Statement to Parliament, 23 May 2006).

Regardless of the lack of clarity in communicating the intended reasons for Traveston Dam (detailed above), the dam has been unequivocally cited by the Queensland Government as being effective at meeting 'long-term supply needs' (see, for example, Queensland Government 2007). However, there is very little publicly available information or analysis that justifies Traveston Dam as actually being effective, let alone cost-effective, at meeting any of its possible water balance objectives: this drought, future droughts, or long-term average needs. This section critically examines available evidence on the effectiveness of Traveston Dam, as well as the approach taken by decision-makers in communicating information and analysis.

***Water during this drought***

As noted in the previous section, a key stated (and legislated) reason for Traveston Dam is as an 'emergency response' to the current severe drought. However, as dam construction will not be complete until at least 2012 (The State of Queensland 2006), if the drought should continue, other measures would be required prior to 2012. Traveston Dam (being rainfall-dependent), would not provide substantial supplies as long as the current drought continues. Therefore, Traveston Dam is unlikely to be effective at providing water as long as this current drought continues.

***Water for long-term average supply***

A desk-top review of supply (but not demand) options for SEQ was conducted by GHD and released in June 2006. This report noted that information about environmental, social and heritage impacts, as well as geotechnical and survey information, was also often out of date or incomplete. The report recommended that "substantial additional information is required in order to undertake definitive assessments and cost estimates of the options for the potential bulk water dam / weir projects in South East Queensland" (GHD 2006, p. 3).

Despite these limitations, the Queensland Government has relied extensively on the desk-top review to justify the effectiveness of Traveston Dam (see, for example, Queensland Government 2007). However, it has chosen to dismiss the assessment of the review which placed the Traveston Dam only fourth in terms of cost-effectiveness and also noted various geotechnical concerns - instead relying on the evidence that Traveston is the highest-yielding supply option. However, as detailed in section 5, proceeding with an option based only on its yield, and without detailed consideration of all alternatives (including demand-side options), is inconsistent with the planning and design mechanisms under the Integrated Resource Planning framework – and will not lead to cost-effective outcomes for the community. For example, analysis undertaken by the Institute for Sustainable Futures and Cardno (Turner et. al. 2007) for the Council of Mayors indicated that the increase in yield due to Traveston Dam would only be needed, on average, after 2030 – and that, consequently, would be a very costly option to construct today.

***Water during future droughts***

In its submission to the Senate Inquiry, the Queensland Government stated that "Recent hydrological investigations indicate that the Traveston Crossing Dam will be full or near full (defined as to within two metres of the FSL) greater than 80% of the time" (p. 122). It refers to a graph comparing five-year average catchment rainfalls in Traveston Dam catchment to Wivenhoe Dam[x] catchment, which shows higher, but highly correlated, rainfall in the Traveston region than in the Wivenhoe catchment. However, this analysis does not quantify or evaluate *how* effective the dam would be in preventing water shortage in a future drought – nor does it compare this effectiveness to other potential 'readiness' options which could be more reliable during future droughts, and less costly in terms of financial and indirect impacts. Full information – including some clearly articulated measure of effectiveness of supplying water *in*

*future droughts* - of drought readiness options would be required, in order to justify Traveston Dam as being the most appropriate option to meet this objective.

**WHOSE VALUES MATTER? The Traveston Dam decision and community values**

> *Traveston has been chosen because it is the only site remaining in south-east Queensland that will allow us to build a megadam.*

The elements of the decision pathway described above, have, to a large extent, been characterised by limited community engagement – and, in turn, limited consideration of community preferences. Assumptions have been made on behalf of the community about what they value, without engaging the community to determine whether this is actually the case (see 'levels of service' discussion below). Decisions have also been made without transparent investigation or communication of all possible options and their impacts (see 'full spectrum' discussion below).

***Levels of service: assumptions made on behalf of the community***

One of the (many) implied objectives of Traveston Dam is to meet long-term supply balance. A key factor in determining what supply or demand options would be required to ensure this objective is the yield – or average annual water supplied – by the *existing* portfolio of supply and demand options. The Water Services Association of Australia advocates the adoption of a 'levels of service' (LOS) approach in the determination of yield by urban water providers in Australia (Erlanger and Neal 2005). This approach involves specifying what levels of service, or reliability, is required from the system – in terms of the maximum acceptable frequency, duration and severity of restrictions. For urban water supply planning purposes in the SEQ Region, the Queensland Department of Natural Resources and Water outlines LOS as the annual probability of level 2 restrictions less than 2%, a mean duration of restrictions of 12 months, and level 2 restrictions to achieve a demand reduction of 15% and apply for no more than 3% of the time (The State of Queensland 2006).

