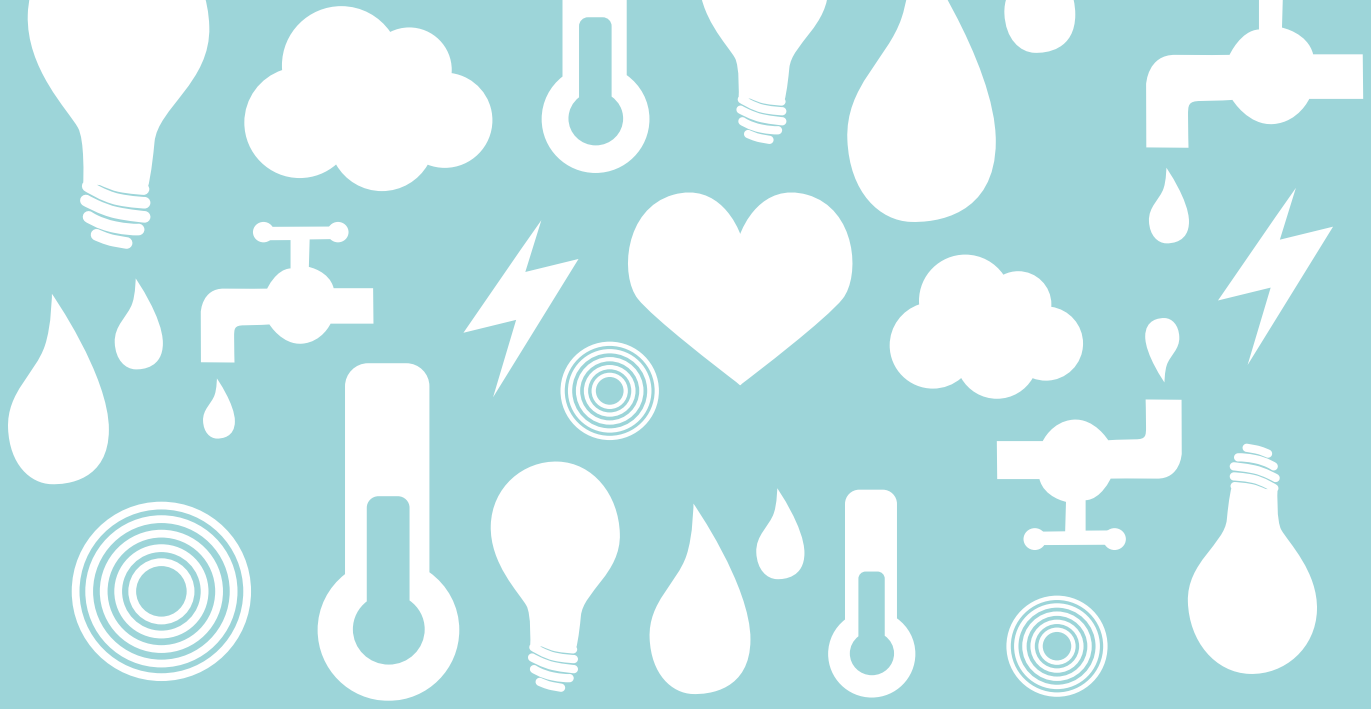


Slowing the Flow.

A Comprehensive Demand Management Framework for Reticulated Water Supply

August 2008

Beacon

A report prepared for Beacon Pathway Limited

About this report

TITLE
Slowing the Flow: A Comprehensive Demand Management Framework for Reticulated Water Supply

AUTHORS
Maggie Lawton, Braidwood Research and Consulting. Beacon Pathway Water Research Team Leader

Damon Birchfield, SHIFT Consulting. Beacon Pathway Researcher

Dorothy Wilson, Director of P.R.I.S.M. Beacon Pathway Researcher

REVIEWERS
Lois Easton and Kay Saville-Smith, Beacon Pathway Research Team Leaders

ABSTRACT
A framework is presented in this report to assist water supply authorities and councils in developing a demand management strategy. It draws on information gathered through research, surveys and workshops with a number of councils. The framework is not prescriptive but recognises that each council needs to consider what to do and how to implement demand management interventions, according to their own local context.

The report also guides the reader through the information needs and decision making processes, involved in demand management. It outlines many of the interventions currently available and makes the case for the benefits of water conservation.

REFERENCE
Lawton, M. Birchfield, D. Wilson D. Slowing the Flow: A Comprehensive Demand Management Framework for Reticulated Water Supply.

Contents

SECTION ONE

Introducing the Demand Management Framework

About the Demand Management Framework

The Demand Management Framework is a guide, intended for water supply managers and authorities that wish to decrease the demand for reticulated water in their locality.

It is not prescriptive but offers a range of approaches that can be adapted to the specific context of each city or district. The Framework provides a pathway for working through the range of issues, options and policy considerations to develop a demand management plan to meet required outcomes. Examples of how the Framework has been used and could further be applied are woven throughout the document.

The Framework has been developed through research on water demand management in New Zealand and overseas, in particular in relation to policy required to promote uptake. It is supplemented with information gathered through a series of demand management council workshops where council staff considered what demand management approaches best suited their particular locality and situation. A full report on the research "Best Practice Water Efficiency Policy and Regulation" (Lawton et al, 2008), with many examples of demand management approaches and a comprehensive set of references, can be obtained on the Beacon Pathway website, www.beaconpathway.co.nz. Networking with other councils engaged in water demand management is also highly recommended.

It is anticipated that the Demand Management Framework can be of assistance to councils in addressing a requirement of the proposed National Policy Statement on Freshwater Management which for Territorial Authorities includes:

"Sustainable management of demands on fresh water in a manner which has regard to available supply of fresh water and adverse effects, both individual and cumulative."

That and other requirements of the proposed national policy statement should be welcomed by councils as it gives direction and guidance on managing one of New Zealand's most valuable resources. The National Policy Statement is a first step in terms of legislation but other changes will be required at all levels of governance to make policy more enabling in support of demand management strategies and plans.

Why Consider Demand Management

Globally there is a diminishing availability of fresh water supplies for people, produce and ecology. In New Zealand we are in danger of over-allocating water in some regions and limiting future uses for people and the environment with serious consequences. Water is a key strategic advantage for our country. Even though reticulated domestic supply only comprises 9% of total water abstracted (MfE, 2007) there are many additional reasons to conserve water.

Supplied by D Birchfield

Benefits of Demand Management

There is a wide range of benefits from water demand management interventions. Some of the principal benefits of improving water use efficiency and demand management are related to cost savings which include the following:

- Saving on capital costs through delaying or eliminating new infrastructure development.
- Achieving cost savings in wastewater management through reducing the water that goes through the system.
- Saving costs associated with energy through reducing in-house hot water use.
- Saving costs associated with energy and maintenance in both the treatment of water to a potable standard and its reticulation.
- Saving energy and maintenance costs in the reticulation and treatment of wastewater.
- Delivering customer benefits from lower water and power costs.

Other benefits of a demand management programme include the promotion of resilience in the overall system, in particular caused by unexpected and extreme climate events. Some of the resiliency benefits include:

- Reducing competing demands for water in parts of the country where water resources are constrained.
- Reducing the need for further large water supply systems which cause changes to the water cycle and do not operate in harmony with natural water cycles and water catchment boundaries.
- Anticipating potential climate related changes and resulting water cycle disturbances and the need to improve the resilience of our supply system to cope with greater variability in climate patterns (McCarthy, 2001).
- Reducing the contribution of leaks and spills from wastewater on declining water quality in New Zealand.
- Recognising that some water sources are not renewable in the short-term, for example groundwater is generally non-renewable for practical purposes.

Urban water supply provision clearly also has social implications with demand management offering several benefits:

- Ensuring customers' expectations that alternatives to major capital works have been investigated when a major new water supply source has been signalled as required.
- Being a good global citizen. Globally more than a billion people lack access to clean, safe water. While New Zealand's water use doesn't directly impact on other countries' water use, the trend toward valuing water and reducing wastage needs to be acknowledged.
- Councils are required to adhere to the principles of the Local Government Act to think sustainably across the four pillars of wellbeing – cultural, environmental, economic and social.
- Giving meaning to section 5 (2a) of the Resource Management Act.

Supplied by M Lawton

"Negotiating a rough patch"

The Demand Management Framework outlines the many considerations required in developing a demand management plan. From discussions with councils across the country, and Beacon's research, the following ingredients for the preparation of a demand management plan emerged.

