CHALLENGES IN MEETING THE NPS FOR FRESHWATER IN AN URBAN SETTING

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ABSTRACT

The National Policy Statement for Freshwater Management (NPSFM) aims to support improved freshwater management in New Zealand. It does this by directing regional councils to establish objectives and set limits for fresh water in their regional plans.

The NPSFM also provides a procedural framework that directs how councils are to go about setting objectives, policies and rules about fresh water in their regional plans. They must do this by establishing freshwater management units across their regions and identifying the values that communities hold for the water in those areas. They are then required to gather water quality and quantity information on the water bodies to assess their current state and decide the water quality objective or goal for each value the community has chosen. Finally, they must agree (with the community) on timeframes to meet those goals.

The NPSFM also provides a set of nationally prescribed "bottom lines" for freshwater quality designed to preserve ecosystem health and human health (for recreation purposes). Importantly, while the NPSFM currently establishes objectives and bottom lines for some contaminants, the principal urban contaminants (such as sediment and heavy metals) are not yet covered. As Councils begin to work with communities to identify values, decide on relevant objectives and translate these into limits, they will find that delivering improved water quality in urbanised catchments is a particularly complex and potentially very costly undertaking – one that will require tailored approaches in greenfield and brownfield contexts.

This paper explains the context that led to the NPSFM and identifies the challenges that may arise as councils seek to apply it in an urban context.

KEYWORDS

National Policy Statement, Resource Management Act, freshwater, water quality, urban contaminants

PRESENTER PROFILE

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1 INTRODUCTION

1.1 BACKGROUND TO THE NATIONAL POLICY STATEMENT

The introduction of the National Policy Statement[1] for Freshwater Management (NPSFM) in 2011 was a critical point in the evolution of New Zealand's resource management system. It made regional councils responsible for setting 'hard' limits – limits that must be complied with – for freshwater quality and quantity, and required them to report on progress towards reaching objectives and managing within limits. Amendments to the NPSFM in 2014 refined the process for setting limits and inserted a set of national water quality objectives and associated 'numerical bottom lines'. This is referred to as the National Objectives Framework (NOF).

Prior to the introduction of the NPSFM, regional councils approached the management of freshwater differently – some followed a 'limits-based' regime, some didn't. Of those that chose to follow a limits-based regime, many relied on qualitative or narrative measures. At the same time, New Zealand's resource management system tended to prioritise plan-making and the scrutiny of consent applications at the expense of monitoring the state of water bodies and compliance with consent conditions. Often, the consequence has been uncertain, expensive planning processes leading to sub-optimal environmental outcomes:

- Significant growth in New Zealand's primary sector industries, including the rapid expansion of New Zealand's dairy herd over the past decade, has had a real impact on freshwater quality – especially in lowland streams. While the quality of New Zealand's freshwater is still good by international standards it is rapidly deteriorating - two-thirds of more than 160 monitored river swimming spots in New Zealand were deemed to be unsafe for contact recreation in the summer of 2013/2014 (http://www.lawa.org.nz/explore-data/freshwater/).

- The quality of many of New Zealand's urban streams are now well below national bottom lines prescribed in the NOF and as urban areas have expanded, water quality in the newly urbanised areas has dropped (Auckland Council, 2014).

These issues have been apparent since at least the early 1990's and from 2003 to 2008 government ran a 'Sustainable Water Programme of Action' designed to improve freshwater outcomes. This programme struggled to gain traction and when in 2008 Cabinet approved a draft NPS as its main output, the response was less that positive. Shortly after this draft NPS was referred to a national board of inquiry for consideration. Then followed a change in government and a major legislative reform programme was implemented with the express purpose of tackling New Zealand's freshwater management issues. At the core of this programme was the objective of providing

[1] National Policy Statements (NPS) are the highest order policy instrument in New Zealand's Resource Management Act (RMA). They complement the "purpose and principles" sections of the RMA and clarify plan- and decision-making parameters for local government in relation to matters of national significance.

The RMA provides a degree of flexibility regarding the process for developing a NPS. But in general terms they are drafted by government officials before being submitted to Cabinet for approval as a 'proposed' NPS. Once approved, they are submitted to an independent board of inquiry who manage a public process for commenting on the proposed NPS. The board of inquiry then reports back to the Minister for the Environment with any recommended changes. The Minister then considers the recommendations and takes a final NPS to Cabinet for confirmation and gazettal.

