Elizabeth Eppel

Canterbury Water Management Strategy 'a better way'?

A refrain heard often in respect of Canterbury's current approach to water governance is 'there had to be a better way'. Canterbury has 12.7% of the national population, contributes 13% to GDP,[1] and yet encompasses 17% of New Zealand's land area, much of which, because of soil type and slope, is considered irrigable. What happens in Canterbury has material significance for the country as a whole. So, what is Canterbury doing about the management of its water resources, why do those involved think it could be 'a better way', and is there evidence that they might be right?

Space does not allow review here of the national freshwater policy environment (covered in Eppel, 2014) or of the actions taken or neglected at either the national or regional levels over the first 20 years of the Resource Management Act 1991 (RMA). Suffice it to say that Canterbury's water governance, which is the focus of this article, is now dealing with water management issues that are the product of over 150 years of European settlement and land use for farming, and some short-sighted, if not neglectful, regulation from 1991 to 2010. Rapid change to intensive dairying in a number of regions, but most notably Canterbury,[2] led to rapid decline in the water quality of many of Canterbury's rivers and lakes. Fish and Game New Zealand's national Dirty Dairying campaign, prompted by this rapid decline in water quality, led to the Dairy and Clean Streams Accord in 2003, and its successor, the Strategy for Sustainable Dairying 2013–2020, through which industry leaders took steps to mitigate and change dairy farmers' environmental impact by fencing streams and planting riparian margins to slow nutrient run-off into waterways.

This article is based on a qualitative analysis of publicly available documents and a series of interviews with participants in the development and implementation of the Canterbury Water Management Strategy (CWMS), launched in 2009. In the following sections I introduce the CWMS by identifying some of the circumstances which led to its development, and the CWMS becoming the official water resource management blueprint in Canterbury. I then examine the contents of the strategy and the processes involved in its creation and promulgation. The CWMS is now five years into its implementation. Some distinctive processes have been developed to achieve its goals, which, given their novelty, demand inspection

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and understanding by people generally interested in complex governance processes, and also by people involved in aspects of natural resource management in other jurisdictions, national and regional. I conclude the article by addressing the question of whether it is possible to make judgements at this point about the likelihood of successful water management outcomes for the region and the country from this approach, and what more is needed.

Where did the CWMS come from?

In its first 20 years of operation under the RMA (1991–2011), the Canterbury Regional Council (generally known as Environment Canterbury or ECan) approved individual water resource consent applications on a first-come, first-served basis, without the benefit of a regional plan for freshwater management. With ten significant water catchments and large groundwater systems, fresh water seemed an unconstrained resource which could be harnessed for economic benefit. ECan's water quality focus in that period was on point-source contamination from manufacturing and agricultural processes such as freezing works and wool scours. There was little recognition of the growing importance of diffuse sources of freshwater contamination from surface run-off in rural and urban areas.

The CWMS was officially launched in 2009 but its gestation goes back at least to 2000, and has a number of parents. The official owner of the CWMS today is the Canterbury Mayoral Forum. This body consists of the mayors of the ten territorial areas in the Canterbury region (one of which is Christchurch City) and the chair of ECan.

In 2000, ECan initiated a Canterbury Strategic Water Study as a joint project with the Ministry of Agriculture and Forestry (now part of the Ministry for Primary Industries) and the Ministry for the Environment. The reasons for the study were summarised thus:

> Canterbury has 58% of all water allocated for consumptive use in New Zealand, and 70% of the nation's irrigated land. Water is highly valued by the regional community for a variety of economic, environmental and social reasons. On-going land use change, primarily in the form of irrigation development, continues to increase demand for water abstraction. At the same time, there has been a shift in values within communities towards greater recognition of the Tangata Whenua's values for water, and towards increased protection of the natural environment and maintenance of bio-diversity. As a result, there is increasing conflict over the allocation of water for abstraction and for maintenance or improvement of instream values.