Council processes in developing the plan are important. The plan needs to be inclusive of those that will contribute to its implementation. There needs to be senior management level commitment and a champion appointed that can drive the process, especially if it hits a rough patch.

It is helpful to engage council officers from across council in discussions and workshops on demand management approaches. Each section of council will have its own perspective and experiences to contribute. Getting multiple perspectives will also ensure that implications of potential policies will be identified. Engineering, planning, community outreach and consenting processes all need to be aligned or the end-user or ratepayer wanting to try something innovative will get mixed messages from different parts of council.

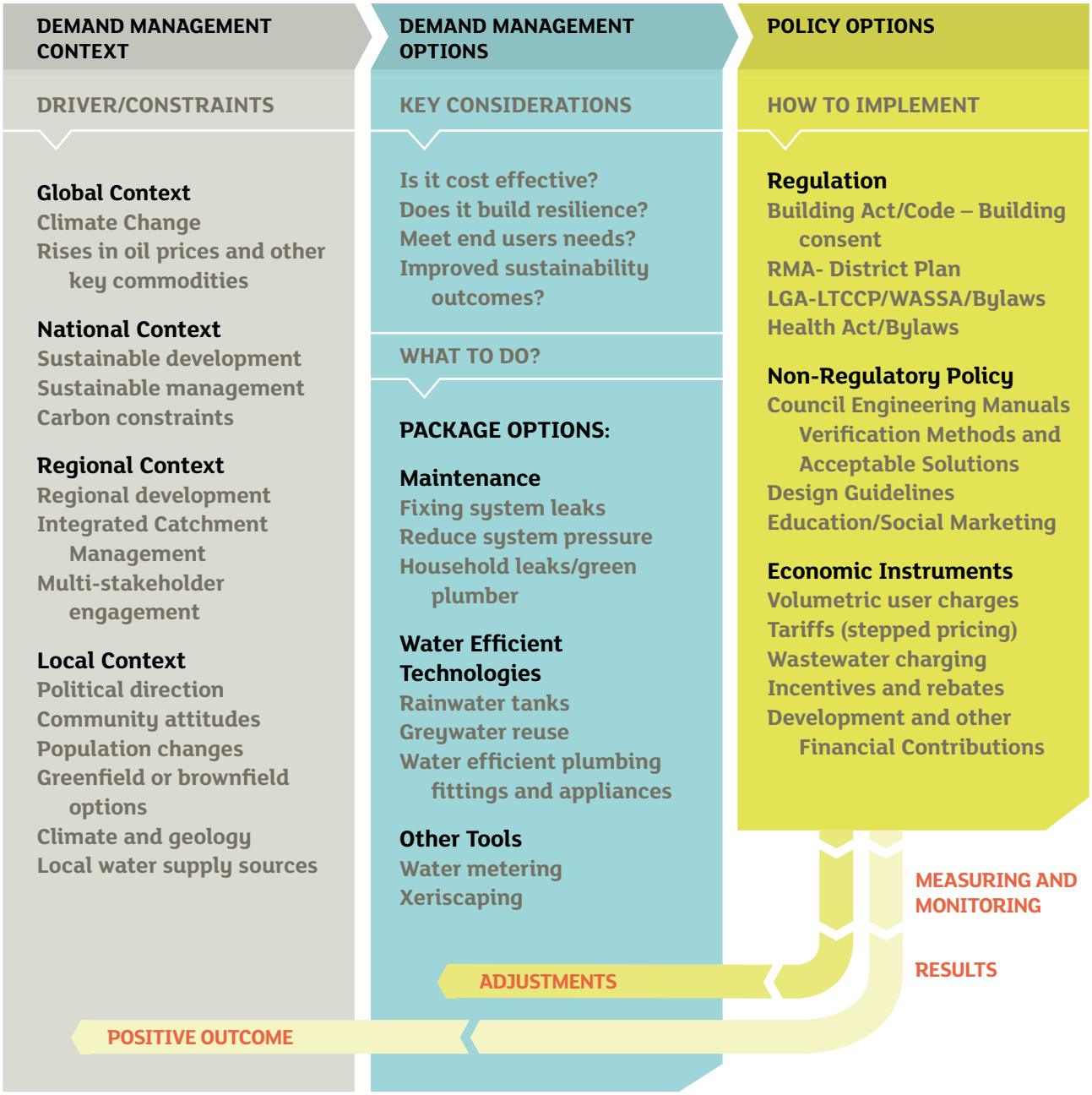
In defining a vision for the water system of the future for the city, strategic targets and goals can be included, built on a commitment to conservation and sustainability.

To develop a demand management plan three distinct areas of consideration are helpful. They consist of:

- Analysis of the context, local and beyond, for demand management decision making.
- Analysis of the various demand management options.
- Analysis of the regulatory and other policy options.

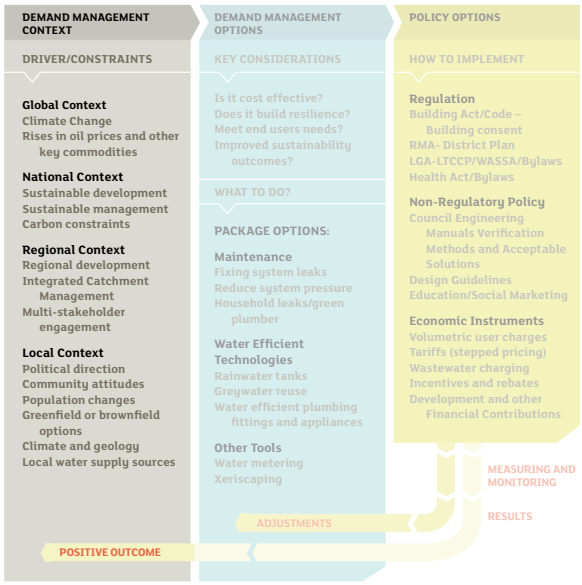
The way those three components are integrated are shown in The Water Demand Management Framework with each component described in more detail in the following text. Examples of how the framework is applied is shown in the "Council Context" boxes throughout the report.

The Water Demand Management Framework



SECTION TWO

The Demand Management Context



The Context for Demand Management

Setting the context includes thinking about the drivers and constraints in the water supply system.

While a demand management plan will reflect the local context, considerations at those larger scales are increasingly driving local policy. Given the long lifetime of water infrastructure it is worth anticipating how external influences will impact on regional and local conditions, not just immediately but in 5, 10, 50 and 100 years time.

Global Context

Global drivers of resource conservation, particularly applicable to New Zealand, are the rising cost of oil and climate change. The first will drive up the costs of supply and the second will impact on the resilience of the supply network, both water availability and the impacts of weather extremes. Future planning of water supply will most certainly need to acknowledge the increasing effect of these global drivers and how they will impact on different parts of the country.

National Context

National drivers include the need to remain competitive in world markets as the squeeze comes on many resources. Water is New Zealand's competitive advantage so it makes good sense to increase its protection for public good as well as commercial use.

Using resources wisely is also a core plank of sustainable development, a concept already underpinning much of our legislation and government policy.

Supplied by M Lawton

"Water; New Zealand's competitive advantage"

Government Sustainable Development Programme of Action

At the national level the current Government's Sustainable Development Programme of Action (SDPoA) outlines an expectation that a shift towards more sustainable behaviour must be reflected in the way resources are managed. Relevant to water are the SDPoA policies and principles for decision making which include:

- Seeking innovative solutions that are mutually reinforcing, rather than accepting that gain in one area will necessarily be achieved at the expense of another.
- Decoupling economic growth from pressures on the environment.
- Respecting environmental limits, protecting ecosystems and promoting the integrated management of land, water and living resources.

(Department of Prime Minister and Cabinet, 2003).

Regional Context

Each region has its own development pathway of which water is an underpinning element. The fair allocation of water between many stakeholders, including the need to maintain satisfactory environmental flows, is a critical task of regional government. With water in several parts of the country already fully allocated, managing demand becomes critical. Many councils are developing catchment management plans to ensure that all aspects of the natural and anthropogenic water cycles are considered and integrated. The proposed National Policy Statement on Freshwater Management requires that domestic water supply be considered in that mix.