Once gazetted, councils must amend their plans within specified timeframes to "give effect to" a NPS. All decisions on consents must "have regard to" the relevant provisions of a NPS.

greater national direction on matters such as the measuring and reporting of water takes, and the design and implementation of local government's water management frameworks. What stood this reform programme apart from others that had preceded it was its use of a national consensus-building process – the "Land and Water Forum" (the Forum). The Forum was, and still is, a collaborative group of over 60 New Zealand industry groups, environmental and recreational non-governmental organisations (NGOs), iwi, scientists, and other organisations (including representatives of local and central government) with a stake in freshwater and land management.

The Forum came together in late 2008 following a public challenge from Gary Taylor (Chairman of the Environmental Defense Society) to set aside the adversarial approach that had come to characterise New Zealand's freshwater decision-making framework. Mr. Taylor advocated for a collaborative approach drawing on lessons Guy Salmon (Executive Director of Ecologic) had brought back from a study tour of Scandinavia. Over a remarkably short period of time, key stakeholders from across New Zealand had joined this self-initiating movement and began to develop their own mandate and policy recommendations.

When in 2010 the board of inquiry made its recommendations on the 2008-iteration of the NPSFM, the Minister for the Environment at the time referred them to the Forum for consideration. The cross-sector consensus that arose from the Forum's deliberations allowed the government to gazette the NPSFM in 2011 – an action that transformed New Zealand's freshwater management framework.

Some members of the Forum, especially some NGOs, were very concerned at the performance of regional councils, who had presided over what they considered to be a period of steady decline in water quality across the country. Some had joined the Forum with the initial objective of replacing regional councils with an independent commission or authority responsible for setting, monitoring and enforcing environmental limits. This option was not advanced by the Forum, which instead recommended greater national direction to control the scope of decision-making discretion at regional council level via the introduction of national bottom lines for water quality. Government picked up this recommendation and elected to develop those bottom lines through a separate process.

While the government largely followed the framework recommended by the Forum, some key elements were not advanced and direction was not forthcoming on some key contaminants. This makes the bottom lines more applicable to the management of freshwater in rural areas of NZ than the urban centers, which creates additional problems in its implementation in these areas. Many influential commentators, including members of the Forum, have criticised the prescribed bottom lines as insufficient for sustaining the values they are designed to protect. The government has signaled its intent to review the NOF in 2016 and 2019, and has enlisted the assistance of the Forum in undertaking the 2016 review.

1.2 KEY ELEMENTS OF THE FRESHWATER NATIONAL POLICY STATEMENT

The NPSFM provides a framework for setting objectives, policies and rules in plans relating to freshwater management. Regional councils are required to amend their regional policy statements and regional plans to give effect to the NPSFM, and to:

- Designate freshwater management units, identify values within those units, classify water quality in those units according to a banded range (A,B,C), agree objectives and timeframes for meeting them, and equate those objectives to limits and targets (or interim limits) as milestones on the path to meeting objectives.

- Involve the community as much as possible throughout the process – identifying values, objectives, limits and timeframes.

- Develop a framework for accounting for contaminants and takes

- Comply with bottom lines set for ecosystem health and human health.

- Maintain or improve water quality across the region – meaning they cannot set objectives below a national bottom line and cannot set objectives that would see water quality drop from one water quality band to another (e.g. from an A to a B).

- Avoid the over-allocation of freshwater bodies – both ground and surface water.

There are three additional critical features of the NPSFM that bear emphasis – the NPSFM:

- Recognises that bottom lines might be unachievable in some places and provides for exceptions in tightly defined circumstances: (a) where waterbodies are below bottom lines due to a natural process (i.e. the presence of a bird colony causing elevated e-coli levels); and (b) where significant instream infrastructure causes downstream water quality to breach bottom lines (i.e. hydro-generation infrastructure affecting flow and temperature rates leading to periphyton growth). For an exception to be granted, a case needs to be made for including a waterbody or piece of infrastructure in an annex to the NPSFM. This requires a change to the NPSFM, following a statutorily defined process including public notification. The relevant annex to the NPSFM is currently empty.

- Requires councils to have regard to the connections between freshwater and coastal water, which is particularly important in some regions (i.e. Auckland) where communities value the marine receiving environment very highly and where rivers are a key conduit for contamination of those environments.

- Is underpinned by the expectation that everyone, regardless of where they live, has to take responsibility for their effects on fresh waterbodies and play their part in meeting objectives and managing within limits. There is an implicit requirement for equity between rural and urban environments in implementing the NPSFM.

It is important to note, given the urban focus of this paper, that the bottom lines in the NOF apply across all NZ without any geographic specificity. The requirement for national applicability prevented the inclusion of biological indices of stream health (i.e. the Macro-invertebrate Community Index or "MCI") as they are not relevant in all contexts. Similarly, the attributes currently included in the NOF seem to focus on a subset of contaminants that are arguably most relevant in rural catchments, but does not include

some of the most important contaminants in an urban context (i.e. sediment, heavy metals, road salts etc.)