The tensions between [the] two perspectives within ECan only increased as the dramatic rise in dairy conversions in Canterbury became more apparent to the wider population of urban Canterbury.

In the absence of an effective vehicle for strategic regional management of the development of Canterbury's water and land resources, central, regional and local government were concerned that ad hoc actions by one group might foreclose on protection or development options that provided greater benefits over the long-term to the environment and to the community as a whole. (Morgan et al., 2002)

The study became a multi-year one, during which information was gathered on the potential long-term requirements for water; the capacity of the region to meet those requirements; the water resources that would come under the most stress; and the reliability, over the long term, of water supplied from natural systems for abstractive uses. A second stage in 2004, commissioned by the Mayoral Forum, identified the potential for water storage in Canterbury, the areas that could be irrigated and the impacts on river flows, while a third stage evaluated the environmental, social, cultural and economic impacts of the water storage options. Evaluation was done by a reference group of people from across Canterbury with a wide range of interests: Ngāi Tahu as tangata whenua, and farmers, irrigators, anglers, recreationists and environmentalists. The reference group completed its evaluation of water storage options for the Hurunui area at the end of 2006 and began evaluating options for South Canterbury and the Waimakariri and Rangitata rivers.

The chief executive officer of ECan from June 2003 to 2010, Dr Bryan Jenkins, an environmental planner, is widely credited as a principal architect of the transformation of the Canterbury Strategic Water Study into the CWMS. He had come to the ECan role with a knowledge of collaborative approaches to the governance of common pool resources, such as land and water, based on the work of Nobel prize-winning economist Elinor Ostrom (Ostrom, 1990; Jenkins, 2011), with prior experience of the benefits of the collaborative approaches to environmental management in Australia. He championed the symbolic, although probably mostly cosmetic, Living Streams programme, which involved local communities in projects to enhance the health of waterways in their local area.

Some ECan councillors were also advocates for having an overall plan for water and all its aspects, from biodiversity through to flooding and drainage, which would result in the concerns of objectors being addressed during planning. Angus McKay, the current mayor of Ashburton, adopted this approach in guiding consents for some developments in his

region. Other councillors, mainly those with non-rural constituencies, seem to have been more intent on stopping development and refusing consents. The tensions between these two perspectives within ECan only increased as the dramatic rise in dairy conversions in Canterbury became more apparent to the wider population of urban Canterbury. Table 1 shows regional changes in total dairy herd numbers between 1994 and 2013: Canterbury has one of the most dramatic (a 500% increase), within a national trend of 68.9%. More irrigation and the application of nitrogen-based fertilisers made it possible to farm more cows per hectare and encouraged conversions from other land uses, such as forestry (Parliamentary Commissioner for the Environment, 2013).

In response to community concerns about the impact these changes were having on water quality,[3] the focus of the Canterbury Strategic Water Study shifted to include consideration of sustainability and water quality and the need to understand community water values more broadly. The study progressed, slowly but methodically, accumulating measurement data and consulting with the community between 2000 and 2010 (Whitehouse, Pearce and McFadden, 2008; Jenkins, 2011), and in hindsight appears to have had an educative effect and enlisted community support for a more strategic approach.

Changes to the Local Government Act in 2002 gave the act a focus on sustainability and the four 'well-beings' (economic, environmental, social and cultural). Emboldened by this change, or principally because of frustration with the current processes, multiple judicial challenges to ECan's authority and ECan's inability to regulate effectively in the absence of a regional plan (Kirk, forthcoming), the Mayoral Forum came to adopt and champion the work of the Canterbury Strategic Water Study. Its final report noted:

> Water storage is only one of the things that need to be considered in a water strategy for Canterbury. Other issues that need to be considered include land use intensification, water quality, cultural values, tangata whenua objectives, and recreation uses. (ibid.)