NPS Policy 1

"By the second anniversary of the date of commencement of this National Policy Statement, every regional council must notify, in accordance with Schedule 1 of the Act, a proposed regional policy statement or variation to a proposed regional policy statement or change to its operative regional policy statement in order that as soon as practicable thereafter every regional policy statement specifies objectives, policies and methods which:

(i) Guide and direct regional and district plans (including considerations for the determination of resource consent applications and notices of requirement) to manage demands for fresh water, including demands arising from Land-use Development and discharges of contaminants, in a manner which –

(ii) Provides priority for reasonably foreseeable domestic water supply, over other competing demands, provided that appropriate demand strategies are established for such supply."

68%

of councils report they are using water conservation methods

Local Context

For most domestic water suppliers the local context is what has generally driven their response and clearly context is very variable across the country. That is the critical reason why there is not a "one size fits all" response to demand management and that local operators should develop a demand management plan that meets local requirements. More than ever however that plan has to take note of the drivers at the regional, national and even global scales. Research suggests that councils across the country are facing significant water supply challenges. A survey of 42 local councils indicated that:

- 68% are using water conservation methods with the majority focused on education.
- The main driver to consider demand management is water supply constraints, followed by the wish to lower infrastructure costs, and thirdly to minimise environmental impacts.

The proposed National Policy Statement allows for future increases of water take for direct human use but not without a caveat. Councils will need to show how their planning will ensure the wise use of water; they must meet the needs of their communities, taking into account all local social, environmental and cultural interests.

NPS Policy 3

"--each territorial authority must notify a proposed district plan change or variation in order that as soon as practical thereafter every district plan gives effect to the regional policy statement and

(i) *Includes rules to require that all relevant land-use and subdivision consents granted after the commencement of this National Policy Statement includes conditions for:*

(ii) *Sustainable management of demands on fresh water in a manner which has regard to available supply of fresh water and adverse effects, both individual and cumulative-"*

Supplied by D Birchfield

"Define the critical issues for the area"

Key Local Factors to Consider

Councils operate within a range of geoclimatic, social and economic contexts and other localised factors that will have a bearing on decision making. Contextual factors include:

- Political direction –whether the council has adopted sustainable development as a general principle and how receptive the council is to trying new approaches.
- Community attitudes.
- Environmental protection – defining the critical environmental issues for the area.
- Governance – whether the water supply system is under the jurisdiction of the local council or there are shared supply arrangements.
- Population – seasonal fluctuation and the rate of population change.
- Greenfield construction or intensification with renovations – providing differing opportunities for demand management.
- Climate and geology – the average and seasonal rainfall distribution and permeability of the soils.
- Current domestic water use if data is available.
- Current infrastructure, leakage rates and water pressure.

Each of those factors will have a bearing on how to approach demand management, where to make the first wins and how best to invest time and financial resources.

SECTION THREE

Demand Management Options

Key Considerations

Having analysed the context, there are some other overarching considerations to check any approach or intervention against.

Cost Effectiveness

Identifying low hanging fruit, getting quick low cost runs on the board, will give any demand management plan a boost. An example may be working with one major user, an industry or a landlord, to help them reduce unnecessary use. Pressure reduction may be the maintenance approach which has most impact. Or for some, it could be a new approach to water charging. Going beyond inexpensive demand management interventions requires a detailed analysis of the costs and benefits of reducing demand against a future new supply and working out an annual demand management budget which is on the right side of the ledger. Ensuring that all the costs and all the benefits, financial and where possible social and environmental are considered, is critical.

Building Resilience (having a backup supply)

With increasing demonstration of the potential impacts of climate change, resilience against natural disasters is being reconsidered in some areas, in terms of storm return periods and potential droughts. Centralised water supply, while having been the mainstay of urban infrastructure for many decades, does have the disadvantage of putting all the eggs in one basket. In proposed new developments it makes sense to consider the benefits of a secondary supply source, whether on a community or individual building basis. This both reduces overall demand on the infrastructure and gives a back up supply if storms damage domestic supply pipes.

Meeting End-user Needs

End-user needs must be met but the question of how to agree on the level of service with the community may not be simple, unless faced with immediate water shortages. There are policy processes such as the Long Term Council Community Plan (LTCCP) which

Supplied by David Killick

should be used to initiate that conversation. However if significant demand management interventions are planned, a raft of educational activities and information sources will be required.

Improved Sustainability Outcomes

Not just financial but also improved environmental and social outcomes should be expected from a package of demand management interventions. Consideration should be given to cultural wishes which, for example, may not favour the transfer of water from one major catchment to the next.

Table 1 summarises some suggested priority approaches for councils when considering demand management. They are explained in more detail in the text boxes of examples given throughout the document. Note that some approaches such as metering would be useful for all councils but should definitely be included in all greenfields developments. Education on demand management is however a necessary activity for all situations.

		GREENFIELDS	RETROFIT	DRY SUMMER CLIMATE	LACK OF COMMUNITY AWARENESS OF WATER CONSERVATION	IRRESPECTIVE OF COUNCIL CONTEXT
DEMAND MANAGEMENT INTERVENTIONS	WATER METERS	✓				✓
	RAINWATER TANKS	✓		✓		
	GREY WATER RECYCLING	✓		✓		
	PACKAGES OF WATER EFFICIENT TECHNOLOGIES		✓		✓	
	MAINTENANCE		✓		✓	✓
POLICY APPROACH	REGULATION	✓				
	DESIGN GUIDELINES	✓		✓	✓	
	EDUCATION	✓	✓	✓	✓	✓
	INCENTIVE FOR HOUSEHOLDERS		✓		✓	
	PRICING MECHANISMS		✓	✓	✓	
	DEVELOPMENT CONTRIBUTION REBATE	✓				

Table 1: A summary of recommended interventions and approaches.

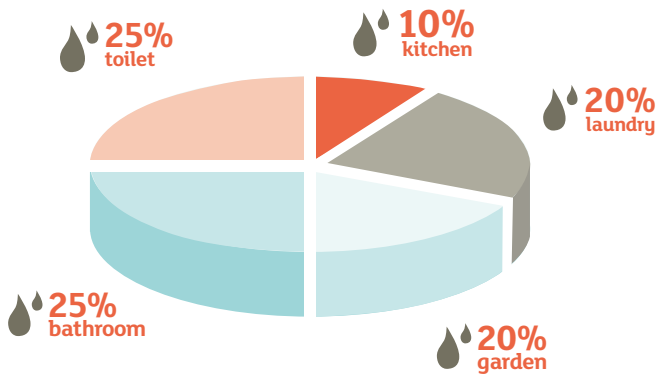


Figure 1: Typical Home Water Use

COUNCIL CONTEXT

Generic Approaches For All Councils

Irrespective of council context

All councils will benefit from some common approaches irrespective of their local context. Demand management is relevant to all councils regardless of size but for small councils the resources may be more difficult to find. Networks across councils to share tasks can be helpful, as can engaging volunteer contributions if available through service clubs or from retirees.

Having a champion or champions in council is essential to overcome some of the perceived barriers to demand management. It is a departure from “Business as Usual” and will take extra time and energy, especially in the early stages.

Priority actions

Develop a plan for demand management which takes note of local climate data and geology and projected population changes. The importance of a plan is to ensure that demand management interventions are not ad hoc and collectively contribute to goals and performance targets for water use efficiency. The plan will also be a response to the requirements of the proposed National Policy Statement.

Consider how to introduce meters if they are not currently used. While not a complete answer there is substantial evidence of their effectiveness in reducing water use, both here and overseas.

Policy approaches

A priority council policy must be to ensure that ‘unaccounted for’ water is minimised. While it is understood that it isn’t an easy task, it is unlikely that water consumers would understand why they should be water use efficient if the water supply infrastructure has a high leakage rate. Knowing what water is unaccounted for is made considerably easier when domestic and commercial water use is metered.