Small changes in the LOS criteria have a substantial effect on the calculation of overall yield. For example, the application of these criteria by DNRW resulted in the down-grading of the yield of the combined sources in the region to 450 000 ML/a, a reduction of 185 000 ML/a over previous estimates, which were calculated using the Historical No Failure Yield[xi] method. It is therefore important that the LOS strike a balance which reflects the risk of shortfalls in supply, and acceptability and cost to the community of restrictions. However, there is no publicly available evidence that customer surveys, community engagement processes or other empirical analysis has been undertaken to set the LOS. The LOS that have been chosen assumes that the community are particularly averse to restrictions. This is not borne out by the evidence from many attitudes surveys which suggest strong support for restrictions in similar cities and regions (see section 5).

Early in 2007, a survey was conducted on behalf of Queensland Water Infrastructure, the organisation established to build major infrastructure such as Traveston Crossing Dam Stage 1. Although this survey posed some questions which would be required to determine the appropriate LOS (that reflect community values), it is not apparent that the information provided to participants focused on this issue, and indeed may have been erroneous. A media report (Chalmers 2007) indicated that participants were provided with information that suggested that without major investment, level 4 restrictions would be necessary every four years and would run for two years at a time. Depending on the assumptions being used this is highly unlikely with the level of infrastructure investment which has already been committed by the Queensland Government.

The consequence of assuming reliability criteria which overstate the community's aversion to restrictions is that the projected supply-demand deficit will be higher than would be the case if calculated in a way which reflects community values. Ultimately, the consequence of this is

that the supply options estimated to be required to meet the supply-demand balance – and associated costs – are also overstated.

***The full spectrum of options, costs and benefits***

Best practice integrated resource planning for supply systems involves consideration of all possible options – both demand management and supply augmentation side. The evaluation of the cost-effectiveness of options, and portfolio of options, in meeting the stated objective should not be limited to those costs or benefits that can be easily monetised, and would ideally involve the community in the assessment.

However, there are a number of features of the Traveston Dam decision pathway which do not reflect decision-makers taking account the full spectrum of options, costs and benefits. In particular, the Queensland Government submission to the Senate Inquiry cites that the desk-top review supports Traveston Dam as the single site which would provide the greatest contribution to yield – the "megadam" argument. Notwithstanding the issues described in this paper including those surrounding yield determination, or whether the dam would actually supply water in future droughts, selecting an option based solely on yield contribution does not give due consideration to whether the wider community's preferences are such that they view impacts of this megadam – both financial, environmental and social – as less costly (for a given effectiveness) than all other options. The Queensland Government submission acknowledges that yield is not the only criteria for selecting an option, but then proposes further assessment *limited only to the Traveston Dam option* (Queensland Government 2007). Without full consideration of other options, and without examination of community values, this decision can only reflect one that has been made with incomplete information and with assumptions made on behalf of the community, about what would be best for the community.

The assessment and communication of dam impacts has been characterised by an incomplete and at times misleading approach. For example, in a speech to Parliament on 25 May 2006, Premier the Hon. Peter Beattie compared Traveston Dam and rainwater tanks, asserting that 1.42 million 5000L tanks would be needed to supply the equivalent water, costing between $4.28 billion and $8.5 billion (Queensland Legislative Assembly 2006a). This comparison is a misleading use of cost data – as it incorrectly portrays that the only alternatives to Traveston Dam are extremely costly. Even using the Government's untested assumptions about the community's aversion to restrictions, subsequent analysis undertaken by the Institute for Sustainable Futures and Cardno indicated that a suite of demand and supply side options has the potential to save over 180 GL/a of water by 2050 at an average unit cost of $1.15. In comparison, the Traveston Crossing scheme will supply approximately 150 GL/a by 2050 (Turner et al 2007).