There was wide consultation in the region on this more strategic framework, which was signed off by the Mayoral Forum in 2009 as the Canterbury Water Management Strategy; targets were added in 2010 and implementation began. By this time the relationships among ECan councillors and between ECan and the mayors were quite strained. According to many interviewees, tensions manifested as a rural–urban divide, where councillors representing urban areas were under pressure from their electorates to slow or ban consents for further takes of water for irrigation and land for dairying, while councillors representing rural electorates wanted to move full speed ahead to promote the economic development in their rural constituencies. Following a motion of no confidence in the ECan chair by eight of the 14 ECan councillors, other members of the Mayoral Forum, led by the Christchurch mayor, had growing doubts about whether ECan would and could implement the CWMS. According to a *Marlborough Express* report, the mayors had a number of grievances:

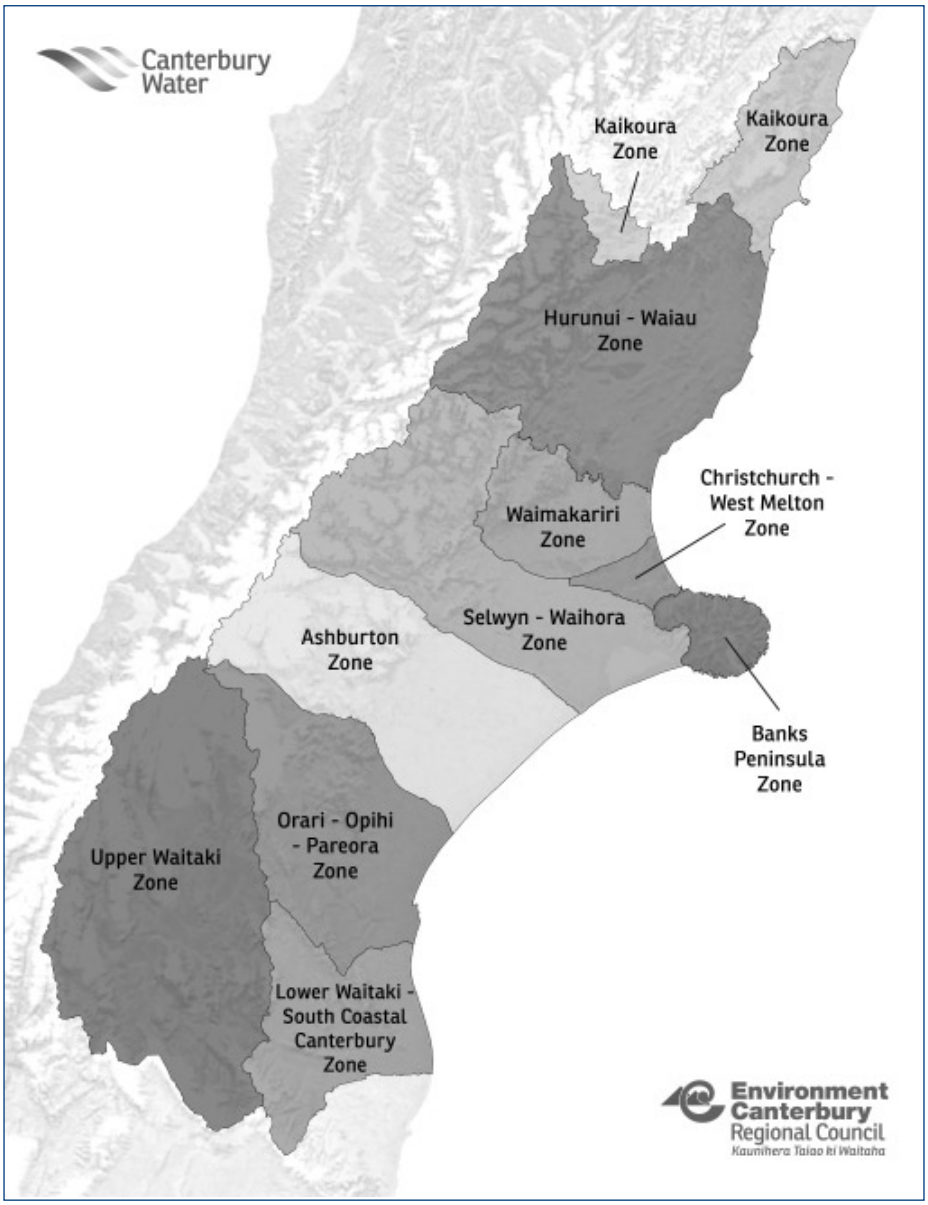
> Concerns … about the effectiveness of ECan on hydro matters, irrigation