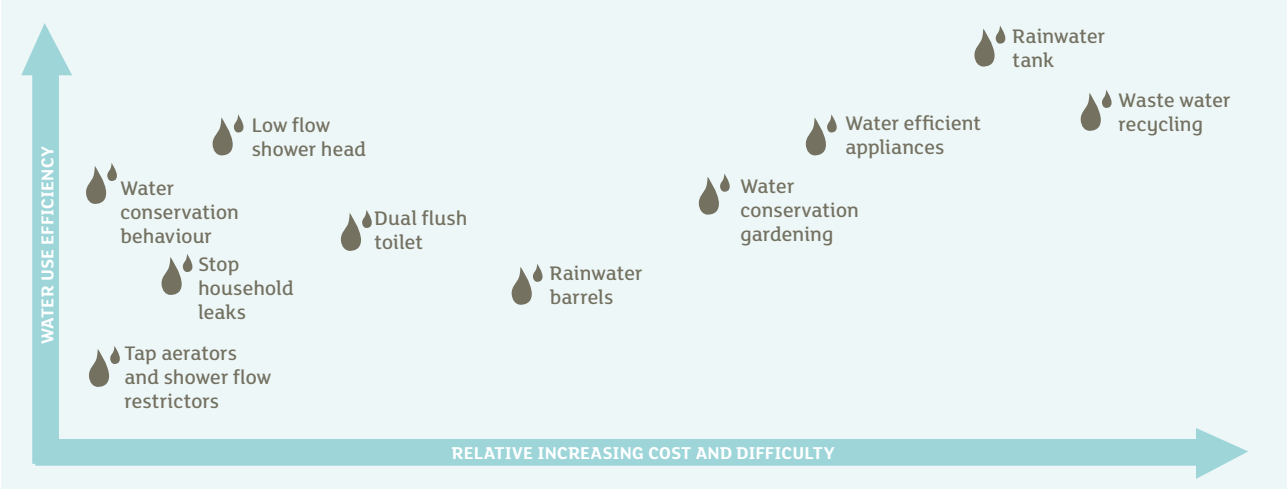


Figure 2: Estimation of effectiveness of interventions against main barriers to uptake

Demand management of the supply infrastructure can be approached through the use of more water efficient technologies such as plumbing fitments and appliances, through supplementing water supply on-site or at a local scale and through changing water use behaviour. Optimised maintenance of the pipe network also reduces demand. Interrogation of water supply data will help show where most gains can be made.

Maintenance and Infrastructure Management

The place to start a demand management plan is with maintenance. The critical maintenance interventions include:

- Fixing system leaks within the pipe network.
- Assessing water pressure reduction possibilities.
- Programmes to encourage end-users to fix household leaks.

There is no required minimum leakage rate in New Zealand as in some countries. However a 10% leakage rate is a target that should be achievable. Sydney Water's leak reduction programme saved the city 18 billion litres of water between 2005 and 2006 while installation of low-flow water devices into households delivered a further 6 billion litres in savings (Sydney Water, 2006). Reducing the unaccounted for water may be the highest priority for some councils. Waitakere City Council has successfully used pressure reduction as a tool in reducing leakage rates. Pressure reduction also reduces water use within the home through reducing flow rates. Ensure council's own water uses are efficient.

Often household leaks go unchecked, especially where water use isn't metered. Some councils have a "green plumber" freely available on request to carry out simple tasks such as changing leaking washers.

Water Efficient technologies

It would make sense if all homes were fitted with the most water efficient devices. However there is no legislation to ensure that, so councils need to consider how to introduce these devices to a sufficient number of new and existing households to make the required difference. WELS, the Water Efficiency Labelling Scheme, scheduled to be introduced soon, should assist in driving the uptake of these technologies. The WELS water rating label will be similar in appearance to the energy rating label and will be used on all new appliances.

Some in-house and supplementary water supply technologies can be graded in terms of the ease of implementation versus their impact. (Figure 2).

For overall resource efficiency, generally the intervention to target is low flow shower heads. They save water and energy. Low water use toilets also offer good value for money. The above analysis and figures shown in table 2 are subject to variations in costs and actual savings. It illustrates savings that can be expected when water efficiency products are introduced into a "standard" home.

Proposed WELS Rating Label

The Methven SatinJet® Low Flow Showerhead

PRODUCT	COSTS $	COST WITH INSTALLATION	WATER SAVINGS % OF TOTAL TOTAL USE	ACCUMULATED WATER SAVINGS % OF TOTAL USE
Gismo (modifies the toilet flush)	2		5-10	5
Tap Aerators	10		5-10	10
Outdoor hose washers	2		2-5	12-15
Low flow shower head	75	150	10-15	22-30
Dual Flush Toilets	225	300	10-15	27-40
4 Star rated washing machine	1200		10	37-50
Add a Rain barrel 400 litres	300		5-10	42-55
Or a Rain tank 4500 litres	4000	4500	40-60	75+
Or a Wastewater recovery system	3000	4000	20-40	60+

Table 2: Water efficient products with average costs and expected savings

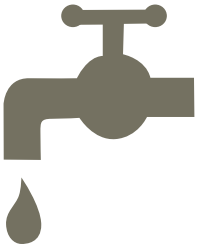
This table demonstrates that significant reductions in domestic reticulated demand can be achieved if the most water efficient products are used.

Low flow shower heads will typically reduce water flow from 15 to 20 litres/per minute to 7 to 9 litres per minute, saving as much as 50 litres of water on a six minute shower. Good performance low flow shower-heads help reduce water use but don't lower shower head pressure. They should preferably have a water rating of at least AAA or four stars or more on the proposed WELS system. An alternative to putting in a new shower head is to use a shower flow restrictor, a device which fits in the arm of the shower head and restricts water flow, a very cheap and easy way to save water.

In the past 10 to 20 years there has been a significant increase in the number of dual flush toilets being installed. Dual flush toilets use between 3.5 and 5 litres per flush compared with older single flush standard toilets that use up to 15 litres per flush. Toilet flushing typically makes up between 20 to 30% of a person's daily domestic water use, therefore any reduction in the amount of water in a flush can have a significant impact.

Appliances such as dishwashers and washing machines have made significant improvements over the last decade. A four star rated appliance will ensure a high level of water use efficiency.

Councils can encourage consumers to choose more efficient appliances, either by offering a small rebate for selected brands, or else by running promotion with opportunities to win those products.



40%

potential reduction in mains water supply by using a secondary onsite water supply

On-site Water Supply

In many parts of Australia the drought has driven the need to consider a wide range of initiatives to reduce demand including the mandatory requirement for new dwellings in some areas to have an urban rainwater tank as a supplement to mains water supply. There are incentives in place to reduce the cost of this purchase for new and existing homes. Demand for rainwater tanks has been very high as water restrictions have severely limited garden watering from the mains supply. Australia has had to react to a crisis. New Zealand has more time to plan its demand management interventions but on-site supply has a part to play in not just reducing overall demand but also providing a back-up supply if mains infrastructure is disrupted.

The Australian drought has seen a rapid increase in the availability in Australia of rainwater tanks of various shapes, sizes and materials, suitable for small urban sections. Some of these are being imported and local New Zealand manufacturers are starting to manufacture urban rainwater tanks here.

There is a wealth of material on choosing rainwater tanks, the critical point being to size the tank for the climate, roof catchment area and end uses.

Rainwater tank sizes and styles include:

- Large 25,000 litre tanks that have been routinely used in rural areas. The cost is around $3000 plus pump and installation.
- Smaller tanks ranging from between 1,000-10,000 litres, the slimline “urban rainwater tanks”. The cost is between $1,000 to $4,000 plus pump and installation.
- Rain barrels which are small but simple tanks which hold up to 300 to 400 litres. They can be used without a pump and do not require installation and retail at around $300.
- Dual purpose rainwater tanks for stormwater detention and to supplement supply.

Kapiti Coast District Council has done much of the groundwork for on-site supply, paving the way in terms of policy, modelling the impacts of interventions, providing documentation, holding public consultation and developing the industry links required to implement on-site supply. The council is always keen to share their experiences. North Shore City Council has also explored the use of rainwater tanks with a focus on stormwater detention and the added benefit of some on-site supply.

Rainwater harvesting and greywater reuses are especially useful where outdoor water use is high. They can complement each other. Greywater reuse, although more limited in terms of use within the house, is better at reducing the summer peak- water use by being available when rainfall is negligible.

The benefits of a secondary on-site water supply are numerous but include:

- A potential reduction in mains water supply of up to 40% per household used for outdoor and non-potable indoor use, depending on roof size and climate.
- A subsequent reduction in the need to utilise treated water for non-essential applications such as outdoor uses, flushing toilets, and clothes washing.
- Improved on-site stormwater management.
- Increased overall supply system resilience and back up in the event of a natural disaster or emergency.
- Cost effective and proven technologies.
- Reduction of summer peak load especially through greywater recycling.