For more information: http://www.mfe.govt.nz/fresh-water/national-policy-statement/about-nps

1.3 IMPLICATIONS IN AN URBAN ENVIRONMENT

The requirement to lift water quality to meet bottom lines and to maintain and improve water quality when currently over those bottom lines, makes water quality a key driver of land use planning, urban growth infrastructure development and asset management.

- Greenfield development and brownfield intensification projects must be designed to avoid reducing water quality from its current state in both the immediate context and wider receiving environment.

- New urban development projects, which will often inherit the effects of historical development practices, may be viewed by councils and communities as a key lever for lifting water quality to meet their aspirations.

- Urban stormwater and wastewater management systems will need to be designed and re-engineered over time to achieve objectives. This implies the need for forward-looking asset maintenance and renewal programmes that are designed to slowly lift water quality through both incremental and catalytic investment.

The number and sources of contaminants in urban environments and their catalytic interactions and cumulative effects, the frequent lack of room to implement infrastructural solutions, the sheer number of landowners and the relative lack of precedent for successfully lifting the quality of degraded urban streams all present very real challenges. Successfully implementing the NPSFM in urban environments will require political courage and commitment. Councils will need to have the mandate to try, fail and 'course-correct'. They will need to partner with local and regional communities and adopt entirely different approaches to water management supported by new kinds of dialogue and different capabilities as they move through the freshwater management process.

In this context, although best practice is moving towards the integration of green and grey infrastructure and greater collaboration, a transformational and strategic mindset will be required. The objectives of the NPSFM imply a 'step-change' from current approaches where water quality is considered but easily de-prioritised in the face of competing objectives such as flood control, yield of residential units or other outcomes that generate immediate economic benefits. To achieve these objectives in urban environments councils and communities will need to make challenging decisions that balance equally important objectives such as housing supply and the health of our rivers and harbours.

2 DISCUSSION

2.1 FRAMEWORK CREATED BY THE NPS FOR FRESHWATER MANAGEMENT

The NPSFM is built around the RMA plan-making process. The elements of the framework are neatly summarised in the following diagram provided by MfE in the discussion document that preceded the 2014 amendments to the NPSFM:

