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How do you change the urban habits of a lifetime, using water profligately as if it is a free good, an unlimited resource? Whose responsibility is it to challenge existing systems and lead the change? Is our water supply policy aligned to using water efficiently and reducing demand and if not what amendments are required?

The results of a structured survey and literature review on urban water efficiency initiatives carried out in New Zealand and overseas, are presented in this paper. The research concludes that having a legislative and policy framework to support urban water efficiency is a key component of a broader interaction between the councils/water supply authorities (WSAs), policy makers, industry and consumers. The information has been used to inform workshops with councils/WSAs who indicated an interest in reducing water demand. Guidelines for decision making have been developed which can be used by any council/WSA embarking on or strengthening their water use efficiency strategy.

Water use efficiency needs to be approached from many angles. While consumer education is essential in understanding the need for policy and regulation it is unlikely, of itself, to provide the degree of incentive required to significantly use water more efficiently. Local government is best placed to lead a demand management strategy which should ideally consider three sets of variables; the current and future context from the global to local scale; available water efficiency or demand management initiatives and the policy approaches required to implement those initiatives within the relevant council context.

National government could provide more assistance through clarifying existing or developing new legislation promoting water use efficiency policy. This in turn would send a clear signal to the water supply industry to provide sustainable solutions to water consumers; setting the scene for a new blueprint for urban water use efficiency.

### **Introduction**

Water plays such an essential and integral role in every day life on Earth that the true value of its services is often forgotten, as are the consequences of what would happen if we no longer had access to it. At the same time water is coming under increasing pressure the world over from

increased anthropogenic processes, in particular increased urbanisation and consumption, industry and agriculture, exacerbated by the uncertainties of climate change. These factors when combined, are threatening the availability and quality of the world's waters, a situation which requires urgent attention internationally.

At home the rationale to save water is not always as evident as in drought stricken countries but is non-the-less convincing when considered holistically. Many of the immediate economic benefits accrue to the water supply authority, although they would eventually filter through to rate-payers, through removing or deferring the need for a major new supply source, by reducing the amount of infrastructure that requires maintenance and reducing the energy and treatment costs involved in achieving a potable standard. In particular the idea of providing potable water for watering the lawn makes no sense, other than it is built-in to our current approach to water supply. In addition, more supply inevitably has an impact on the environment, either at the supply source or through even the most efficient wastewater system.

It is frequently not until a country starts to run short of water that there is consideration of how to better conserve and protect such a precious resource. At this point it is often difficult to achieve change and it can be at great expense, as is clear from the Australian experience. It is imperative that New Zealand, with its present level of access to fresh, relatively high quality water, doesn't miss an opportunity to effect a paradigm change with respect to urban water management, and step up its efforts to better value, conserve and protect its water resources.

Despite its importance in our home and commercial lives, water use in New Zealand has not been high on the political or public agenda. Recent intensification in agriculture has raised concerns in the rural environment, in both the availability and quality of streams, lakes and groundwater but as yet little interest has been focused on urban water services, except when water rate increases are threatened.

A recent survey of water users indicated that Aucklanders' knowledge of urban water systems and its role in economic and environmental systems is limited, (TNS Conversa, 2008). The survey indicated that while 81% of respondees were conscious of their water use and generally viewed water as a valuable resource, there was little appreciation that the water resource is finite. Water is viewed as less important than electricity in running the home and the awareness of water as an environmental issue is only moderate and trails behind other issues such as climate change, recycling and air pollution in importance. The survey also found that the most motivating reasons for households to conserve water are to save money, environmental impact and a sense of community spirit while the barriers to conservation were lifestyle, questions about responsibility and Auckland's climate and perceived usage levels.

Inflammatory media reporting in early October 2008, responding to a proposal in the revised Building Code to include low flow shower heads as an acceptable solution highlighted how easy it is to portray any form of resource conservation as a threat to personal rights and hence to avoided at all costs.

### **Methodology**

If the perception of water as a free good is prevalent, how do we increase water use efficiency, is there a need for greater economic incentives, more education or better policy or regulation and if so where could it best be applied?

While it is accepted that there are several key stakeholder groups involved in reducing domestic water use being, the consumers, the water product industry, plumbers and developers; the role of local government is paramount through setting policy and being responsible for the delivery of domestic water services. Council also interacts with the developers and householders and manages the building consenting process, being required to take into account the major “Acts” that influence water services. Given this significant role, the focus of this research has been in the first instance, to understand how policy can be better developed to support improved efficiency of domestic water services. The main research hypothesis is that “barriers to water use efficiency can be overcome by well designed policy and regulatory approaches, specific to end-user requirements.”