Table 1: Dairy cattle in New Zealand as at June 30 1994–2013

Region	1994	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	% Change 1994-2013
Southland	114378	356220	347793	349021	348075	375911	432642	495971	589184	599198	614648	670581	615428	438.1
Otago	82173	204802	181484	174253	161616	180734	218264	232905	257049	262417	307817	336278	367292	367.0
Canterbury	212492	542610	556339	599643	604756	655676	754937	831666	918480	938453	1006742	1200293	1304618	514.0
West Coast	79251	124640	122572	141401	142370	148730	152481	152869	179416	160791	179308	173651	178907	125.7
Marlborough	22648	32526	28233	26831	30604	25783	23899	33544	–	25980	30012	33218	27811	22.8
Nelson	1412	–	–	–	–	–	1862	–	–	–	–	–	1259	-10.8
Tasman	49092	67473	71206	70848	67535	65994	63849	70689	86531	71088	72803	71956	76283	55.4
Wellington	83935	111180	111973	95021	95274	103290	92787	103525	85331	92375	114120	108174	108647	29.4
Manawatu-Wanganui	308022	416802	408986	381464	410765	390125	393453	425484	424880	478514	472992	475466	448030	31.2
Taranaki	599083	651700	623459	664922	615592	598667	589573	571505	607436	645891	625315	604383	595014	-0.7
Hawkes Bay	31707	88982	92852	91786	82772	79419	80200	99931	93871	113465	90655	93047	95098	200.0
Gisborne	6226	12533	6969	–	–	–	7891	16432	–	10535	17806	17095	19332	210.5
Bay of Plenty	285752	331410	326885	320923	329776	300509	299013	315183	299696	306884	331536	312326	314679	10.1
Waikato	1437630	1663446	1679882	1685661	1726323	1735353	1669472	1717421	1786579	1757624	1795785	1832380	1837858	27.8
Auckland	168754	150089	167559	141618	122015	122234	113344	115883	94391	98416	129768	117281	110288	-34.6
Northland	356561	405387	374019	399064	343195	378152	367183	392193	392577	353314	384636	397764	383057	7.4
New Zealand Total	3839184	5161589	5101603	5152492	5087176	5169557	5260850	5578440	5860776	5915452	6174503	6445681	6483600	68.9

Source: Statistics New Zealand

Figure 1: Canterbury region showing water management zones



and water allocation, and the fact that ECan serves a widely disparate geographical area which needs different local foci, including specific urban and rural needs … a common feeling of frustration at many of the issues Canterbury councils faced when dealing with ECan. These included lengthy time frames for issuing consents; frequent delays and inconsistencies which meant often councils were facing penalties and extra costs such as paying for duplication of specialist time, monitoring and associated administration. The mayors also noted a number of occasions that consents were often held up by what their councils considered to be minor matters. Inconsistency when dealing with ECan was cited as a common problem also, with a lack of experienced staff, often with no or limited local knowledge, and high staff turnover both possible reasons for this. The (then) Mayor of Ashburton, Bede O'Malley, said the staff turnover at ECan had been 'historically high'. This often meant consent processes had to be started over again when new members of staff took over. 'Lack of community engagement', a disappointing 'lack of openness', lack of dialogue and consultation and a lack of direction were all aspects of Ecan's performance which needed review. (Dangerfield, 2009)

The minister of local government and the minister for the environment, hearing these concerns, commissioned a review of ECan by former National government minister Wyatt Creech (Creech et al., 2010). The immediate result, the dismissal of the elected council and its replacement by seven appointed commissioners with Dame Margaret Bazley as chair, triggered a national outcry about this suspension of democracy.