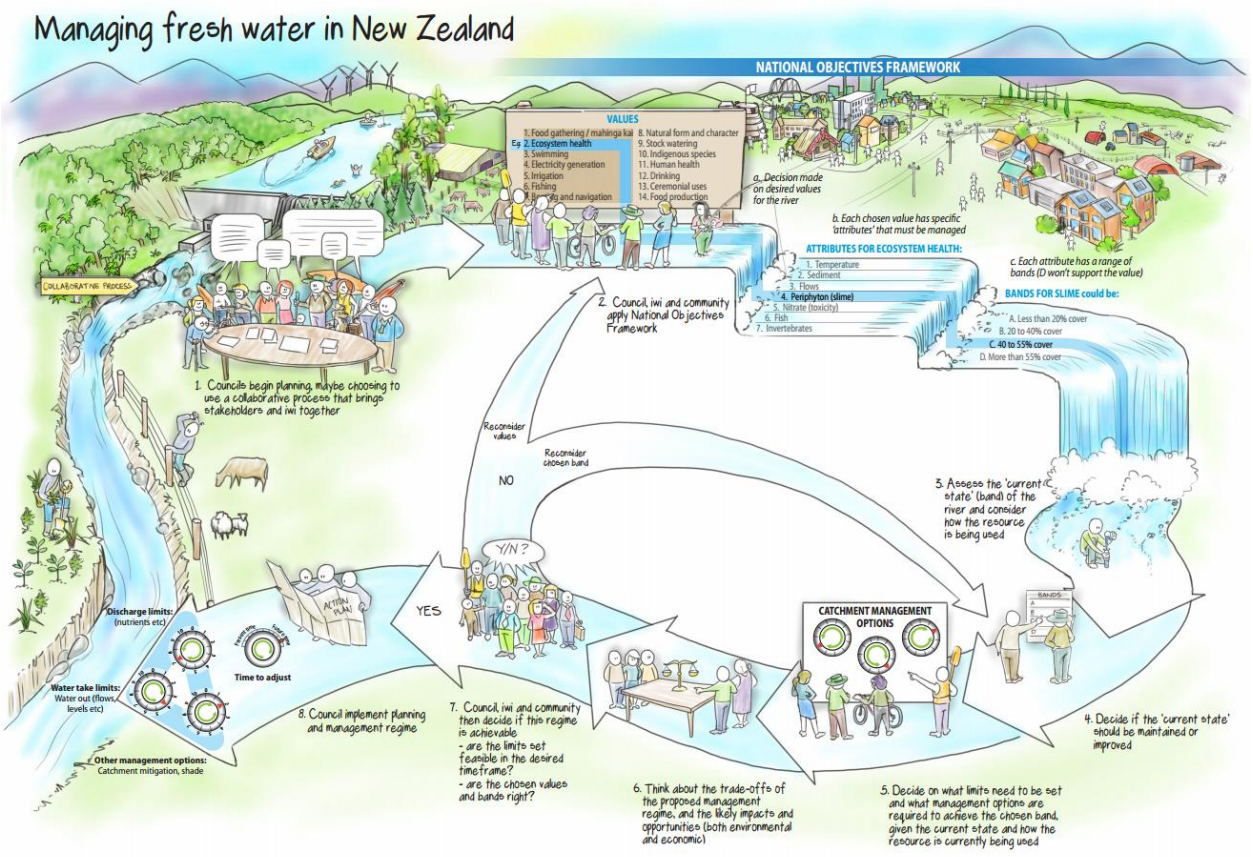

Figure 1: Managing Freshwater In New Zealand (MFE, 2013)

Councils across New Zealand are at different stages in implementing the NPSFM. In New Zealand's most populous urban environments, however, councils are generally preparing to enter into planning processes or considering how to factor NPSFM requirements into planning processes that are already underway.

Before proceeding to implement the NPSFM, councils will need to consider the issues that are likely to arise as they work through the freshwater management process. Their position on these issues will inform key procedural decisions, including at the outset as they decide the nature and degree of collaboration they intend to enter into with stakeholders and communities.

By highlighting key challenges councils will face in implementing the NPSFM in an urban context, the authors hope to facilitate dialogue that assists the effective delivery and iterative development of the freshwater management framework.

2.2 BEGINNING PLANNING

There is an expectation in the NPSFM that freshwater management plans will be developed collaboratively. Collaboration is not, however, compulsory and there is broad scope for councils to define what 'collaboration' means. In a context where council capabilities and the strategies of stakeholders are geared towards adversarial and litigious decision-making processes, it is highly likely that ingrained behaviors will take time to shift. In addition, and importantly, collaboration implies a degree of power-sharing between councils, community leaders and stakeholder representatives – democratically elected representatives and council experts will need to be willing to play new roles in the decision-making process.

In particular, shifting the role of council officers from subject-matter experts to custodians of a process that draws out a consensus could be seen by some as a diminution of their role. It is perhaps instructive that a key conclusion from a review of community-based planning processes in Australia was that:

> *"Despite any rhetoric to the contrary, government actors often perceive a vested interest in resisting authentic application of the subsidiarity principle. Their success in resisting derives just as much from fiscal dominance and cognitive hegemony as it does from formalised powers. When authentic subsidiarity does occur, this is often due to strategic bottom-up efforts to overcome this resistance by mobilising a bandwagon of support from higher levels."*
>
> Marshall, 2008: p 93

Collaborative water management approaches are likely to struggle without political champions and the support of powerful stakeholder groups – both key elements of the early successes we've seen in collaborative processes in the Canterbury, Waikato and Wellington Regions.

Once a decision has been made on the design of the planning process, councils will need to resource those processes and gather the information necessary to support them. Until recently, regional councils have arguably been focused on plan-making and the processing of consent applications with less emphasis being placed on environmental monitoring, compliance and enforcement. As a result baseline information about the state and trends of waterbodies can be patchy. There will be some catchments where a suitable amount of information is available – especially those subject to major consents for commercial purposes, or those where large scale greenfield development has occurred in recent years (because these processes would have required applicants to generate information to support their cases for development or use rights). But there will be others where a monitoring programme will need to be put in place before meaningful objective- and limit-setting processes can take place.

To put the challenge in context it is important to understand the scale and complexity of water management in an urban setting. Contaminants are derived from a very wide range of sources, including roads, roofs, construction materials, commercial processes and wastewater overflows. Historical policy decisions around landuse and subsequent design standards have resulted in these contaminate sources being highly dispersed throughout any given urban catchment. Further, given the tendency towards efficient drainage systems (i.e. pits and pipes), these contaminants are conveyed rapidly to receiving environments.

