

Towards Effective Water Management

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Summary

New Zealand naturally has substantial water resources of great importance to the country and its people. Despite water managers' attempts to manage the resource in the public interest, private interests have secured access to or use of much of the freshwater resource or caused increased diffuse pollution of it over the last decade or more. This has fuelled a considerable part of the country's economic growth over that period. The result has been a trend of degradation of lowland water resources particularly; labeled the 'water grab', which has aroused much concern in the community. Demand for more water for abstraction, intensification of land use or for hydro-power generation is not abating. Water managers have struggled to respond; their rate of response is several times slower than effects of change. The long term prognosis of 'more of the same' would be a recipe for further degradation. Solutions require some systemic changes; agriculture needs to take responsibility for its effects; strong, clear national direction with some structural change is essential. Is natural clean water our most immediately threatened resource?

Background

New Zealand has been described as 'irredeemably pluvial'¹, in reference to the relative surfeit of water on a per capita basis across the country as a whole.² Unsurprisingly, freshwater management in New Zealand was initially limited to the removal of excess water in the form of flooding and drainage legislation such as the Land Drainage Act 1908 which establishes drainage rating districts which still compels landowners to fund and allow drainage to be undertaken on a small catchment basis. Drowning, usually during attempts at river crossing, was such a common form of death in the early days of New Zealand settlement that it was known as 'the New Zealand Disease.' Despite negative views of overly abundant water resources, New Zealand recognised the value of water for navigation, sustainable harvest of water resources (initially for Maori but also for settler fishing and hunting) and even for its contribution to landscapes and the fledgling tourist industry.

¹ Comment attributed to former Prime Minister, Sir Geoffrey Palmer.

² Our quantity of water was estimated in 2003 as 86 554 m³ water/person or 10th best in world, while average water quality was third best.

Subsequent legislation includes the Soil Conservation and Rivers Control Act of 1941, which partly existed to prevent arguments between different river boards over the consequences of river control actions and to ensure both concerted action on a river catchment basis by newly formed catchment boards. The Water and Soil Conservation Act 1967 sought to manage freshwater in a 'multiple use' fashion, and particularly to control point source discharges and, to a lesser extent, allow water allocation. Recognition that this legislation had inadequately protected water resources from the effects of its use, led to the passage of the Wild and Scenic Rivers Amendment Act 1981 which sought, through National Water Conservation Orders and Local Water Conservation Notices, to recognise and protect important water resources. The Resource Management Act 1991 was intended to holistically address any adverse effects of coastal, water, land and air use in an integrated fashion, primarily through catchment management regional plans, although these have not had priority as their development has been optional.

In practice, in respect of freshwater management, the RMA devolves almost all freshwater management to local authorities, mostly regional or unitary councils. There has been little national direction or resources to apply to freshwater resource management issues. The Act enables local authorities to undertake a number of functions, including to:

- protect important water bodies;
- allocate water resources for abstractive purposes;
- control the effects of discharges to water quality;
- manage land use which may affect waters; and
- control activities in river beds and on water bodies.

Little direction has been provided by central government to guide or assist local government to perform this function. After nearly 17 years the effectiveness of the RMA at achieving these sometimes conflicting objectives for freshwater management is reviewed. Options for making the legislation more effective are traversed.

Whose is the Water? – Public and Private Interests in Water Management

The question of who 'owns' water in New Zealand is not made explicit in any legislation; its management, however, is clearly the responsibility of regional councils under the RMA (section 30(1)). The issue of 'ownership' has made some aspects or opportunities for management difficult, because if the Crown was to assert 'ownership' it is likely that Treaty claims from one or more iwi would follow. Indeed, despite this ambiguity, a claim has recently been lodged by Te Atiawa in respect of certain aspects of the management of the water resource by Tasman District Council.

There have been several consequences of an absence of societal discussion on 'ownership' of water. Most obvious from a water user's perspective has been an inability by society in general and regional councils in particular to contemplate water transfer or trading between water users, as this would imply water has a value which has been captured by water users despite their not 'owning' the resource. This is despite extensive evidence that water has considerable value to those who use it. This can be seen in the value of land when water is scarce and/or fully or over-allocated. Land with water permits attached can reach values of several times that of adjacent otherwise similar land which lacks access to water. Semantic debate over 'ownership' is somewhat futile if privileges have been granted which confer a bundle of rights akin to ownership.