Supplied by Tanks Alot

A rainwater tank can reduce outdoor demand over the dry summer period

COUNCIL CONTEXT IS:

Low summer rainfall and high outdoor water use

Areas of the country with low summer rainfall have a higher summer water use, mainly for watering gardens. Free draining soils add to the amount of water required to meet outdoor needs. Standard hosepipe use can add 500-1000 litres per hour to household use so outdoor use is required. To add to the pressure on water supply, peak water use is often at the time of year when dam levels are at their lowest. Some councils respond by implementing temporary water restrictions to help reduce demand. That is a blunt tool but relatively simple to introduce.

Priority Actions

A combination of xeriscaping with rainwater harvesting and greywater recycling can make a dramatic difference to outdoor use.

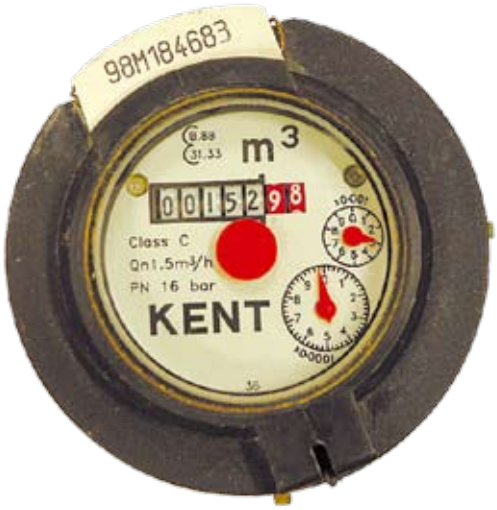
Policy approaches

Legislation will be required, preferably a District Plan change for rainwater tanks and greywater recycling, to achieve significant uptake targeted for new developments. A rebate on development contributions could be considered.

Developers can be encouraged to set the best scene for xeriscaping through their landscaping of new sub-divisions. A Code of Subdivision Practice or other similar written material which promotes low water use gardens should be provided.

Some jurisdictions overseas use a higher tariff rate for outdoor use. However that requires a means of metering outdoor use separate from overall use.

One-on-one advice is an effective form of education. Consider a “Green Gardener” trained in landscape design or similar to assist homeowners to develop their sections to meet their needs in the most water sensitive way.



Supplied by Nelson City Council

Other Tools

Water Metering

Most councils, whether currently metered or not, acknowledged that while metering is not the total answer, it is still an important tool in implementing domestic water supply demand management. It raises awareness of water use and the value of water with customers, enables a volumetric charging system to be introduced and also enables the total domestic supply to be measured and hence unaccounted water identified.

Xeriscaping and Garden Irrigation

Outdoor water use accounts for a higher water use than inside the home in some parts of New Zealand, especially over summer. Not only is it a waste of treated potable water but in areas where the water is chlorinated it can, over time, have a detrimental effect on local ecosystems. Xeriscaping means matching the garden to the climate and landscape conditions. Plants are chosen for their ability to withstand dry conditions. Drip irrigation, applied when surface evaporation is low, combines with good plant selection, to minimise outdoor water use.

Xeriscaping is a simple concept but needs nurturing. In addition to providing a "green gardener", sponsoring a stand at 'Home and Garden' shows is an opportunity for councils to provide design advice to many people in a short space of time.

All council irrigation services should be reviewed to ensure they are water efficient and provide an example of best practice.

For those interested in learning more about potential savings and success rates for various demand management interventions, the text book, "Handbook of Water Use and Conservation" by A Vickers is recommended.

Water Metering Case Study
Nelson City Council

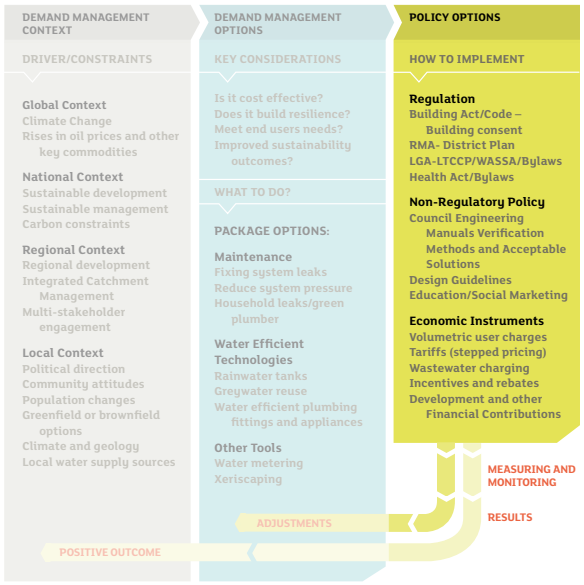
Nelson City Council adopted universal water metering in 1996 with a capital programme installing meters into every property. The meters have been in place since July 1999. The maximum two day average water use figure in 1997/98 was 42,000m^3/day, whereas the peak since universal metering has been in operation is less than 35,000m^3/day (Nelson City Council, 2006).

Reducing the summer time peak demand was a key imperative for Nelson City Council and was the basis for the Council's decision to meter household water use. Nelson had plenty of water capacity for its winter supply period when water use was low, but needed an intervention that would change water use behaviour in the summer. Nelson determined that the additional summer water demand was being driven by outdoor sprinkler use and to cater for the high number of tourists coming into the town. Failure to implement a water reduction measure would require 100% extra capacity to allow for summer peak use, which is only approximately 10% of the year.

The initiative has paid off; Nelson estimates that the utilisation of water metering has decreased water use and that water savings at peak times of over 37% have been achieved.

SECTION FOUR

Policy Options



Deciding what approach has most value for the local context is the easy part. The real issue is how to get the required change.

Improving council's in-house water supply performance will be the most straightforward initiative to implement from a policy perspective, not requiring wide community consultation or behaviour change. Reducing leakage rates and optimising pressure are primarily engineering issues which can be scheduled as time and finances allow.

Other demand management interventions require more lateral thinking, time and financial resources. They may be achieved through non-regulatory policy or they might require a legislative route to make them mandatory. The mandatory route has generally not been used, with councils preferring education as the main form of gaining uptake. However, given a lack of awareness of the value of water and the weak price signals to save water, the only way at present to be certain of making the gains available from the use of some water efficient technologies is to make them mandatory.

Supplied by D Birchfield

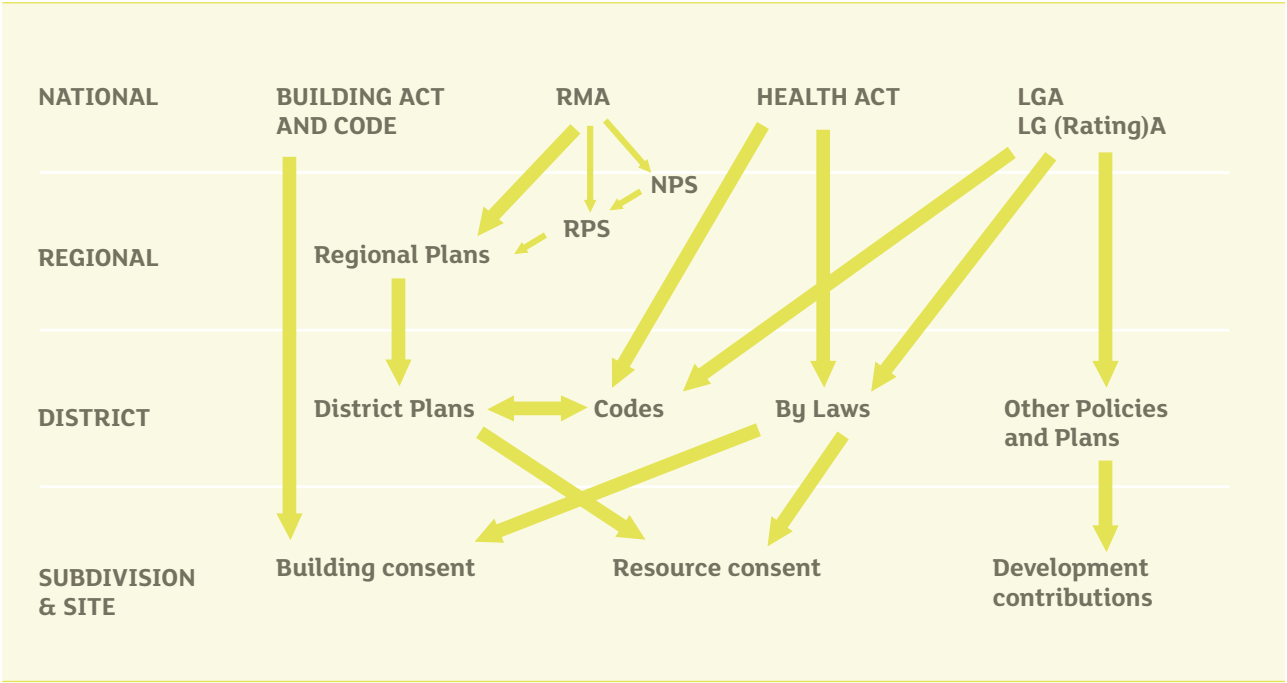


Figure 3: Legislation that impacts on domestic water supply

Regulation

The legislation that impacts in some way on domestic water supplies is complex, as depicted in figure 3. No one Act covers domestic water supply and the boundaries between Acts are sometimes blurred.