Another important factor is that the aspirations of many urban communities may be to return their streams to their pre-development state or at least something approximating it (including in Auckland where the driving vision is to become the world's most livable

city and in communities where Mana Whenua have witnessed the piping, culverting and concreting of waterways against their wishes). In this context, communities may enter discussions seeking to leverage significant improvements to water quality and reengineering of catchment storm and waste water systems. These expectations may be unrealistic, especially where there is little public land on which to implement management solutions and where cross-regional investment is required to address the implications of previous land development and infrastructure solutions (e.g. to reduce sewerage overflows in Auckland, the council is planning to invest ~$1 billion in the Central Interceptor – the design and location of this infrastructure the way it interacts with the network around it will influence management decisions across the Auckland isthmus). In reality, many urban streams will be beyond repair – even with significant levels of capital investment and management options will be so constrained as to effectively rule out meaningful collaboration.

It is also important to recognize that there will likely be circumstances where non-freshwater values drive the freshwater planning process. In Auckland, for instance, some communities seem to value clean harbours and beaches more than rivers (many of which have been piped or in very unhealthy states for generations). In these circumstances it may be that the NPSFM framework, and the influence it can have on catchment management and land use, is viewed by some as a primary vehicle for protecting the marine receiving environment.

A very important step in the planning and preparation phase will be to divide a region into freshwater management units (FMU). The boundaries of a region's FMUs will have a significant influence on the nature of issues and management options faced by any particular objective- and limit-setting process and, broadly speaking, the amount of planning effort communities and councils will need to commit to. Councils could choose to take a strong hydrologically-based approach and cut a region into catchments or sub-catchments – potentially leading to dozens or hundreds of FMUs. Alternatively, they could choose to consolidate these into super-catchments or geographic sub-regions. The latter approach has been adopted in the Canterbury (ten zones) and Wellington regions (five Whaitua) for its planning processes, each retaining the possibility of defining smaller management units within their boundaries.

The latter approach – consolidated catchments – accords with the findings of a review of 14 consensus-based planning processes used by the government of British Columbia in the early to mid-1990s. Almost 80% of the 50 project managers interviewed in the study considered that consensus processes worked best at the district/large catchment scale. At this scale issues weren't so personal as to strain relationships between neighbours but there was enough scope to make the trade-offs necessary to accommodate the views of different participants. The full regional scale was considered too large for stakeholders to have meaningful input. If the scale of a process was too large, the inevitable lack of 'grounding' prompted participants to take ideological rather than practical or action-based positions, which hampered efforts to reach consensus (Jackson, 2002).

Setting objectives and limits in a complex urban environment, against a backdrop of patchy information and competing community demands, will likely be resource-hungry and politically challenging. It is very likely to imply phasing and prioritisation of investment, and require a mechanism for ensuring that the first "cabs off the rank" don't unduly constrain options for other catchments, transfer negative externalities to others and receive a disproportionate amount of financial support.

2.3 APPLYING THE NATIONAL OBJECTIVES FRAMEWORK

The NOF sets the management parameters for nationally important attributes of freshwater bodies relating to human health for recreation and ecosystem health. The framework created by the NOF is, arguably, focused more on managing rural contaminants and waterbodies that are in a relatively natural if impacted state (i.e. not heavily modified by flood control, land drainage or urbanisation). Many of the most important urban contaminants are not represented in the attributes and bottom lines set out in the NOF.

This means that, as they work through the freshwater management process, urban communities may wish to insert values and attributes to reflect what is important or meaningful to them. Given the current lack of direction regarding urban-specific contaminants, applying the NOF in urban environments could be a complex, time-consuming, costly and politically challenging task for councils with inconsistent outcomes.

Importantly, some urban communities may seek to advance freshwater values that are historical – values that may have been lost a long time ago but that are nonetheless part of long-held aspirations, especially for Iwi. One implication is that the process of identifying values in an urban context may be a catalyst for discussions aimed at daylighting and restoring piped streams. These discussions are a 'live' part of the political landscape in urban environments such as Okahu Bay in Auckland. Some good work has been undertaken through initiatives such as the Te Aranga Co-Design Principals, which sets in place a framework for engagement with Mana Whenua and achieving environmental outcomes consistent with their values and beliefs.

2.4 MAINTAIN OR IMPROVE?

The NPSFM requirement to 'maintain or improve' water quality effectively prevents councils from allowing any further reduction in water quality. This could be seen as an impractical requirement (and a barrier to implementation) by councils facing significant growth pressure. These councils may be reluctant to force developers to bear additional up-front development costs (despite the potential for long term savings in operational costs) and to adopt novel approaches to urban design and new housing typologies – approaches and typologies that are not proven in the New Zealand market.