While ownership of water has not been resolved, its management has been devolved to regional councils by central government through the RMA (eg Section 30 (1) c, e, f, fa, g, and (4)). Central government has provided little or no guidance to regional councils other than the Act itself as to how to undertake this task and few resources. On the other hand, central government has seldom held local government to account in its administration of this legislation. One outcome has been a plethora of different approaches towards water (and other resource) management by local authorities with considerable inconsistency between them as to the approaches adopted. While, arguably, local decision-making after local communities is a good thing, a probity issue has emerged about the appropriateness of local decision-makers to address long term and technically complex environmental issues, such as those which arise in water management. In the few cases where local politicians have taken a stance seeking environmental protection over immediate economic development, those councillors have usually been voted out at the next election.

It has been convenient, therefore, to refer to water management and not discuss ownership. The Act sets out some simple priorities in water management, with a wider regime implicit and following the regime set out in the former Water and Soil Conservation Act 1967. Access by anyone to water for use for domestic purposes, for stock water and fire-fighting does not require any specific permission. It must be assumed that these uses, although trivial in total quantum of water used, have priority in water use.

After this, in managing the freshwater resource, most regional councils generally seek to provide for public non-consumptive water uses (sometimes described as instream values) which have been defined in Part II of the RMA. These include protection of the habitat of indigenous species, trout and salmon, preservation of the natural character of water bodies, protection of public access to water bodies, protection of tangata whenua interests in water, amenity values, intrinsic values etc. This is achieved by way of provisions such as policies or rules in regional plans, where these exist. The more common alternative is to grant (or very rarely not grant) consents which control land uses which may affect the water resource, water use and allocation, discharges to water and activities in river and lake

beds, which are covered by Sections 9 to 15 of the RMA. With the exception of the activities on the surface of waters (which have been deemed to be 'land use' activities for the purpose of the legislation), all activities affecting water or water bodies under Sections 9 (if referred to in regional plans), 13, 14 and 15 are managed by regional councils. The legal presumption in respect of these activities is that they require consents or rules in regional plans or higher instruments (eg Water Conservation Orders or National Environmental Standards) in order to take place. This is the reverse presumption to that for other (non-regional) land use activities, which can only be restricted where a District Plan so provides.

The extent to which 'instream' values have been provided for through regional plans and consents remains a moot point. It is not possible to apply for consent to 'not use' or seek protection of a water resource, but only apply for consent for consumptive uses. Where regional plans exist, most regional councils have brought in detailed rules or policies in relation to habitat protection for instream biota, for example. Few, however, have much detailed specification of what is required to protect landscapes, natural character, recreational values or tangata whenua values, or even what standard of protection is sought to be achieved in those plans. In any case, regional water management plans have been slow to be drafted, notified or become operative. Many regions still lack operative regional plans throughout their entire region or, even where such plans are operative; these are silent on many activities affecting freshwater management, such as caps on water abstraction to prevent water users drawing typical flows down towards minimum flows for prolonged periods.

The upshot is that freshwater resources have relied upon a 'consent by consent' process to protect freshwater resources. Such a process has proven illusory at achieving protection, however. Decision-makers have found themselves only able to consider the effects of that particular application rather than it as part of the context of cumulative effects of all such applications.

This has proven particularly the case for water use applications. In addition, most of the activities causing diffuse sources of pollution to water bodies have been permitted, either 'de facto' by the lack of enforcement by local authorities, or by specifically permitting the application of fertilisers and/or not restricting land use intensification such that runoff into water bodies which has caused pollution. This has been described as the 'salami syndrome', where small slices of the resource are cut off or degraded which individually are considered acceptable, but which ultimately reduce the size and/or significance of the resource. This is a classic example of Hardin's (1968) 'tragedy of the commons'.

An alternative exists for those concerned about the ineffectiveness of the 'consent by consent' process at achieving sustainable management of freshwater resources; to apply for a regional plan or water conservation order to achieve that protection. Few, if any, applications for regional plans have been made other

than by regional councils themselves. Some water conservation orders have been applied for, however, specifically because of the absence of an appropriate plan; such as that for the Rangitata River by the Central South Island Fish and Game Council and Ngai Tahu.