The research components were:

- A nationwide survey of territorial authorities or associated WSAs to establish the extent of water conservation programmes across the country and the key drivers for those programmes.
- Four case studies of New Zealand councils that have demonstrated results attributable to demand management approaches including the use of voluntary programmes, water metering and volumetric user charges, changes to district plan rules to achieve water conservation outcomes, leak reduction programmes, and other methods of demand management such as education and training.
- An international literature search which identified policy approaches in other countries that could be applied to the New Zealand context.
- Workshops on water demand management with a series of councils to consider how they could develop a demand management strategy and prioritise actions, given their individual circumstance and local context.
- The development of a conceptual framework and some specific pathways to implementing water demand management.

A detailed report on this project is available (Lawton, 2008).

### **New Zealand policy and regulation relating to domestic water supply**

The response rate to the survey of councils or their local WSA was 55% of the 76 councils in New Zealand. From the responses it was obvious that the majority were considering how to implement or increase their level of water demand management. In general they did not need to be persuaded that demand management was desirable, despite their need to balance their financial targets through water sales. The over-riding issue was that they had not managed to convince the consumers of the need for demand management. Additionally in some cases the local politicians had stood for council on a ticket of not implementing metering and without metering, it is difficult to identify how best to target specific water use efficiency measures, understand the leakage rate, or apply incentives to reduce demand. Water use differs significantly throughout the country as shown in table 1. Unfortunately where councils don't meter they often report their gross per capita water use which includes each person's share of non-domestic water including infrastructure leaks, so an accurate comparison across councils is not possible. In addition it is not possible to accurately estimate the gross or domestic water use per capita across the country but we know that Auckland's net domestic use is 178 l/pp/pd and gross use is 275 l/pp/pd (Auckland Water Industry, 2007). Given that Auckland's consumers are

at the lower end of the usage scale it is clear that the national average is higher than the above figures. While not high compared with some parts of the US, Canada or even Australia, only four out of 22 EU countries have a slightly higher per capita water use than ours appears to be (Defra, 2008). Our water usage can certainly come down.

Table 1 Per capita average domestic water use in New Zealand towns

Water supply authority	Liters per person per day
Nelson	160*
Waitakere	167*
Rodney	179*
Metrowater	184*
Manukau	189*
Papakura	190*
Tauranga	214*
Upper Hutt	227
Christchurch	333
South Taranaki	450
Kaikoura	648
Kapiti	650
Queenstown	750

\*Metering with volumetric charging

A number of authorities stated that they were facing growing population pressures and will have supply constraints in the near to middle future. Due to the long planning horizon needed for major infrastructure, anticipated increased supply would need to be considered 10 to 20 years or more before it is required. The case for reducing demand, instead of increasing supply, must be strong and ideally shown to work prior to committing to that approach. With the need for new supplies looming to match the anticipated population needs, it is critical that demand management practices are implemented swiftly if large capital investments with consequent ecological consequences are to be avoided. A key component of considering supply versus demand options is a levelised cost benefit analysis which treats all options on an equal basis. The New Zealand case studies that were examined in detail provided a wealth of examples of educational approaches throughout the country. It was clear from workshop feedback that a mechanism to share these stories and successes would be a useful role for an industry agency, research provider or government agency. However the educational approaches that offered the best success were hands on, with practical one on one advice sometimes supplemented with in-house water services maintenance. While internet advice may reach the masses, it doesn't appear to have the same impact as the personal approach. A good example of community based education being developed through Waitakere City Council is Project Twin Streams. This started as a stream restoration project but has now extended to a broad suite of environmental education projects including energy and water use in the home. It is hoped and envisaged that the education messages will resonate more strongly when they are delivered by a trusted member of the local community rather than a council staff member. Tauranga had a domestic water advisor who was able to advise on water efficiency as he made simple repairs and Kapiti Coast District Council has a green gardener to advise on savings on outdoor water use, essential with their sandy soils

and dry climate. Several councils now have Eco-Design Advisors who include advice on household water conservation in their suite of advisory tools.