The Environment Canterbury (Temporary Commissioners and Improved Water Management) Act, passed in April 2010, required that ministers 'must appoint Commissioners who collectively have knowledge of, and expertise in relation to: (a) organisational change; (b) fresh water management; (c) local authority governance and management; (d) tikanga Māori, as it applies in the Canterbury region; and (e) the Canterbury region and its people' (section 14) and that the commissioners 'must as soon as practicable establish a process for seeking advice from the mayors of the territorial authorities in the Canterbury region on local issues that affect the exercise of the powers, and the performance of the functions, of ECan' (section 21).

This act also brought a number of other remarkable changes which, in the words of its preamble, 'provide the Council with certain powers that it does not otherwise have to address issues relevant to the efficient, effective, and sustainable management of fresh water in the Canterbury region'. In particular, it conveyed upon the newly appointed council, which continued to have the status and responsibilities of ECan under the Local Government and Resource Management acts, the power to impose a moratorium on the granting of consents, and replaced some sections of the RMA for Canterbury – regarding, for example, how water conservation orders could be imposed – and limited the grounds for appeal against water conservation orders and any plans issued by ECan to matters of law (for a more detailed account, see Brower, 2010; Brower and Kleynbos, 2015).

What is the CWMS and how is it being implemented?

At the time the commissioners were appointed, continuation of the CWMS was not a foregone conclusion. The

CWMS is a statement of shared values and outcomes for water resource management in Canterbury. Its vision is: 'To enable present and future generations to gain the greatest social, economic, recreational and cultural benefits from our water resources within an environmentally sustainable framework.' It identifies targets as an agreed way to measure progress towards this outcome,[4] and includes a set of goals, applying from 2010, that reflect the fundamental principles. Targets are then set for 2015, 2020 and 2040 to provide a set of long-term environmental, social, economic and cultural outcomes reflecting a sustainable development approach to achieve the goals. The detail of how these targets are to be met is worked out at the local level with input from the community concerned through ten zone committees (one for each major water catchment in the region and one to oversee region-wide infrastructure and co-ordination issues) (see Figure 1).

The zone committees, established progressively by ECan and the respective territorial councils since 2010, are joint committees under the Local Government Act 2002, which, among other things, means that they are subject to the Local Government (Official Information and Meetings) Act 1987. The committees are advisory to ECan and the relevant territorial council and operate under terms of reference. Nominations for membership were sought from the local communities in each zone. Rūnanga, ECan and the relevant territorial councils also have a member on each committee and membership has been refreshed regularly since then. Zone committee members are required to give effect to the fundamental principles, targets and goals of the CWMS; be culturally sensitive, observing tikanga Māori; give consideration to and balance the interests of all water stakeholders in the region in debate and decision-making; work in a collaborative and co-operative manner, using best endeavours to reach solutions that take account of the interests of all sectors of the community; promote a shift in philosophy from an individual rights basis for using water resources to a collective interests approach to water management.

Committee members are selected with considerable thought to their ability to work constructively with those holding different views. As well as reflecting a particular perspective, members often have deep roots in the community arising from regular contact with other interests, such as the farmer who is also a recreational angler and whose children like to swim in the local stream.

> We look at geographic spread – if everyone is coming from one part of the catchment then you miss out on parts of the community's experiences; we look at sector representation – balance is essential; we look at gender mix – that's really important because they hear different things in the community. We look at skill set – there is quite a broad assessment criteria. So when people are sitting in front of us we might say, well you would both be very good, but when we look at who is already on the committee and what is missing, we need more of [one than another]. Or if we conclude we don't really need any more people but we really like what you bring, how can we get you involved in a catchment group, like another layer of the zone committee process so that you can use your skill sets there. (Atkinson, 2014)

At least one of the ECan commissioners attends zone committee meetings regularly, along with the representatives of the district council and Ngāi Tahu. Expert advisors can be called on for scientific input. The intended outcome for each catchment is a zone implementation plan or ZIP, which sums up the local priorities for freshwater management. Reaching this point can be a lengthy process and many remark on the difficulties inherent in working collaboratively.