Water Conservation Orders

Water Conservation Orders (WCOs) have existed since the passage in 1981 of the 'Wild and Scenic Rivers' Amendment to the Water and Soil Conservation Act 1967. This legislation was passed to recognise and provide for 'outstanding' freshwater resources, which it had been recognised were being whittled away by a series of small or large development proposals. WCOs are intended to protect outstanding wild and scenic rivers and lakes for their natural, fisheries, wildlife, recreational and landscape values. They have been carried over into the RMA as a 'code within a code', in that the WCO provisions in Part IX of the RMA are not subject to the sustainable management framework of Part II of that Act, but intended to achieve preservation or protection of outstanding freshwater resources, now also including wetlands. Water Conservation Orders are applied for and subject to a special nationally instituted special tribunal process, with rights of appeal to the Environment Court. If accepted through the process, they are gazetted as regulations and sit at a higher level than most other planning instruments under the RMA. It has been argued that these are now unnecessary given the existence of regional plans, which can achieve similar protection, but WCOs have certain unique features. These include their enduring nature, a rigorous and specific process to be created and that they address 'outstanding' resources. Several parties, particularly Fish and Game Councils, the Department of Conservation, QEII National Trust and Ngai Tahu have all applied for Water Conservation Orders. It is notable that no regional councils have either applied for these, or given support to them. Some councils have not opposed WCOs sought in their areas, but several have actively opposed them, even where there has been no equivalent regional plan promulgated.

Regional Plans

The RMA provides for regional councils or other parties to produce regional plans for any or all water related issues, but does not require Councils to produce these, unlike the compulsory regional policy statements and regional coastal plans. This lack of compulsion has resulted in most regional water management plans being initiated late or, in some cases, not yet started. Regional water management plans are 'multiple use' documents which can address water allocation and use, water body protection, water quality protection and/or classification and activities in the beds of water bodies.

Few regional water management plans are yet fully operative. Even where they are; that they may be found wanting in some aspects when new issues arise or new information become available. An example is the Waimakariri River catchment, which has a flow regime developed, but this has been questioned by many sides during the recent applications to take water, such as that by Central Plains Water.

Regional councils sometimes struggle with the potential conflict between their Local Government Act role of 'sustainable development', which implies that all resources (including water) should remain potentially available for exploitative use but at perhaps varying rates of use, as opposed to their RMA role of 'sustainable management', which specifically requires consideration of protection or non-use of resources such as water. This perhaps explains a reluctance to support the explicit protection objective of water conservation orders, and to prefer regional plans, with their ten-yearly reviews, requiring that any protection of water resources has a finite life and is subject to review. This must be contrasted with the usual approach towards protection of terrestrial areas in perpetuity.

Social Contract

To summarise, freshwater management can be considered the exercise of a social contract as follows:

- Water is available for firefighting, domestic use and stock water as highest priority
- Provided that public non-consumptive interests has next priority, remaining water is made available for private consumptive use at no charge for its use (apart from the consent application cost).

The question arises, however, as to whether this approach will work in the future, with full or over-allocation, diffuse sources of pollution being permitted activities and water transfer/trading and markets likely? This 'social contract' is now failing as the water resource comes under greater pressure.

What are the problems with the current water management?

First, greater rights are conferred to the holders of water permits when these are issued than may be retained by the public to what remains. This can be seen by Court decisions such as that over the ability of Environment Canterbury to issue further water permits to take water in the upper Waitaki River catchment, which was taken by Meridian Energy, holder of extensive water permits to operate

various hydroelectric power schemes in that area³. The High Court considered that the principle of non-derogation of grant meant that no other person could subsequently be issued water permits from that area, as this might (perhaps even in a miniscule way) reduce the amount of water available to Meridian. This decision must be contrasted with the situation described above, where the cumulative effects of the operation of multiple consents are not taken into account⁴ in granting any new consent where many other consents take or use water from the same resource. Put more bluntly, no minimum flow regime, except the very rare absolute preservation by way of a Water Conservation Order, maintains water in an unaltered, or even a current state. In much the same way, those whose activities are permitted (eg fertiliser or animal waste dischargers to land) seldom have the effects of their activities measured or actions taken to control or constrain the adverse effects on water quality from diffuse sources arising from these activities, despite the cumulative effects being measured and quantified at some often distant point downstream.