Although full assessment of social and environmental impacts (through an environmental impact assessment, including as required under the EPBC Act) has yet to commence, the Traveston Dam decisions have progressed significantly. As noted above, the Government Submission indicates further analysis of the dam (but not other options), and as at March 2007, at least 42 per cent of properties have already been purchased (Queensland Water Infrastructure 2007). In contrast, prior to the construction of Wivenhoe Dam, over six years of studies, tests and consultation with affected families were conducted before the first property was acquired (McHugh in Australia 2007).

## 7. Conclusion

This paper, through examining in detail two case study drought decision pathways, has touched on some of the possible underlying beliefs underpinning the 'paternalistic' approach. In some situations, there is evidence that decision-makers believe that the issue at hand is too complex; in others, there could be strong political motivations. Whatever the underlying

reasons, basing decisions on assumptions made about what the community prefers – without engaging the community to find out whether this is actually the case – can only lead to outcomes that are not representative of society's values. Ironically, this paternalistic approach betrays the dominant paradigm which in contemporary times has been the foundation philosophy of government intervention– that of 'economic efficiency', or maximising social welfare.

As the two case studies reveal, decision pathways have been characterised by a lack of transparency about objectives, incomplete or erroneous assessment of the costs and impacts, and miscommunication about the nature of the decision. There is no doubt that issues associated with investment in infrastructure as a drought response, which options should be implemented, how much they cost, who should pay, willingness to pay and how this relates to restrictions are complex. However, it is because of this complexity, and the potential consequences on specific stakeholders and the community more generally, that it is essential that decision processes include the use of rigorous and transparent community engagement processes with an opportunity for participants to become well informed.

## 8. References

Abbott T (2006). Paternalism Reconsidered. *Quadrant*, September: 30-34.

ABC – Australian Broadcasting Corporation (2006). *Qld Govt proposes Mary River dam*. http://www.abc.net.au/news/items/200604/1624879.htm?widebay (accessed 30 May 2007).

Barber, B (1985). *Strong Democracy: Participatory Politics for a New Age*, University of California Press, Berkeley CA.

BOM – Bureau of Meteorology (2001). Known Floods in the Brisbane and Bremer River Basin. http://www.bom.gov.au/hydro/flood/qld/fld_history/brisbane_history.shtml (accessed 27 May 2007).

Carson L & P Hart (2005). *What Randomness and Deliberation can do for Community Engagement*, Paper presented at International Conference on Engaging Communities, Brisbane, Australia, 15 August. http://www.activedemocracy.net/articles.htm (accessed 30 May 2007).

Carson L and B Martin (1999). *Random Selection in Politics*, Praeger, New York.

Chalmers E (2007). 'Firm tests the water on price hike'. *The Courier Mail*, 8 February 2007. http://www.news.com.au/couriermail/story/0,23739,21189974-3102,00.html (accessed 30 May 2007).

DNRE – Department of Natural Resources and Environment Victoria (1998). *Ministerial Guidelines for Developing and Implementing a Drought Response Plan*, August 1998.

Dryzek, J (1990). *Discursive Democracy: Politics, Policy and Political Science*, Cambridge University Press, Cambridge.

Edwards G (2006). Whose Values Count? Demand Management for Melbourne's Water. *The Economic Record*. 82: S54-S63.

Erlanger P and B Neal (2005). *Framework for Urban Water Planning*, Occasional Paper No. 14, June 2005, Water Services Association of Australia, Melbourne.

GHD (2006). *Desktop Review of Identified Dam and Weir Sites: Report to the Bulk Supply Infrastructure Task Group*, GHD Brisbane.

Howe, C & S White (1999). Integrated Resource Planning for Water and Waste Water: Sydney Case Studies, *Water International*, Vol 24, No 4. 356-362.

IPART – Independent Pricing and Regulatory Tribunal of New South Wales (2004). Residential water use in Sydney, the Blue Mountains and Illawarra – Results from the 2003 Household survey.

Keating J (1992). *The Drought Walked Through: a history of water shortage in Victoria*. Victorian Department of Water Resources.

Keating M (2006). Water Pricing and its Availability. Speech to Centre for Economic Development of Australia by chairman of NSW IPART, 29 November 2006.

Kelly P (2001). *100 Years: The Australian Story*. Allen & Unwin Pty. Ltd.

Kelly P (2004). Comment: The Australian Settlement. *Australian Journal of Political Science*. 29(1): 23-25.