In this context it is important that the NPSFM requirement is in fact to 'maintain or improve' the 'overall quality of freshwater within a region'. This drafting seems to open the door to a 'net regional approach' to maintaining or improving water quality, where gains in one catchment can offset reductions in another. If this approach is available, the cost and uncertainty associated with remediating streams in heavily modified catchments areas might mean the focus of water quality shifts to urbanising and rural areas. Similarly, the cost of maintaining water quality in areas tagged for intensive greenfield development may shift the focus to investing in the restoration and enhancement of rural streams where management tools are proven, results more certain, streams are in a much more 'remediable' state, there are fewer landowners, and where there are more management options. The 'payoff' from investment in rural streams is likely to be much higher in terms of quality outcomes. The 'credit' this generates can be used to 'pay' for the impact of heavier development or allow urban authorities to avoid having to spend money managing damaged streams that are effectively irreparable.

A regional 'net benefit' approach will likely be very tempting to urban authorities but it will be challenging to implement – there is no clear 'currency' that can be used to weigh benefits in one catchment against losses in another. More importantly, this approach has the potential to contravene one of the foundational elements of the Forum's consensus

and the construction of the NPSFM – everyone has to play their part. If urban ratepayers shift their water quality responsibilities to rural ratepayers, the outcome could undermine the consensus in support of the NPSFM and its 'hard limits' framework.

2.5 SETTING LIMITS AND TIMEFRAMES, EVALUATING TRADE OFFS AND MAKING DECISIONS

Limits are a management tool designed to support an outcome – the limits themselves will be based on estimates of how much contaminant a waterbody can absorb while still protecting the values the community has chosen. The accuracy of these estimates will vary depending on the quality of baseline information and knowledge of a catchment's hydrology and contaminant sources. In many cases there will need to be iterative adjustments to limits as new information comes to light.

The authors of the NPSFM anticipated the need for a long timeframe for transitioning to the new regime as well as discretion to allow very long timeframes for meeting objectives. The framework recognises that, in reality, water quality may get worse in some catchments before it gets better – either because the effects of historical activities are working their way through the pipeline or because councils will need to follow pre-programmed long-term asset planning, maintenance and renewal schedules.

There will be an inevitable tension between community members who want change as quickly as possible and asset managers and resource users who are likely to want to align timeframes with commercial objectives and maintenance programmes. Decisions on timeframes for meeting limits are likely to generate robust debate.

Often, this debate will cast non-monetisable (or difficult to monetise) values against immediate and concrete costs and benefits. The methods that are used for evaluating costs and benefits and for supporting trade-offs between values can be highly contested and a source of conflict and litigation – given the importance of the decisions that they inform.

Effectively supporting these decisions is likely to present quite a challenge to councils, especially if they are engaged in freshwater plan-making and limit-setting across a region. Institutional capability will no-doubt have a significant influence over the design of freshwater management units and planning schedules.

2.6 IMPLEMENTATION

The drivers of water quality are complex and understanding them an imperfect science. There are cumulative and catalytic factors that affect water quality and the effectiveness of interventions. In order to achieve outcomes, the design of urban water management interventions will need to be holistic and integrated. Grey infrastructure will need to be balanced with green infrastructure, and backed with design standards and policies to enforce compliance.

One of the primary drivers for degraded freshwater environments in an urban context is the change in catchment hydrology. The aggregate effect of large scale conversion of land from vegetated cover into impervious surfaces results in highly modified stream flow characteristics. These changes reduce base flow, increase peak flows and increase overall volumes. This results in increased contaminant concentrations during low flow periods, stream bank erosion and surface flooding.

For these reasons, a focus on hydrology is a critical component of an effective water management response. If a catchment's hydrology could be brought back to pre-development conditions – or something approaching pre-development conditions – then

the retention and attenuation that would occur on a catchment scale would significantly reduce contaminant loads (Davis, Hunt, Traver and Clar, 2009)

Challenges do exist in the implementation of the concept of replicating pre-development hydrology. Emerson, Welty and Traver undertook an analysis of a partially developed catchment in Valley Creek, Philadelphia where a number of detention ponds were installed to manage peak flows for a range of events from 2-year to 100-year recurrence. Their findings indicated that peak flow can in some instances increase when a series of individual stormwater ponds are installed without consideration of the whole catchment's hydrological characteristics. When undertaking actions to achieve water quality outcomes in an urban environment, councils should consider:

- Incorporating exfiltration into as many device designs as possible, where infiltration practices are applicable
- Geotechnical factors including soil strength and water flow when infiltration practices are proposed
- Where soil infiltration needs to be avoided due to the presence of natural or un-natural contaminants in the soil
- Whether there is suitable geography for hydrological neutrality to be a feasible option.

Historically the view has been that properly designed bioretention devices – a key tool in managing urban water quality – should be relatively maintenance free. However, in recent times evidence has emerged that indicates poor maintenance, due to a lack of expertise or familiarity, has both reduced effectiveness and significantly increased the long-run cost of operation.