Second, there is little enduring certainty of outcome in seeking protection of public water resources. For this to happen, reliance must be placed on a rigorous response from local enforcement authorities when breaches are detected. For example, water quality standards in the Buller Water Conservation Order were breached when a new dairy development resulted in a several-fold increase in the numbers of cattle crossing a stream identified as a spawning tributary in the Order to which precise standards applied to protect the stream's water quality. Despite this, and the activity being one which was clearly a discharge in terms of the Act, no enforcement action was taken by the local authority. Eventually two bridges were constructed to cross the stream, but water quality standards were breached for months before this action was taken. Even more surprisingly, a review of the Council's actions by the Ministry for the Environment did not result in any censure of any party. The utility of specific water quality standards under the WCO or any regional plan must be called into question under such circumstances. At a smaller scale, ensuring that consent conditions are adhered to through regional council enforcement has been quite variable around the country, partly due to the politicized nature of the enforcement process in most regions. Enforcement action, where it happens, is usually a consequence of repeated transgressions by an offender.

Third, effects based legislation such as the RMA implies a 'polluter pays' principle in respect of water use, discharges or land uses affecting water. The effectiveness of such an approach, especially with diffuse forms of pollution, is very doubtful in the New Zealand context. This is discussed further by Guy Salmon in his presentation at this conference.

³ Aoraki Water Trust v Meridian Energy Ltd - [2005] NZRMA 251

⁴ Despite the provisions of Section 3(d) of the RMA, which specifically refer to cumulative effects within the meaning of the word 'effect'.

Water users do not pay for water, or even for the costs of its management in proportion to its use. Transaction costs to obtain consent can be high, however, particularly for point source contamination or where the resource is at or beyond sustainable use. Where no consent is required at all, however, such as for the use of fertiliser which runs off into water bodies or allows stocking rates which cause nitrate contamination, the person causing these effects pays no costs at all. It is unsurprising that a voluntary approach towards regulation of contaminants which may enter water ways from land use intensification is sought by consumptive users, except that regulation is desirable where it confers privileges to use the resource such as water permits. It is clear that the environment and public non-consumptive users subsidize water users or those land users causing non-point contamination.

In summary, whose interests are protected in water management? Particularly in the absence of effective and specific regional plans, despite the clear 'onus of proof' being on a water user, it would appear that the rights of those who have obtained privileges to use water may be greater than those whose interests are retained by leaving the water in situ. An example of this is the extent to which the water users of Tasman District were supported by their Council in fighting for their on-going entitlement to take water under consents issued by that Council, rather than the interests of forestry companies who subsequently have been restricted in their ability to plant trees on their land, to ensure that runoff providing water to those who had been granted an allocation was not reduced⁵.

Public Expectations

Public expectations are relatively simple. In summary, swimmable, fishable and ecologically healthy waters are considered appropriate and desirable by the general public. This is borne out by social research undertaken biennially since 2000 referred to by Ken Hughey at this conference. The public also have concerns about privatisation and trading of water. It is clear, however, that in much of the country, but particularly where the rates of degradation of water resources have been most rapid such as eastern parts of the South Island, concern about declining quality and quantity of water resources is frequently mentioned in the media due to a high and increasing public concern.

What are the Freshwater Issues?

Broadly speaking, the main water issues can be separated into water quality and quantity, although these distinctions are somewhat artificial. Frequently the effects of activities on water quality may also be compounded by effects on water quantity and vice versa.

⁵ Carter Holt Harvey Forests Ltd vs Tasman District Council, 1998; W007/98

Water Quality

Most direct discharges of contaminants to water are now adequately controlled by discharge permit requirements. Various polluting discharges have been cleaned up and few of these now cause significant adverse effects as they once commonly did until the late 1980s.

Diffuse (or non-point) sources of pollution have been recognised as the single largest issue in water quality management, not just in New Zealand but also elsewhere in the world. Both urban and rural environments can be affected by diffuse sources of pollution, with most pollution of the former being runoff from land disturbance and/or urban heavy metal or hydrocarbon pollutants, while most rural contamination is from sediment and nutrients. The difference between urban and rural contamination is one of scale, however; relatively small parts of New Zealand's land area is affected by urbanization, while primary production affects a large proportion of the country.