> We are four years in now. Our ZIP was developed over about 18 months and was a very interesting process … we all bring our experiences and expertise and we do come from different backgrounds … In those early days there was quite a bit of laying your cards out on the table, letting everyone have their say, and listening and understanding each other … We developed respect for each other and respect for each other's approaches and where they were coming from. (McKay, 2014)

A ZIP typically includes recommendations to amend ECan's rules: for example, in relation to the amount of nutrient that can be allowed to leach from farmland or the minimum flow required on a particular river. ZIPs might also include recommendations for additional flow, water quality monitoring or action on biodiversity. Recommended rule changes are taken up by ECan using its powers under the RMA to create or amend the regional plan.

Since 2010 ECan has promulgated the long-awaited National Regional Resources Plan (NRRP), which had been a work in progress for some years.

This last sentence makes the translation to a plan amendment sound simple, but it elides the tricky processes required to translate the wishes of a community into the statutory rule-making of ECan, dictated by the RMA. This needs to occur while balancing two very important tenets which coincide when top-down rule-making meets bottom-up and middle-out collaborative processes: maintenance of the trust of the community and the community collaborative capital generated through the processes of consultation carried out over several years by the zone committees; and exercise of ECan's statutory obligations,

including the necessary independence of their decision-making. That this delicate balance has been achieved so far has much to do with the careful wisdom of the ECan commissioners and the quality of the relationships that have been established between the commissioners and the zone committees and the wider Canterbury community. Commissioner David Caygill welcomes the process of arriving at the water management rules for a particular zone:

> The right way is as much what we all agree to do. There are tests as to whether what we are doing is working or not. But if we are agreed to do it this way, then does it really matter that Australia does it this way or America does it slightly differently. Our approach might reflect our different culture or it might reflect circumstances or it might just reflect that this is the bargain that we struck here. Which is also why I am untroubled by the thought that at a zone level we end up with outcomes/bargains that are different in different zones, if they are agreed. A good example might be that having set a particular nutrient limit, a particular zone might agree to allocate it/divide it up in a way that reflected historic usage more than another approach would. Another zone might be more concerned with current land use. Another area again might be happy with a minimum for everyone and only allocating above a certain level. If you end up with different bargains in different areas, does that really matter, if the local people are comfortable with their bargain? That is what I took from Elinor Ostrom's work: the diversity, and the absence of common patterns other than the requirement for buy-in. (Caygill, 2014)

Since 2010 ECan has promulgated the long-awaited National Regional Resources Plan (NRRP), which had been a work in progress for some years. It subsequently revised its regional policy statement to which all such plans (including district council plans) are subject and replaced the NRRP with a shorter and more accessible land and water regional plan (LWRP).

While litigation is still threatened or initiated, Bazley or one of the other commissioners is quick to meet with people in the community to both understand the issue in depth and to negotiate a satisfactory resolution.

> Significantly the LWRP includes, for the first time in Canterbury, rules that limit the discharge of nutrients, especially nitrates. ECan is no longer focused solely on point source discharges, but now has rules addressing diffuse pollution as well. (ibid.)

It is intended that the work of each zone committee will over time and where necessary be adopted by ECan as a sub-regional chapter of the LWRP. While it would be desirable to carry out this process in every zone simultaneously, ECan has the expert resources to meet the requirements for measurement and analysis for only one sub-regional plan at a time. The first zone committee to reach this stage is Selwyn–Waihora.[5] Christina Robb from ECan describes the process that happens at this stage:

> When the sub-regional planning process rolls into town, you get four scientists, three economists, a social scientist, all the cultural opportunities, TRONT[6] puts some resources in to help the rūnanga. So some of the attraction of the sub-regional planning process is the resourcing that comes with it from us [ECan] and others.
>
> The sub-regional plan is where the decisions lie about what the actual [nutrient] load is … It's where that real action, with the numbers involved, happens. We already know that in Waimakariri, because they are a red zone, new development is only going to happen if the existing people reduce their leachate. When we do the sub-regional plan we will be able to tell you by how much. You can have different options for how much growth you are allowed. We can tell you the milk solid effects, the drinking water costs. We can produce 20–30 technical reports about all the things that you need to think about when you are making that call. And we are getting better at it. Because we are learning and some of the information about, like, how much it costs a dairy farmer to reduce nitrates by 20% – we have done that sum. (Robb, 2014)

This does not mean that other zone committees are marking time. There are many issues and actions that zone committees have identified that do not require inclusion in regulation for action to take place. For ECan and the zone committees a big focus has been farm environmental plans as an engagement and education tool for gaining farmer buy-in to more environmentally sustainable farming practices:

> We need to get a change in mind-set; make it natural that people do good management practice and look after their water. It [becomes] just something that they do because they want to do it … One of the things we are trying to encourage, is to not only fill the Farm Environmental Plan out, but not file it away in the bottom drawer. It's a living document that you use. It's got to

> be doing something. For example, irrigation efficiency, you might say … at the moment not a lot of people have moisture meters, tapes in the ground that tell you whether you need to water, or some scheduling information. You might say that in five years, I will have that put in. You'll give yourself a decent amount of time because it's quite expensive. Or you might not have 30 days' effluent storage, so you might say that by year whatever, I will have done that. (McKay, 2014)

What is the likelihood of CWMS success?

I began this article with the refrain 'there had to be a better way', and progress towards this better way is viewed through the eyes of those seeking that way from where Canterbury's water management was in 2010. Past neglect cannot be undone quickly, if at all. People who wanted a better way tended to think that the litigious culture that had arisen under the operation of the RMA by ECan was wasteful of time and resources. ECan's failure to take a strategic and longer-term view of water management and its inability to make progress on an agenda to make better use of the region's water through irrigation from 1991 to 2010 was also an issue. Since the implementation of the CWMS began, the rules have been made clearer through the LWRP and litigation has ceased to be the default response to ECan decisions. While litigation is still threatened or initiated, Bazley or one of the other commissioners is quick to meet with people in the community to both understand the issue in depth and to negotiate a satisfactory resolution. The wider community appears more supportive of Ecan, but this could reflect distraction with earthquake recovery work, and could become more visible with the return to having some elected members of ECan in 2016.[7]

The first national policy statement for freshwater management under the RMA was not promulgated until 2011, nearly 20 years after the passing of the RMA, with the objective of maintaining or improving 'the overall quality of fresh water within a region'. In 2014 this was amended to include 'bottom lines' for a few aspects of water quality and a requirement to report on ecosystem health and water quality (Ministry for the Environment, 2014). These were generally seen as positive steps towards helping regional councils do their job. But water ecosystem experts would like them to be stronger: for instance, by specifying a level at which visible invertebrates such as mayfly and caddis fly larvae, which signal ecosystem health, can survive in reasonably high numbers[8] (Joy, 2014; Parliamentary Commissioner for the Environment, 2015a).

Adding to the omissions of the past, two factors now affecting water quality in Canterbury (and Otago, Southland and Waikato) are ongoing increases in dairy herd numbers and land area devoted to dairying, facilitated by increased irrigation; and historical water-use consents granted over the years by ECan and only recently, or yet to be, acted on. When the appointed commissioners took over in Canterbury they decided not to revisit previously agreed consents, which, according to David Caygill, would have been a massive and problematic exercise, as well as controversial and probably court-contested given the strict processes laid out in the RMA for the review of consents.