The key consideration when designing or retrofitting bio-retention devices is to do this with low and easy maintenance in mind. Work has been carried out looking at how to design these devices with less complex maintenance requirements such as the introduction of forebays for easy-access cleaning, and diverse eco-sourced planting to suppress weed growth and reduce mortality.

Case Study: Green Square Town Centre, Sydney, Australia

AECOM was engaged to undertake the detailed design for the Essential Infrastructure and Public Domain. The design required green infrastructure that treats all runoff to stringent local standards for environmental protection, while providing a well-watered landscape outcome of lush greenery and shade. This required that all landscapes be passively watered by stormwater runoff. Some of the runoff could be treated in raingardens, but there were many highly constrained areas where a raingarden would not fit. Passive watering of landscaped areas was sufficient to make up the deficit in treatment. The implication of this small design modification was extensive as civil, drainage and transport designers had to accommodate a different approach to grading the site to accommodate passive watering.

Innovative approaches included:

The use of linked trenches along the streets to create an extensively linked ecological system that promotes water quality, infiltration and optimises tree growth and resilience to climatic extremes.

Passive irrigation of gardens and trees through careful street grading and manipulation of kerb types.

Integration of biofiltration areas with gardens that also contribute to the village character, traffic calming and pedestrian amenities.

Photograph 1: Green Square Town Centre

Case Study: NYC Green Infrastructure Plan

New York City has invested billions of dollars in efforts to minimize sewer overflows into their receiving environment. This has resulted in significant improvement in the harbor, in fact their harbor is cleaner than it has been in 100yrs. However, they reached a point where achieving further reduction in contaminants entering the receiving environment through conventional infrastructure was going to be excessively high. As a result they have developed a Green Infrastructure Plan which combines the value gained through traditional infrastructure with the benefits of green infrastructure. Progress against The Plan is reported annually.

The Green Infrastructure Plan has five key components:

1. Build cost-effective grey infrastructure
2. Optimize the existing wastewater system
3. Control runoff from 10% of impervious surfaces through green infrastructure
4. Institutionalize adaptive management, model impacts, measure CSOs, and monitor water quality
5. Engage and enlist stakeholders

The holistic approach New York City is taking to tackling the issue of contaminated environments has resulted in a cost effective, sustainable 'greener, greater city'.

More information: http://www.nyc.gov/html/dep/html/stormwater/nyc_green_infrastructure_plan.shtml

Case Study: Toronto Green Roof Bylaw

The City of Toronto has been a leader in environmental policies and initiatives including the Toronto Green Standard and the City Green Roof By-law.

In 2009 Toronto City passed a by-law requiring all new commercial developments and a number of residential developments to install green roofs. The City undertook a benefits study which found the implementation of the policy would result in significant benefits such as reduced urban heat island; reduced stormwater runoff; reduced energy consumption and increased air quality.

Since implementation in 2010, a total of 249 roofs have been constructed with a total area of more than 21Ha.

Photograph 2: Example of green roof in Toronto

More info:
http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=3a7a036318061410VgnVCM10000071d60f89RCRD)

Case Study: Copenhagen Cloud Burst Management

On 2 July 2011, The City of Copenhagen experienced a 'cloud burst' with approximately 150mm of rainfall in a period of less than three hours – a return period >1000yr. The damage cost of the event was US$1.04Bn. As a result of this event the city developed a Cloudburst Management Plan to outline method, priorities and measures for the city to adapt to extreme rainfall.

A city wide planning process followed is a demonstration of truly holistic city wide planning with a forward thinking perspective. The objectives were simple; to reduce the frequency of sewer overflows and maintain the flood depths to less than 100mm. The outcome of the planning process was substantial.

A cloudburst management toolbox was developed that included

- Retention of rain water in the higher elevated areas
- Creating robust and flexible drainage of low lying areas
- Where possible the rain water shall be handled locally
- Focus on green and blue solutions implemented in existing projects

Figure 2: Saint Jørgens Lake – Central Retention

More information: http://en.klimatilpasning.dk/media/665626/cph_-_cloudburst_management_plan.pdf

The case studies highlighted above go some way towards illustrating the diversity of possible responses to water quality issues in different urban contexts.

The outcomes that have been achieved also highlight that technical implementation is only the first step in achieving the desired outcomes, how long the tools will take to work and how efficient they will eventually be is a matter of significant uncertainty. Further, many tools will not be available or too costly to adopt because of space constraints in already developed catchments. The costs associated with land acquisition for the sole purpose of treatment interventions will often render ideal water management solutions economically unfeasible.

To combat this issue councils will need to consider multiple outcomes when making planning and investment decisions – i.e. 'greenways' that combine stormwater management with recreational amenity, ecological corridors and transport (cycling and walking) connectivity. To do this effectively will require a significant investment in developing cross-council integration.