The major source of sedimentation of water bodies, particularly in vulnerable parts of the North Island, is runoff from land uses. Nutrients, particularly soluble nitrates and sometimes phosphorus, are also a concern as a result of runoff from intensification of agriculture.

One of the most complete examples of the effects of intensive land use is the study of 5 lowland catchments across the country undertaken by Bob Wilcock et al (2007). This analysis compared water quality in five farming catchments across the country: Toenepi in the Waikato; Waiokura in South Taranaki; Waikakahi in South Canterbury; Bog Burn in Southland and Pigeon on the South Island's West Coast. These were of similar size, but underlying geomorphology, types of farming uses, climate and hydrology differ somewhat between catchments. All, however, were relatively intensively farmed; in some cases farming had intensified in recent years (eg Waikakahi). Most landowners were trying to use commonly recommended land use practices to minimize the effects of land use on water quality. Water quality data over the approximately five years of research are summarised in the table below. There is considerable scatter in the data, but in almost all cases, the averages across all sites of the median data for each site show that the water quality in these catchments exceeded nationally recognised water quality standards, with the exception of ammonia levels. In the case of nitrates, total nitrogen, free reactive phosphorus (all nutrients) and *E. coli* (microbiological contamination) the average exceedances across all sites were at least three times the standards. In summary, intensive farming practices result in water quality which does not meet standards for public uses of those waters, such as for fisheries or contact recreation.

The main change in land use which typifies intensification is conversion to dairy farming. Research by Bill Vant from Environment Waikato (referred to in the

paper of Robert Brodnax at this conference) showed there is a linear relationship between increases in dairy cattle numbers per hectare and increased concentrations of nitrates in receiving waters. More intensification leads to greater water quality degradation and a failure to maintain water quality standards. It should be no surprise, therefore, that community concern has grown about the effects of land use intensification on public waters and opportunities for public uses of these waters. Ken Hughey referred to public attitudes on this topic in his presentation at this conference.

Catchment	Dissolved Oxygen (%)	Black Disc (m)	<i>E. coli</i> (MPN/100 ml)	NOx-N (g/m ²)	NH ₄ -N (g/m ²)	TN (g/m ²)	FRP (g/m ²)	TP (g/m ²)
Toenepi	80.7%	1.4	367	1.19	0.022	1.76	0.089	0.174
Waiokura	96.5%	0.38	1250	2.82	0.026	3.29	0.032	0.111
Waikakahi	87.4%	0.77	290	1.76	0.022	2.3	0.075	0.12
Pigeon	90.6%	0.86	640	0.284	0.104	0.713	0.059	0.12
Bog Burn	92.5%	1.05	530	0.755	0.02	1.1	0.023	0.102
Mean of 5 site Medians	89.5%	0.892	615.4	1.3618	0.0388	1.8326	0.0556	0.05
Standard	98-105%	1.6	126	0.444	0.9	0.614	0.01	0.033
Standard Exceeded	Yes	2-fold	5-fold	3-fold	No	3-fold	5-fold	Yes

From Wilcock et al (2007)

There are some who maintain that the situation is not declining or that concerns are over stated, or perhaps that the community should accept and be grateful for the economic development which has accompanied land use intensification. Other disinterested parties have expressed similar concerns, for example the concerns of the Environment Court in respect of Te Waihora (Lake Ellesmere) at the time of the Lynton Dairy case:

*"We were shocked at the ever-present effluent smell from all these waterways and the clear evidence of poor management, excess effluent levels and contamination. Te Waihora (Lake Ellesmere) was a significant shock to the Court. The lake is eutrophic, green in colour and seems to be devoid of any riparian management. For example, stock seems to have free access to the water, the margins appear to be subject to chemical spraying regimes and lake levels manipulated for farming rather than natural values. The lake is in a serious ecological condition and is in urgent need of attention..."*⁶

⁶ Environment Court, Lynton Dairy Ltd (Env C 146/04) vs Canterbury Regional Council Decision C108/2005

Fortunately Lake Ellesmere is 'protected' by a Water Conservation Order! Despite this, due to the absence of appropriate provisions in any plan, consent was granted for the particular applicant in this case to take groundwater some distance from the lake.