The Building Act (2004) does not currently include interventions via the Building Code which would directly assist water demand management. The Local Government Act (2002), (LGA) could be used to raise community awareness of the value of water through the LTCCP process. The Water and Sanitary Services Assessment (WASSA) could be used to signal the need for demand management, as could the asset management plans. By-laws which can be enacted under the LGA and The Health Act are not considered effective or relevant enough to demand management to make water efficient products mandatory although the Water-By-Law can be used by at least one district council to incorporate a "rule" in the district plan which requires a certain intervention to gain code compliance for new or significantly renovated homes requiring a building consent.

Of some concern is that the RMA might not be able to impose a performance standard higher than that decreed under section 18 of the Building Code.

Supplied by D Birchfield

The Waterstone subdivision in Kapiti is the first in the country to include both greywater and underground rainwater tanks on each lot

However Kapiti Coast District Council is using the RMA through their proposed District Plan Change 75 to require a level of performance not specified in the Building Code. Indeed there is also legal opinion to indicate that the RMA has influence over aspects of building performance if the case is well made.

"--in the absence of clear authority to the contrary, it is apparent that local authorities will be able to introduce rules to ensure that sustainable management of natural and physical resource even if these directly influence the construction process." --"Carefully drafted rules, emphasising their valid resource management function are likely to be safe from legal challenge despite s18 BA04," (**Warnock, 2005).**

As yet the District Plan approach has only been used when the situation needs a radical change, given the level of justification for its introduction required under section 32 of the RMA. Therefore it has been used for rainwater tanks and greywater recycling systems for new homes which have potentially large water savings. Without the mandatory requirement for these interventions, cost would mean that their uptake would be relatively low. Only their mandatory provision would allow councils to plan for the savings that they can deliver.

Supplied by D Birchfield

Underground rainwater tanks at Waterstone

Kapiti Case Study: Mandating for Rainwater Tanks and Greywater Systems

Kapiti Coast District Council is the first council in the country to regulate specifically for a demand management intervention via its District Plan. Below is the wording from the plan change which is currently notified and has been through the submission process. Kapiti is also developing a Code of Practice for greywater systems to support its plan change.

Under the Residential Zone Rules and Standards section of the plan it states:

ADD a new rule to.... Non-Complying Activities

All new or relocated residential dwelling units unless they are provided with a rainwater storage tank complying with the Water Demand Management Permitted Activity Standard.

ADD a new standard to.... Permitted Activity Standards

(i) All new or relocated dwelling units shall install one of the following:

a) Rainwater storage tanks with a minimum capacity of 10,000 litres for the supply of non-potable water for outdoor and indoor toilets.

b) Rainwater storage tanks with a minimum capacity of 4,500 litres for the supply of non-potable water for outdoor and indoor toilets, and a greywater re-use system for outdoor irrigation. The greywater re-use system shall comply with SAI Global standard ATS 5200.460:2005 or equivalent and shall re-use all water from bathrooms (excluding toilets) and laundries. It shall be installed in accordance with New South Wales Government standards specified in part B of Guidelines for Greywater Re-use in Sewered Single Household Residential Premises.

Supplied by D Birchfield

While a District Plan change is regarded as the most effective way for a council to introduce rainwater tanks, or other water saving products, the success of that approach would depend significantly on the local context and the strength of the case for water conservation. With case law in the making there is no guarantee of success and it is worthwhile seeking legal advice before investing too much time and effort.

Public Health, Water Supply and Managing Demand.

Water supply and wastewater disposal have a long-standing connection with public health and therefore the Health Act (1956) also plays a role in managing water demand.

There is only a minimal reference to public water supply within the Health Act, with a requirement under section 39(1) for all dwellings to provide access to "an adequate and convenient supply of wholesome water". However, local health authorities generally have a less than favourable view on the use of rainwater tanks. Their concerns relate to preventing backflow into the municipal infrastructure and ensuring people don't drink or bathe in water which isn't treated to potable standards. These are technically straightforward requirements to address.

There are many forms of greywater recycling systems for outdoor use only or also for toilet flushing which can be designed to meet health requirements. The value they add in taking the peak off high summer water usage suggests that they should be given serious consideration in dry summer climates, especially for outdoor use. Again there are likely to be health related requirements but they are not insurmountable barriers.

Non-regulatory Policy

Besides the use of regulation there is a range of other policy and strategy related documents that can be used to signal and promote demand management solutions. These include:

- **COUNCIL ENGINEERING STANDARDS.** Engineering Standards give guidance on "how to build". They are not RMA or Building Act documents but rather local council infrastructure standards and can be changed by resolution of council. They are normally referred to in the District Plan, that is, the development must comply with the council engineering standards but the standards themselves are not part of the Plan.
- **VERIFICATION METHODS AND ACCEPTABLE SOLUTIONS.** Verification methods and acceptable solutions are contained in the Department of Building and Housing's Compliance Documents, the Building Code and often quote other documents such as New Zealand Standards. The Verification methods and acceptable solutions provide one way of establishing compliance with a particular clause of the Building Code.
- **PRACTICE NOTES AND DESIGN GUIDELINES.** These are less formal guidelines than council engineering standards and generally have a collection of design guidelines for specific technologies such as rainwater harvesting, stormwater rain gardens or swales.

Any documentation that adds clarity to council requirements will assist in getting uptake of demand management interventions. It also makes sense for councils to build on the documentation of other councils, rather than individually re-inventing the wheel. Building consensus over politically sensitive issues can take time but the LTCCP is the community engagement process that can be used for that debate.

Supplied by Kapiti Coast District Council

At the Kapiti Home & Garden Show with a household water use display

COUNCIL CONTEXT IS:

Low community understanding of water value and domestic water systems

Some communities may have a very low understanding of the need to conserve water or the costs in supplying it. There may be strong opposition to metering or volumetric pricing.

Priority Interventions

Prepare a comprehensive information package for council and the community which outlines the benefits of water conservation and 'if required' removes concern about water privatisation. Pilot packages of low cost technologies as part of an education campaign will give information on household use and attitudes and provide a basis for decisions on further technologies to target.

Having examples of what works that people can see and discuss is also valuable, so use any opportunity to showcase a water efficient building, whether it is a new council facility or through working with a developer on a sub-division with water efficient features.

Policy Approaches

Do the sums on the next water supply and 'if practical' make an environmental, social and cultural assessment of effects. The costs or savings if the supply wasn't required can form the basis of an annual budget for demand management.

Rebates and incentives can be part of low-cost technology packages. The package could include tap aerators and outdoor tap restrictors, a 'gismo' for older toilets and possibly a low-flow shower head. Another option is a rain barrel for outdoor use.

Targeting selected groups can be effective, working with schools, business clusters or landlords with significant holdings to develop a water demand plan to meet their needs.