Further, the complexity of catchment hydrological interactions and uncertainty of outcomes mean that councils will need to be willing to adopt a trial and error approach. To combat the uncertainty this creates, and to minimise their exposure, councils could choose to build an adaptive management approach into the design of plan provisions and consent conditions. Under this approach, responsibility for water quality could be extended beyond design, construction and normal operation, potentially making asset owners responsible for: reengineering storm- and wastewater management systems; implementing additional mitigation, or taking steps to improve water quality elsewhere in the catchment should initial designs prove less effective than anticipated in achieving desired overall water quality outcomes.

Possibly the most important challenge councils will face in implementing the NPSFM is successfully directing sufficient financial and human resources towards monitoring behaviors and outcomes, and iteratively refining limits and management responses. These critical steps 'close the loop' between plan-making and consenting, and ensure the focus is on tangible, verifiable improvements in water quality.

2.7 UNCERTAINTY

The NPSFM is new and the NOF is even newer. The framework it creates has not been fully implemented anywhere in New Zealand and is effectively still under development – especially as it relates to the management of urban contaminants.

The NOF will be reviewed in 2016 and 2019. Some opposition political parties have signaled their discomfort with the bottom lines in the NOF and elements of the NPSFM itself. Add to the mix the fact the RMA has been amended almost once per year since it was enacted in 1991 and it becomes evident that the dynamic policy environment will make it especially challenging to chart and hold to long term, sometimes generational, programmes like those required to address urban water quality in accordance with the NPSFM.

Importantly, the implications of failure to comply with the NPSFM and, more starkly, failure to manage within limits are entirely unclear. If meeting bottom lines or avoiding degradation is hard or expensive and comes into conflict with other important objectives (e.g. housing supply and affordability), councils could cynically set objectives to comply with regulatory requirements and simply not follow-through with actions and investment. The only sanctions available seem to be those used to replace elected representatives with Crown-appointed commissioners in Canterbury or to insert a Crown-agent to perform particular council functions, as in Kaipara District. These actions are rare, not lightly taken and bring with them substantial political risk. Perhaps further consideration of the authority held by US EPA to enforce regulatory compliance with environmental standards is needed.

3 CONCLUSIONS

The NPSFM is an innovative and influential tool for managing New Zealand's freshwater, but it is incomplete as it relates to urban environments. Maintaining and/or improving water quality in an urban context is looming as a complex and difficult challenge.

Successful implementation of the NPSFM will require changes to fundamental elements of New Zealand's freshwater management regime (including revision of design standards and codes of practice) and the adoption of radical new approaches to urban design and storm- and wastewater management. Resource managers and users often won't know the effect of their actions at the outset and will have to take an adaptive 'trial and error' approach to implementing the NPSFM.

The complexity, cost and uncertainty associated with urban freshwater management mean that project horizons will be long and communities will have to wait sometimes generations until they begin to see outcomes. Councils won't be able to do everything their communities would like them to do everywhere at once and a schedule of actions will need to be agreed along with priorities for investment. Implementing the NPSFM will require political courage, commitment and the willingness to make legacy decisions.

In some urban areas experiencing growth pressure there is likely to be a tension between the imperative to maintain and improve water quality and the imperative to rapidly increase housing supply. We can expect this tension to encourage some politicians, resource users and managers to take a regional net benefit approach – reducing perceived constraints to growth by offsetting water quality reduction in one catchment with improvements elsewhere. The irreparable state of many urban waterways may even encourage some to seek access to exceptions and effectively opt out of the NPSFM requirements. Either approach could simply shift the burden of responsibility for keeping

our waterways healthy onto future generations or, if not managed well, have significant consequences for the integrity of the national consensus supporting the NPSFM.

When approaching the NPSFM and NOF it is important to recognise that the NPSFM framework was developed with a solid understanding of the challenges highlighted in this paper and gives resource managers and communities' room to move and time to adapt. Most importantly it forces a transparent discussion about the implications of urban development – and a responsible, robust process for making decisions.

That said, the regime is still developing and is arguably geared towards the management of rural contaminants. This, along with the uncertainty surrounding the requirement to 'maintain and improve' water quality, reduces the value of the NPSFM as a vehicle for national direction in urban environments.

Nevertheless, the NPSFM will require resource users, communities, politicians, water management experts and officials to adjust the way they approach the management of freshwater in urban environments.

As experience with the NPSFM and NOF builds in urban environments, and as practical realities become clear, there will be a need for strong feedback loops between those responsible for implementing and operating within the NPSFM framework and those responsible for its continued development.

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