Water Quantity

While there is a great deal of information held by regional councils on how much water has been allocated and/or is used, there is little on how effective water resources have been protected with the remaining instream flows or levels or the changes in instream values. Despite the effects based nature of the legislation, relatively little effort has been made in most regions to measure more than the water quality and/or quantity aspects, rather than the biotic, landscape, cultural or amenity values which the instream flow or level regimes are intended to protect. Relatively little of the resource management infrastructure measures the effectiveness of the regimes which operate in water management, with most effort going into transaction costs, such as the development of regional plans and or granting of resource consents.

A considerable proportion of water has been allocated in the last 10 years, predominantly in drier eastern parts of the country. About a third to a half of current allocations have occurred over the past decade. Data from Aqualinc for the New Zealand Business Council for Sustainable Development predict this trend towards full allocation of available water resources to continue until full allocation is achieved in many river catchments, as shown in the following figure. Decision-makers have found it difficult to say no to applications to allocate water, in the absence of detailed regional plans with appropriate allocation limits.

Decision-makers also find it difficult to evaluate costs and benefits of the demonstrable economic benefits of water use against less tangible ecosystem services, or social or community benefits of its non-use. In addition, the 'first in first served' basis for access to water commonly used is adequate for little used water resources, but may be economically inefficient when applied to fully allocated resources.

Implications for Water Resource Management

Freshwater resources can be adversely affected in three possible ways by the increasing exploitation of both land and water resources. First, more water is used to increase production and have control over the environment. This is best exemplified by 'hydroponic' farming in Canterbury drylands. While traditionally dairy farming was not regarded as suitable for the summer drought and light gravel soils of the Canterbury plains, with added nitrogen and sufficient water, farmers have excellent control over conditions to grow grass and control the effects of high stocking rates on their soils and for pasture production. The downstream consequences to ground or surface waters are effectively an externality for such operations. In some cases rivers now show reverse hydrology on their natural flows; with higher summer flows and drying up in winter, as a consequence of these land and water use changes, such as around Culverden in North Canterbury.

This is the second potentially adverse effect of such development. More leaching of this water and/or nutrient into groundwaters and its return to surface waters, of which there is less to perform the ecosystem service of dilution and contaminant processing. This has been the primary cause of the degradation to lowland water bodies such as many lower Waikato shallow lakes and Lake Ellesmere referred to above.

The third potentially adverse effect is the large increase in demand for power to pump water and treat milk, increasing demands for hydroelectric power development. Examples include the North Otago Irrigation Company and the proposed North Bank Tunnel/ Hunter Downs Irrigation Schemes, which pump many cumecs of water up 100 m altitude or more, which require considerable energy resources. It is unsurprising that such developments are underwritten or supported by power companies.

There are additional concerns which can compound these effects on freshwaters, including biosecurity issues such as the spread of pest fish or plants such as aquatic weeds or didymo. Climate change is likely to also exacerbate problems in already dry regions.

It is disheartening to read the same or stronger comments being made in similar reports written over a decade ago. Most trends relating to water management are heading in the wrong direction as can be seen in detailed reports commissioned by the Ministry for the Environment (2007) and see more of these in the references. Some quotations from the recently released Environment New Zealand document include:

- *“The amount of nutrients going into the land from fertiliser application and livestock continues to increase as farming becomes more intensive”* p. 275
- *“The median levels of nitrogen and phosphorus have increased in rivers within the national monitoring network over the past two decades.”* p. 271
- *“On a per capita basis, it is estimated that the demand for water is two or three times higher in New Zealand than in most other OECD countries”*p. 298
- *“Several eastern regions have surface water catchments that are highly allocated (20-50% of low flow)...”* p. 300
- *“Total water allocation increased by 50% between 1999 and 2006.”* p. 302
- *“However, the level of non-compliance of discharges of dairy shed effluent (33 percent) fails significantly short of the target set”* p. 306

This raises concern about what actions may be appropriate, necessary or possible. In particular, a looming issue is what to do about over-allocation of water. All too often, overallocation occurs because consent authorities continue to issue consents until they ‘hit the wall’. In some cases, the concerns of existing water users’ security of supply are the most obvious reason to stop issuing more consents, rather than effects on instream resources. Streams may get to the stage of drying up, or users’ security of supply is precarious, before a halt to issuing consents occurs. This has happened in parts of Tasman, Marlborough, Otago and Canterbury (eg their Red Zones) over a considerable period and is now starting to occur in other regions such as Northland. This is one of the negative aspects of local decision making; the freedom to make the same mistakes.