Supplied by M Lawton

Save water, bathe with a friend

Education / Social Marketing

Education or awareness raising is an important aspect of water demand management and is by far the most common approach to change water use behaviour in most developed countries. Even where homes have water efficient fitments and appliances, the way those technologies are used will have a substantial impact on their performance so reinforcement of the need to conserve water will be required. Some examples of education approaches include:

- School programmes – using the school as a laboratory or through involvement in stream restoration or other parts of the water cycle as an introduction to value the resource. Develop teaching modules for schools, particularly for primary school level, to educate children about the water cycle and efficient water use.
- Several New Zealand councils and central government have Water Wise websites, www.smarterhomes.org.nz
- Community activities – either focused on water issues or wider sustainability issues. Project Twin Streams in Waitakere has recently been extended to include water demand management through a community development approach.
- Booklets, flyers and other promotional material are sometimes included with the rates bill. These materials focus households on opportunities to save water and, in areas where there is a volumetric charge, financial savings. Posters on saving water can be displayed at the council or in libraries.
- Funded in part by the Sustainable Management Fund, eight New Zealand councils now have Eco-Design Advisors who provide a free service for people intending to renovate, extend or build a new home who are interested in being more energy or water efficient.

Supplied by D Birchfield

A Greenfield subdivision

COUNCIL CONTEXT IS:

Expanding population and greenfields developments

A projected increase in population gives a council considerable opportunity to encourage innovation in water services in new greenfields developments. Based on an assessment of product information and average water use behaviour, a new home with water efficient fitments and appliances and moderate, rather than frugal, water use could achieve 125 l/pp/pd for indoor water use.

Priority Options

Smart meters which enable homeowners to monitor the home's performance, water efficient technology and supplementary supply can all be considered.

Policy Approaches

Incorporation of some interventions within a District Plan gives most certainty of uptake. Otherwise they can be highlighted through Engineering Standards and Codes of Practice which form necessary background information that council must develop.

While community education and discussion are always important background activities to any policy change, the developer is the key stakeholder to work with in new developments. His or her concerns will be whether any extra cost can be recovered and understanding any risk or responsibility once the development is finished and whether there are any on-going maintenance requirements. Development contributions rebates can be used to assist the developer to off-set any initial extra cost.

Nelson City Council water treatment plant

Economic Instruments; Pricing and Incentives

The use of economic instruments in demand management has been to send a financial signal to domestic water end-users. Tools fall into the two categories of pricing or incentives. Pricing signals can make end-users consider whether the amount of water they use can be reduced while the incentive makes it easier on the pocket for them to reduce.

Volumetric User Charges

Volumetric charging for water provides a price signal that water has a value but first, metering is required.

The Ministry for the Environment estimates that water meters are compulsory in 12 of 74 territorial authorities (approximately 16% of councils) while only 11 councils actually charge for domestic water use (MfE, 2008). Given that Auckland councils are included in those being metered it means that close to 40% of the urban population of New Zealand now have water meters.

Tariffs

Tariffs also provide a useful pricing tool to send a water conservation signal. Section 19 of the Local Government (Rating) Act 2002 states that water can be charged for "according to a scale of charges", a stepped pricing system which rewards low water users and penalises high users is used in some countries but infrequently in New Zealand. Tariffs can moderate seasonal demand, or high outdoor. They can also take account of the ability to pay. The key is using pricing mechanisms to ensure that consumers have enough water to meet their reasonable daily requirements at a fair and equitable price while still encouraging water efficient behaviour. The flipside of this approach is the greater complexity in estimating revenues from water sales and working out the mechanics of how to charge for differing household sizes.

UK authorities were concerned to ensure that low income families, sometimes with several children, had the ability to pay when they are likely to be higher users of water. The UK dealt with that issue through the "Water Industry (Charges) (Vulnerable Groups) Regulations 1999", which caps the payment for water for certain families.

New Zealand has a wide variation of water use across the country, significantly due to outdoor use, especially in summer.

Wastewater Charging

The cost of treating and disposing of wastewater can be over double the cost of supply, making it the most expensive aspect of the integrated water system. Water supply and wastewater are directly related (unless the householder uses greywater recycling) as a large percentage of the water supplied to a household is subsequently discharged as wastewater. In Auckland City, charges for wastewater are based on 75% of total water supplied to the household while United Water in Papakura uses 80%. The introduction of wastewater charging can send a price signal that results in lower water use.

If homes are metered and already charging by volume for water, wastewater charging would appear to be an effective next step. It requires no extra technology or infrastructure, just a change in billing. However at present wastewater is not mentioned under the Local Government (Rating) Act as a service to which targeted rates can be applied for domestic dwellings. Only Council Controlled Organisations (CCOs), councils' trading enterprises, can charge for wastewater. A recommendation for councils to be able to charge for wastewater was made by a Rating Review in 2007 and is currently under consideration.

Incentives and Rebates

There are a number of ways councils can use financial incentives to promote demand management. The following list provides a cross-section of financial incentives available for council use:

- Consent fee waivers
- Financial assistance such as rebates and loan schemes for higher cost products
- Discounts on particular products and services or free products, usually the lower cost products
- Development contribution reductions

Incentives can be applied to encourage the uptake of more water use products, whether directly with the homeowner for existing home retrofits or with the developers for new developments.

Rebates or incentives can be very effective for some low cost products which may, with enough uptake, make a significant difference to local water demand. Some Auckland councils offer rainwater tank rebates. However such incentives, typically around $500 or even $1000 each, have not had much uptake. Clearly the size of the financial incentive offered needs to be substantial enough to influence the purchasing decision.

Low cost initiatives can include providing households with a free pack of tap aerators which once fitted can significantly reduce the throughput of water from taps. Waitakere City Council has provided discounts on a number of different water efficient products by teaming up with suppliers. Suppliers get good promotion and the council can reduce water demand with a minimal financial commitment. In Australia significant financial incentives have been offered in some states and these have been shown to drive widespread uptake of water efficient technologies and have driven substantial reductions in water use. Incentives and rebates in Australia are however, significantly higher than in New Zealand.

Tap aerators and rain barrels

Cheap and easy ways to save water

COUNCIL CONTEXT IS:

For Retrofit options

While new developments offer a clean sheet to apply new approaches, there are also opportunities to modify existing homes, commercial buildings and commercial and council practices.

Priority actions

Identify the top water use commercial water users and help them to retrofit and possibly modify their processes to reduce their water use. Start a schools' programme of retrofit and possibly supplementary rainwater supply linked to an education programme. Identify any landlords with large holdings in the locality and plan to retrofit plumbing fitments and fittings over an acceptable time period. Roll out a housing retrofit programme through targeting high users (if known through metering) or through community groups and associations.

Policy Approaches

Retrofit opportunities are not likely to come about as the direct result of regulation. Hence the mix of education and financial incentives is required.

Supplied by M Lawton

Rainbarrels on display at Waitakere City Council

Development Contributions

Under both the LGA (2002) and the RMA (1991), councils have the ability to require a development contribution from the developers of new houses and subdivisions. This fee is charged in return for these developments being able to access existing council services and infrastructure and the increase in demand that these place on such infrastructure. If a new subdivision can be shown to be able to reduce reticulated water demands through the use of water efficient technologies, a reduction can be made to development contributions to acknowledge the reduced demand on infrastructure requirements. So far this mechanism has not had a high degree of uptake indicating that more discussion is required with developers on what will best incentivise them to include low water use technologies.

Continuous Improvement

The framework for considering water use efficiency includes a monitoring and feedback loop. This allows programmes to be adjusted, added to, or reconsidered as required. To successfully do this the collection of baseline data at the outset is also essential. Monitoring isn't just a management tool; good news stories that emerge from successful demand management campaigns can provide valuable feedback to council and consumers on money well spent.

SECTION FIVE

Conclusions

The degree to which sustainable management of urban water supplies is achieved is a matter of political will, business or industry processes and consumer understanding.

The technologies required to reduce water use are generally readily available. It is the quantity and quality of our water conservation policy and regulation that is lagging behind and needs further development if they are to better support the adoption of those technologies.

The advent of the proposed National Policy Statement that promotes demand management is a significant advancement in terms of national direction. However given the complexity of legislation impacting on domestic water use, other avenues should also be explored, modifying current legislation or creating new legislation such as a National Water Act.

Meanwhile, local councils and their water supply operations can achieve considerable gains in water use efficiency through having a strategic approach which adopts packages of interventions supported by the necessary policy initiatives. To implement those initiatives, whether through regulatory or non-regulatory policy, councils will require sound economic analysis which can identify the value proposition for demand management approaches as opposed to building a new source of supply. There is no doubt that the value of a water champion within the organisation should not be underestimated and that the dots must be joined up within different parts of council to ensure that a shared and agreed plan is developed and rolled out.