Those WSAs that had implemented water metering with volumetric pricing had found an immediate drop in water use, dramatic in the case of Tauranga where it was reported as being reduced by 30%. Ironically introducing water metering was considered to be more difficult since the introduction of the LGA which strongly promoted a public consultation process for local authorities. The process known as the Long Term Council Community Plan (LTCCP) with a ten year horizon and three yearly refinements should have been a good opportunity to discuss water management issues with the community but instead appeared by some, to be viewed as a barrier, an indication maybe that the current approach to community participation is not working well.

It is clear from the research that legislation in New Zealand is not enabling when it comes to reducing domestic water use. There are a number of Acts which impact on water use within a dwelling but none of them provide a clear pathway to water use efficiency. The Building Act 2004 could require performance standards related to water use efficiency but as yet there has been no indication that will happen in the near future except through a concern for energy use efficiency with a proposed change in the Building Code to conserve hot water. The Local Government Act 2002, requires both the long-term planning of water assets and community consultation through the LTCCP. These processes could be used to encourage water use efficiency but that is more likely to happen if there is another more direct driver. The use of by-laws, available to protect people from harm or nuisance, are considered an unlikely and ineffective approach to this issue and too difficult to police. The Resource Management Act 1991 (RMA) is regarded as the most likely candidate to be able to effect a sustained water use efficiency intervention, through rules in the District Plan. To enable that pathway to be easily followed there are two immediate improvements to current legislation that could make. The first is to make better use of the full powers of the RMA through emphasising the need to conserve water at the national level in a National Policy Statement (NPS). The proposed NPS on Freshwater Management is a start but the emphasis on demand management of reticulated supply needs to be clearer with a water conservation principle taken through to the Regional and District levels so that where required, rules or methods to conserve water can be included in the District Plan.

Further RMA related actions could be to amend section 76, relating to “rules” within District Plans to strengthen the ability of local government to put rules in District Plans to manage their resources at source, as opposed to the current situation which is primarily to manage effects. It would also be useful clarify a perceived conflict which exists between the Building Act and the RMA. At present:

*“Section 18 of the Building Act 2004 precludes the imposition of performance standards for building work additional to or more restrictive than those specified in the Building Code. Therefore a person who carries out any building work is not required by this Act to: achieve performance criteria that are additional to, or more restrictive than, the performance criteria prescribed in the building code in relation to that building work: or*

*take any action in respect of that building work if it complies with the building code. (2) Subsection (1) is subject to any express provision to the contrary in any Act”.*

The lack of certainty as to whether this section can over-rule the ability of the RMA to perform its prime function of resource management was certainly considered a deterrent by some councils who were not prepared to risk the cost faced by litigation if a legislative approach was contested. This affected their ability to mandate for water efficient products from dual flush toilets to requiring rainwater tanks with all new homes.

A final option, first suggested by the Parliamentary Commissioner for the Environment (PCE 2001), would be to develop a Water Act which gave clear direction and responsibility for managing water as a scarce resource, a sensible approach given the pivotal position water has in relation to our economic and social well-being.

While local authorities have tended to value their independence, there was a suggestion that came through the workshops that national legislation which supported water demand management would assist them, especially in considering regulatory routes. They wanted stronger signals from national levels which still provided enough flexibility to implement those interventions that suited their local context. In general they would have welcomed simple requirements such as dual flush toilets and low flow shower heads to be mandatory across the country. Similarly, mandating for metering at a national level would probably be welcomed as it would have removed the decision from the local arena where it has become in many cases, a political football.

Through an analysis of water use data and discussions with various councils, two key problems were found to contribute to high water use. The first was infrastructure leakage, often exacerbated through unnecessarily high piped network pressure. The other was outdoor water use in gardens for irrigation which was found to be a key differentiator of urban water use throughout New Zealand. In general those areas with low summer rainfall and/or sandy soils used significantly more water than those where rainfall was more evenly spread throughout the year. While not a surprising result it did emphasise the value of addressing indoor and outdoor use separately and how the use of rainwater tanks and/or grey-water recycling came into their own, especially in high outdoor water use areas. Unfortunately the current application of both those technologies is limited by perceived health and consent requirements as well as cost which can push the use of rainwater tanks and grey-water recycling into the too hard basket. Future research will include removing myths and barriers that currently work against water use efficiency.