Consents to take water are often granted in the absence of knowledge of the possible effects, including cumulative effects, subject to review clauses or with an ‘adaptive management’ approach. This implies that it may be possible to review the conditions of the consent in the light of effects which later become apparent. Even if this does not occur at time of review, consents all ultimately have a term and will cease, at which time any new consent granted should address any adverse effects which have arisen as a consequence of the operation of that consent. It is becoming apparent that in the cases of demonstrable over-allocation, new consents may not be issued on the same basis as their predecessors. One option is water augmentation to supplement water. Few consent authorities have realistically considered methods of reducing takes, or clawback, however, to address over allocation of water resources. This perhaps symbolizes the relative priority seen in the use of water for abstractive purposes as against instream interests. The environmental consequences of ‘business as

usual' may be quite severe in some cases, such as the examples cited above. Changes to water management are therefore essential.

Possible Solutions

Solutions to these water resource management issues are complex. Many are structural and fundamental to the economy so will not be resolved until changes are made to the institutional arrangements which lead to them (see Guy Salmon's paper at this conference). Some suggestions are made below.

Acknowledgement of the issues and responsibility from agriculture in particular is required, followed by actions to address these. Some responses, such as the Dairy sector's so-called 'Clean Streams Accord', which did not involve affected parties such as instream interests in its development, provides some obvious technical solutions which are necessary but may not always be sufficient. The time frames for action are also too long, given that land use change and environmental indicators are mostly heading in the wrong direction. The major problem with this 'Accord', however, is that it is not outcome focused, but considers matters of process only. The more recent proposals by the primary sector to identify and address these issues in an effort to take responsibility for the issues are a good first step, but the goals need to be mutually agreed between all parties, outcome focused and the way forward mapped out if the solutions are to be durable. Many responsible farmers have been quietly getting on with it, but have been reluctant or unable to hold others accountable. Further delaying tactics are not an option.

Better governance and accountability, especially from central government, is essential. Parts of the Government's Sustainable Programme of Action on Water may be useful, but of the 16 work streams originally proposed only about 4 are at mid-to-late stages of implementation and many of these would not take immediate effect for some time. It is proposed more water is allocated and land use intensified in the mean time. A lack of resources has dragged out these processes. A National Policy Statement must specify clear community goals and deliver paths to cause local authorities to get us there. Government recognised some of these issues as of concern over 10 years ago with their National Agenda for Sustainable Water Management. None of the matters considered in that process were implemented. The problem is now considerably bigger.

Difficult, long term, technically complex environmental solutions to water management problems cannot be addressed by short term politicking. New governance models may be required to deal with the probity issues referred to earlier. Parties need to engage, but governors need to be accountable for their environmental performance, not just process performance. Effects based legislation needs political will to implement, with more emphasis on monitoring and enforcement and less on transaction costs.

National leadership is required; local government can be assisted by good direction from the centre in order to achieve consistency and action. Central government must ensure that local authorities are held to account for the responsibilities they are granted. This would only be possible, however, if help is also provided from the centre. Central government must accompany good and effective freshwater management with resources; technical, financial and practical. The effectiveness of environmental functions of local government should be reviewed and best practice supported. National bodies may need to be re-established which have technical and financial clout, the ability and competence to review tasks and, where necessary, adequately resource regional actions.

Water augmentation, particularly storage, may be an appropriate option for water short areas, but should only be contemplated when there is:

- appropriate site selection;
- protection of water resources from which water is drawn; and
- recognition and effective amelioration of the water quality consequences of intensification.

Economic instruments may be an appropriate solution, which recognises the reality of privatisation, but only where there is first:

- provision of adequate flows/quality for all uses
- adequate safeguards are ensured, including user pays and polluter pays principles; and
- provision of realistic claw-back mechanisms or 'adaptive management' if monitoring shows public interests in adjacent water resources are diminished.

Such a process implies resource rental and/or cost recovery and may imply an adaptive management approach, if the necessary preconditions for this are present.

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