Mark D (2006). Govt paternalism push meets Indigenous outrage. Transcript, *PM*. Radio National, Australian Broadcasting Corporation. 21 June 2006. http://www.abc.net.au/pm/content/2006/s1668693.htm (accessed 29 May 2007).

Meier A, J Wright & A Rosenfeld (1983). *Supplying Energy Through Greater Efficiency*. University of California Press, Berkeley, CA.

Melbourne Water (2006). *A History of Drought*. http://drought.melbournewater.com.au/content/history_of_drought.asp?bhcp=1 (accessed 29 May 2007).

Nancarrow B and G Syme (2002). Challenges in implementing justice research. *Social Justice Research*. 14(4): 441-452.

O'Connor (2000). *Natural Capital: environmental valuation in Europe (2000)*. Policy Research Brief 3. Cambridge Research for the Environment.

Nunes PA and JCJM Van den Bergh JCJM (2001). Economic Valuation of Biodiversity: Sense or Nonsense? *Ecological Economics*. 39:203–222.

NSW Government (2006). '2006 Metropolitan Water Plan'. http://www.waterforlife.nsw.gov.au (accessed 30 May 2007).

Office of Best Practice Regulation (2006). *Best Practice Regulation Handbook*. Commonwealth of Australia, November 2006.

Parliament of Australia, Senate (2007). Inquiry into Additional Water Supplies for South East Queensland - Traveston Crossing Dam. http://www.aph.gov.au/Senate/committee/rrat_ctte/traveston_dam/info.htm (accessed 30 May 2007).

Queensland Government (2007). *The State of Queensland Submission*, Inquiry into Additional Water Supplies for South East Queensland – Traveston Crossing Dam. Senate Standing Committee on Rural and Regional Affairs and Transport. 4 April 2007.

Queensland Legislative Assembly (2006a). Hansard, 25 May 2006.

Queensland Legislative Assembly (2006b). Hansard, 31 October 2006.

Queensland Legislative Assembly (2006c). *Water Amendment Regulation (No. 6) 2006*, Subordinate Legislation 2006 No. 202 made under the Water Act 2006.

Queensland Water Infrastructure Pty Ltd (2007). *Proposed Traveston Crossing Dam Project Update*. March 2007.

QWC – Queensland Water Commission (2006). *Water Supply Emergency Projects Water Amendment Regulation (no. 6) 2006: monthly progress report September 2006).* http://www.qwc.qld.gov.au/myfiles/uploads/project_reports/executivesummary.pdf (accessed 30 May 2007).

Roseth N (2006). *Community View on Water Shortages and Conservation*. CRC for Water Quality and Treatment.

Sagoff M (1988). *The Economy of the Earth: Philosophy, Law, and the Environment*. Cambridge: Cambridge University Press.

SEQWater (2005). *Responding to drought in South East Queensland: Contingency Planning for Urban Water Supply*. Technical Report Series No. 1, September 2005.

Spash C (2001). *Deliberative Monetary Valuation*, Paper presented at the 5th Nordic Environmental Research Conference, Aarhus, Denmark, 14-16 June. http://www.clivespash.org/2001acp.pdf (accessed 30 May 2007)

Sydney Water (2003). *Drought Response Management Plan (2002-2012).* Revised February 2003.

Taverner Research (2005). Survey of Household Water Attitudes. Prepared for the Independent Pricing and Regulatory Tribunal of New South Wales, Sydney.

Tietenberg T (1992). *Environmental and Natural Resource Economics*. 3rd ed. Harper Collins.

The State of Queensland (Department of Natural Resources and Mines) (2005). *South East Queensland Regional Water Supply Strategy, Stage 2 Interim Report.* 2nd ed. November 2005.

The State of Queensland (Department of Natural Resources and Mines) and Brisbane City Council (2004). *South East Queensland Regional Water Supply Strategy Stage 1 Report.*

The State of Queensland (Department of Natural Resources and Water) (2007). *The South East Queensland Drought to 2007*. http://www.nrw.qld.gov.au/climatechange/pdf/SEQ_Drought_2007.pdf (accessed 30 May 2007).

The State of Queensland (Department of Natural Resources, Mines and Water) (2006). *Water for South East Queensland: A long-term solution*. August 2006.

Turner A, G Hausler, N Carrard, A Kazaglis, S White, A Hughes and T Johnson. (2007) *Review of Water Supply-Demand Options for South East Queensland*. Final Report for Mary River Council of Mayors, February 2007.