The analysis of overseas countries, in particular the UK, Australia, the United States and Canada was of value in terms of their experiences in conserving water. The UK offered much in the way of a national approach, through legislation and organisational structures. The UK has a Water Act and a recently published water strategy; it has also proposed a performance standard for new homes that will require them to achieve a water use of 125 litre/pp/pd as opposed to the current 150 litres/pp/pd. (Department for Communities and Local Government UK, 2007). That will be reinforced through the Code for Sustainable Homes, recently introduced through legislation. Water pricing is set nationally, even through water is privatised. There is a high degree of water

recycling required to meet a large population, a process which is accepted through necessity in the UK. In the USA water conservation is accepted with state funding available to help customers reduce water use, automated meters and mandatory policy is generally considered more effective than voluntary. Canada uses the “Soft Path”, based on modeling scenarios and backcasting, community involvement and political review. Australia has introduced a National Water Initiative, a strong multi-pronged approach. In many states they believe that the low hanging fruit has been taken and again, more regulatory measures are required. Many of those initiatives or approaches could be considered or introduced in New Zealand.

A synopsis of research led to the development of a framework to indicate how the components of demand management fit together and some of the thought processes that would help in developing a robust strategy for any council starting down this track. The outline of the framework is given in Figure 1.

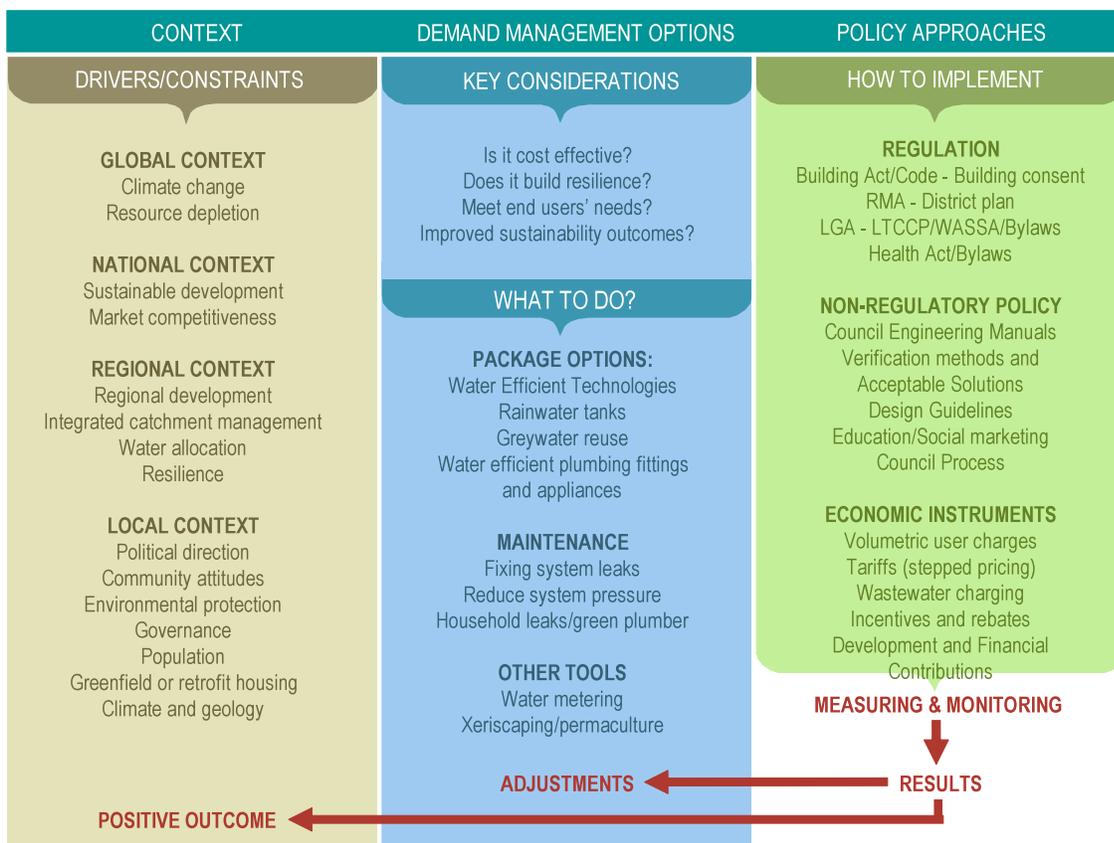


Figure 1: Interactions between context, water demand options and policy approaches