Based on the assessment of demand management policy in New Zealand and overseas, some general principles emerge for councils and their water supply authorities in influencing water use efficiency and promoting demand management:

- Maintenance of the infrastructure and reducing leakage is a given as unless the leakage rate is at an acceptable level, there can be little credibility in asking consumers to moderate their water use habits.
- Management of the water supply system by pressure reduction programmes can also play a key role in that regard.
- In the absence of strong price signals or an overarching planning framework which supports conservation in the built environment, specific regulation can be developed to gain uptake of technologies which provide for water efficiency.
- Regulation alone can sometimes result in perverse behaviour, with homeowners being more profligate with water such as taking longer showers because they have a low-flow shower head and hence negating the technical advantage.
- Therefore non-mandatory policy is an essential companion to regulation. Consumer education coupled with financial incentives and correct pricing signals provides a strong combination.
- There is little reason why indoor use across one region should differ from another. However outdoor use will be significantly influenced by climate and soil type.
- A well defined target in terms of a proposed reduction in overall water use is likely to drive innovation.
- The target could be similar across regions for indoor use and at least initially be variable for outdoor use, depending on climate and soil composition with a clear strategy and interventions to reduce outdoor use over time.
- Cities that have clearly defined and coordinated programmes of demand management interventions running over a substantial time enjoy greater returns on their investment than those employing programmes run on an ad-hoc basis.

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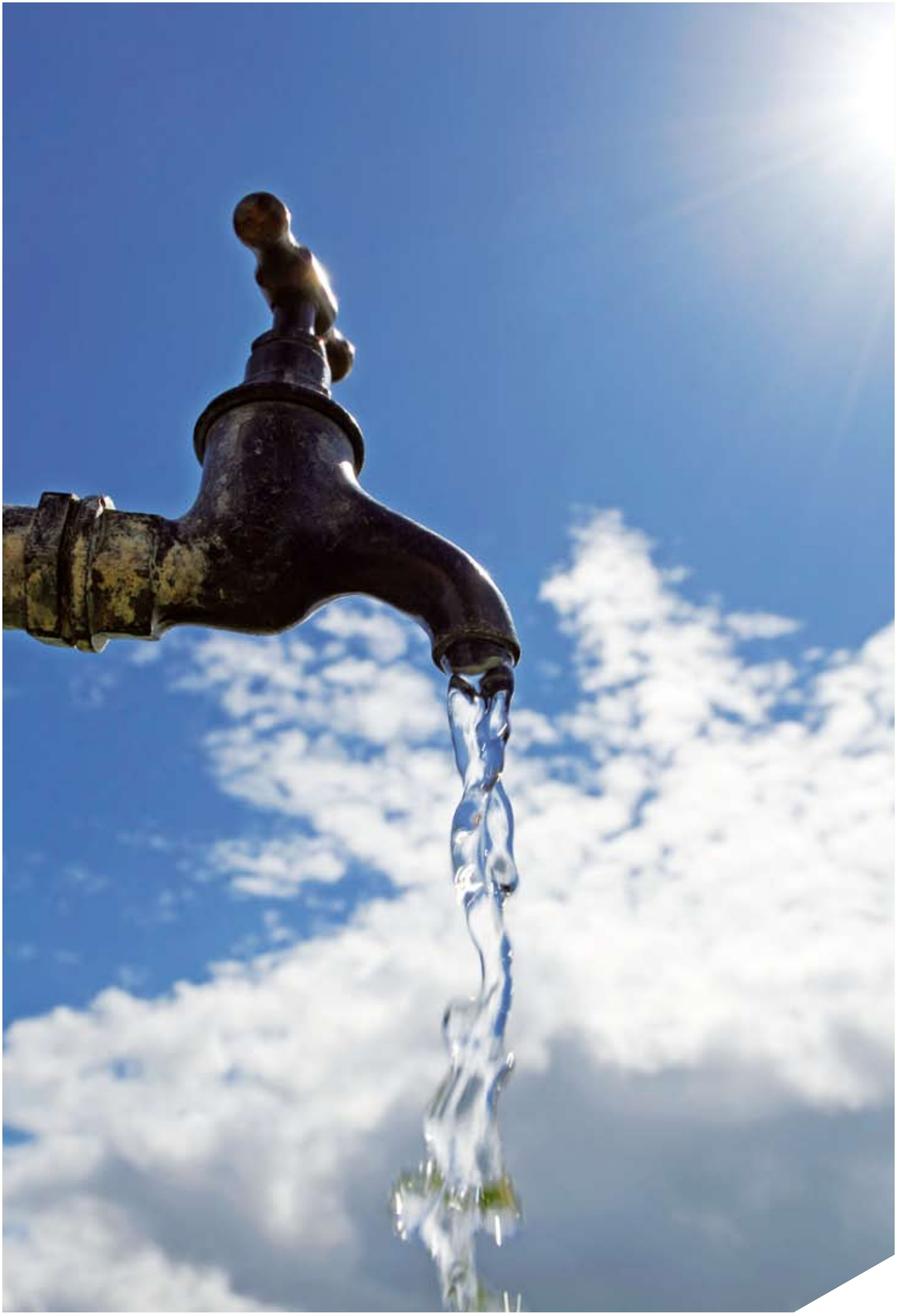
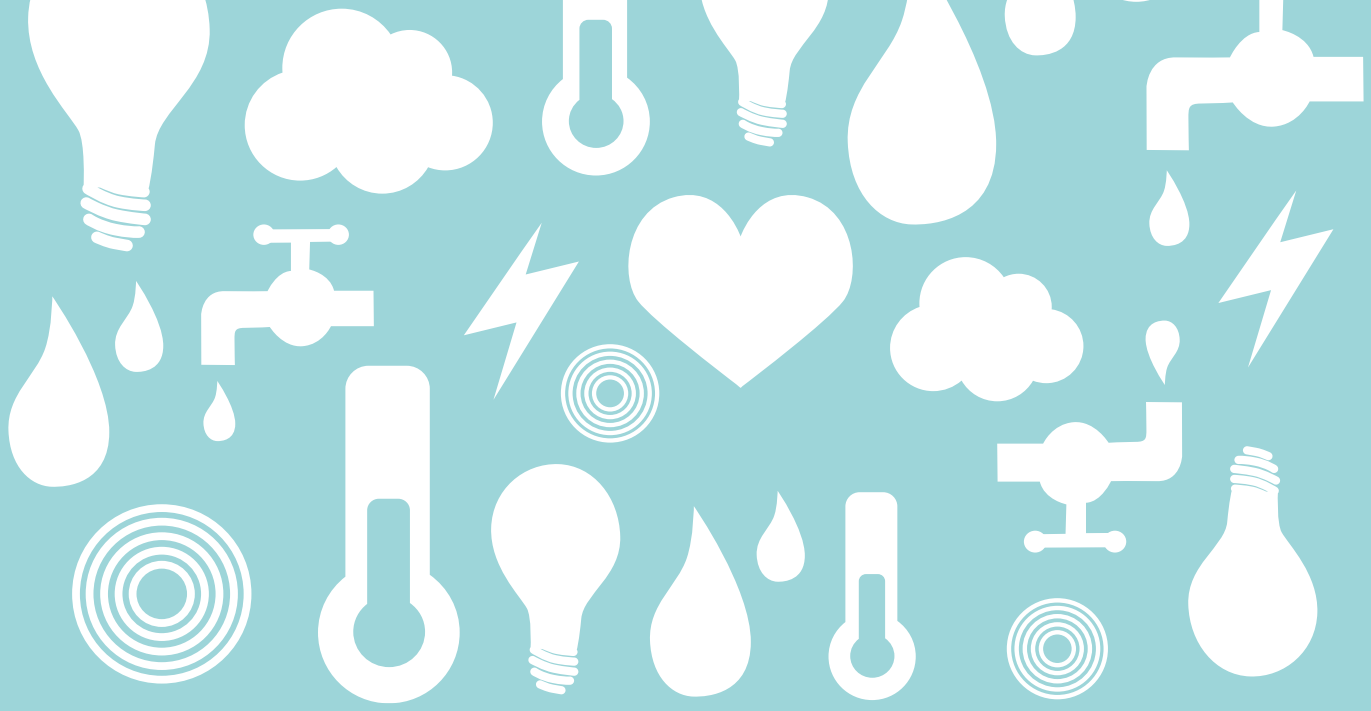


Let’s slow the flow



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