White, S (ed) (1998). *Wise Water Management: a Demand Management Manual for Water Authorities*, Water Services Association of Australia, Sydney.

White, S, S Fane, D Giurco, D, & A Turner (2006a). *Putting the economics in its place: decision making in an uncertain environment*, Paper presented at International Society for Ecological Economics Conference, New Delhi, 15-18 December.

White, S. et al. (2006b). *'Review of the Metropolitan Water Plan: Final Report'*, report prepared for NSW Cabinet Office, Sydney, April. http://www.waterforlife.nsw.gov.au (accessed 30 May 2007).

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[i] Note that triggering restrictions according to dam levels is not applicable in all locations, for example those with many mixed sourced of supply.

[ii] 'Avoided costs' for demand management options could include reduced water and wastewater treatment and stormwater management costs (to utilities) and reduced energy costs related to hot water savings from water efficient showerheads, taps or washing machines (to customers).

[iii] Revealed preference techniques include cost-based approaches (eg. damage costs or replacement costs), production function approaches (factor income or impacts on production) and surrogated market valuation approaches (travel cost method, hedonic pricing). Stated preference techniques include contingent valuation, choice modelling, conjoint analysis and deliberative polling. Another technique is benefit transfer.

[iv] Stage 1 of the South-East Queensland Regional Water Supply Strategy was undertaken by the South East Queensland Regional Organisation of Councils and the Queensland State Government between 2003 and 2004. The overall aim of Stage 1 of the South-East Queensland Regional Water Supply Strategy is to ensure that all local government in the study area will be able to meet their short-term water supply needs (to 2020).

[v] The South East Queensland Water Corporation Limited, trading as SEQWater, is the major supplier of untreated bulk water to Local Governments and industries in the south east Queensland region, through ownership of Wivenhoe, Somerset and North Pine dams. SEQWater is a public company owned by the Queensland Government (20%), Brisbane City Council (45%), and eleven other Local Governments in south east Queensland (35%). *Source: http://www.seqwater.com.au/content/standard.asp?name=AboutUs*

[vi] At May 2007, the *Stage 2 Interim Report* is the latest publicly available document of the South East Queensland Regional Water Supply Strategy.

[vii] Local Government has traditionally been responsible for water supply and planning in Queensland. More recently, the perceived need for regional coordination to respond to drought and to provide water security for the whole of the SEQ region in the longer-term has resulted in the establishment of a number of regional water management institutions, including the Queensland Water Commission (QWC).

The QWC is governed by a legislative framework under Chapter 2A of the *Water Act 2000*. As required in Act, the Commission will: advise government on supply options and demand measures to ensure a secure water supply; develop and enforce a 'system operating plan' as the basis of a regional water grid; ensure implementation of government-approved water security programs (such as building infrastructure and introducing retrofit programs); set and enforce water restrictions to ensure secure regional water supplies; and advise the Minister on matters relating to water security. The Commission reports to the Deputy Premier, Treasurer and Minister for Infrastructure the Hon. Anna Bligh MP. *Source: http://www.qwc.qld.gov.au/Who+we+are+-+Legislative+framework*

[viii] This report states that it "explains the rational behind the Queensland Government's recent water infrastructure announcement and provides the background material on which decisions have been based" (p. 1).

[ix] For example, a dam may increase average yields (the water available to be supplied by the system on an average year), but if rainfall in its catchment is highly correlated with rainfall in catchments of existing storages, and/or evaporation rates from the dam are high, the dam will not necessarily have a significant impact on the probability of water shortage during the next long and protracted drought. Conversely, a 'readiness' measure that is specifically designed to be operated only during drought (such as restrictions, or an emergency desalination plant) would not contribute at all to meeting supply-demand balance in most years, but would always be effective, by virtue of its design, during drought.

[x] Wivenhoe Dam, on the Brisbane River, is currently the largest dam (by storage capacity) supplying the Brisbane area. *Source: http://www.seqwater.com.au/content/standard.asp?name=WivenhoeDam.*

[xi] The HNFY of a water supply storage is the maximum annual volume that could have been drawn over a past historical period for which climatic information is available, such that the minimum storage volume reached (during the worst drought period) approached but did not fall below the dead storage volume – that is, the supply did not fail.