The workshops confirmed that differing approaches are required between councils to take account of their individual contexts and local trends. Key differentiators of council context and hence, what they should do and how they should approach demand management are shown under local trends in figure 1. A key issue is funding of retrofitting, both of the products although they are often relatively low cost, and any labour which will add to the cost. Particularly in smaller councils lack of discretionary income calls for more innovative interaction with the

community and the potential to involve volunteers. Some councils with little new development and a low standard of existing housing stock will focus on retrofitting, with low cost water efficient fittings, the possibility of financial incentives such as loan schemes or subsidies. Others will have greenfield opportunities and they need to find and recruit the help of local developers willing to assist and hence create some best practice examples within the community. Some councils may not have the political willingness to be the leaders in that regard but can follow suite.

Overall there is a reasonable level of willingness to engage in water demand management and with an initial analysis of local context and conditions leading to a strategy that ensures that demand management approaches aren't simply ad-hoc, councils can ensure that they best focus their demand management dollar.

### **Discussion and Conclusions**

Through the surveys, case study analysis, overseas literature research and workshops some key findings are emerging.

Consumer acceptance and political willingness will play a major role in how far and how fast water managers and politicians are prepared to promote water use efficiency. The issue of water metering and volumetric pricing is a point of contention in many districts. One perception within the community is that access to "free" water is a right for all people and it shouldn't have a charge attached. This overlooks the cost of supply and the fact that people have always paid for water in their general rates. Education and awareness raising will in part help dispel the "free good" argument but it is unlikely that this will affect a wholesale change of attitude without other policy interventions. In addition the value case for demand management for each of its stakeholder groupings, needs to clearly articulate the benefits based on sound data.

The understanding of "water as a necessity" is undoubtedly more pronounced in those areas of the country that have experienced periods of drought in more recent years. It is yet to be tested whether those areas are more likely to offer support for mandatory water conservation approaches and volumetric pricing based on consumption. The degree of necessity relates substantially to water access and climate. Some parts of the country have low rainfall but still enjoy a plentiful water supply. Other parts are more obviously short of water with most of the available supply already allocated to hydro, agriculture, industry as well as domestic use.

Councils are in general keen to adopt demand management and recognise the value of conserving water, especially where it will result in the delay or removal of the necessity to find a new water supply source. Councils will make most progress when they understand their own context and develop a strategic approach to water demand management which involves a package of interventions. Often demand management was found to be associated with a champion within the organisation, notably a new council employee who was keen to take a fresh approach. Councils recognised the benefits of learning from each other and welcomed the idea of a network which focused on demand management and provided for a sharing of resources and experiences.

The degree to which current policy and regulation is helpful or provides barriers will undoubtedly impact on the route of uptake of water use efficiency. The current regulatory route can be long and often needs to be addressed on multiple fronts. Without strong national legislation promoting water use efficiency it is left to councils or water supply authorities to individually determine their policy or regulatory route. Hence there is massive replication of effort, some of which could be avoided by national level guidance or legislation. In fact New Zealand legislation does not respond well to the need for water use efficiency. Maybe it is time for a National Water Act as has been introduced in the UK. There has been some call for a national structure to oversee and promote water use efficiency initiatives. New Zealand has acknowledged the benefits of an organisation focused on energy efficiency, the Energy Efficiency Conservation Authority (EECA). Water is arguably an even more essential resource than power given its status as a resource that is essential for all life so a similar organisation to EECA, but focused on water, could be created immediately. Australia has introduced the National Water Initiative which provides a potential model for New Zealand. While national guidance and legislative support is important, there will still need to be local solutions, specific to the variables of each water supply authority's context. They reflect the differences in climate, population, socio-economic groupings, local political viewpoints and development opportunities. The suite or package of interventions and the policy to implement them will have considerable site specificity.

Nobody wants a prolonged drought as we have seen in Australia. It has however galvanised the country into a major focus on preserving the essential resource that is water. Without such a crisis it is likely that New Zealand will take longer to respond to what is now recognised as a global need to carefully manage water use. There is a willingness amongst councils to be proactive but they require support from national and regional levels, a move which would also gain efficiencies through providing model examples of how to reduce water demand. Consumers have a way to go in understanding our water supply but financial instruments will play an increasing role as energy costs, linked to water supply and heating continue to rise. Domestic water supply in New Zealand is at the beginning of a major period of change to embrace sustainability but it badly requires a widely accepted blueprint for sustainability.

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