> What we decided to focus on was strengthening the actual rules, in particular getting in place rules that for the first time set limits on the discharge of nutrients from farmland. Without those rules in place there would have been no basis against which to review existing consents. The increase in land intensification meant that the crucial issue in Canterbury is not water quantity but water quality: above all, limiting the discharge of nitrogen/nitrates, and for this we needed rules. (Caygill, 2015)

Into the foreseeable future there is likely to be an increase in irrigated land, facilitating more intensive farming and making increased nutrient run-off into waterways likely. The new national bottom lines and the ECan LWRP requirements aim to regulate this. Jenkins notes, however, how problematic the parallel achievement of reduced nitrate loads and increased irrigation will be: 'existing users will need to adopt better than good practice management and incur cost' (Jenkins, 2014, p.13). Commissioner David Caygill and others involved in the CWMS admit that the water quality trend is likely to get worse before it gets better, largely because a large proportion of Canterbury's water is trapped in underground aquifers which will continue to be affected by past diffuse pollution for decades to come. This view is shared by the parliamentary commissioner for the environment (Parliamentary Commissioner for the Environment, 2015b).

> The Canterbury experience definitely does not support any dilution of the RMA's focus on protecting the environment.

ECan's June 2015 progress report on the CWMS shows that the first five years of the strategy have been largely about setting up the processes and getting the community's buy-in, particularly in its rural and farming districts. A better way involves a collaborative approach to rule-making and more voluntary or incentivised action in the form of on-farm management practices, to make water use more efficient and limit nutrient loss from the soil root zone into freshwater sources, backed up by new regulatory limits such as the LWRP and the new sub-regional chapters as they are promulgated.

The Land and Water Aotearoa[9] environmental reporting website shows indicators such as total phosphorus and dissolved nitrates at monitoring sites in the region. It reveals a pattern of average to above average water quality in upland

sites, and some well below average in lakes and lowland streams. ECan has been working on the quality of its aquatic ecosystem health data and monitors 200 sites annually. The 2015 CWMS progress report aggregates water quality data and reveals the same trend: 50% of alpine and high country streams generally have a good to very good water quality index (WQI), while the WQI is largely fair or below in lower hill-fed streams, and all of the Banks Peninsula streams are graded only fair, poor or very poor, and there are few signs of improvement in 2013–14 over previous years (Environment Canterbury, 2015, p.19). Aquatic ecosystem health of spring-fed plains and urban streams showed a rapid decline in the 2012–2014 period over the previous three years, with around 70% graded as poor or below.

The CWMS has milestones mapped out to 2040 and the next progress report is due in 2020. The LWRP has set some water quality and nutrient discharge limit rules for the region which are now being acted upon, and which will be progressively refined in the sub-regional chapters where more stringent limits are required. As part of its 'immediate steps' programme ECan has allocated $420,000 to 29 lowland sites and $650,000 to 36 high country and foothill steams to improve habitats that contribute to aquatic ecosystem health, but clearly there is much more to do to remediate existing damage and prevent more. Montaine lake systems are particularly vulnerable to increased run-off from intensified activity and must be better protected.

> For me, the Selwyn–Waihora decision … is going to be very significant. It's a very tricky catchment. It drains into a shallow lake which is only intermittently open to the sea so it doesn't clear itself readily. So you have a sump that is collecting the nutrients from decades of land use. The zone committee laboured for three years before they recommended an agreed position to ECan, Selwyn District and Christchurch City, but it is mainly us [ECan] that has to respond, because of our powers … The zone committee's recommendations are aimed at achieving a trophic level index in the lake [Ellesmere/Waihora] which we won't get to on their plan until 2035–40 – that sort of timeline. So this is a 20–25 year programme that we are dealing with. The conditions in the lake will get worse before they get better partly because of the legacy of what is already in the aquifers and partly because the plan recognises that there will be further development that will take place in that catchment, some of which is already consented … The Central Plains water scheme is consented to supply water to more intensive farms and more hectares of intensive farming than there is at the moment and the authority for that is attached to their consent … At the same time, the alpine water that the Central Plains scheme is bringing to the catchment will take pressure off groundwater, and in turn also pressure off the lake. And there will be others outside of that scheme that still hope to develop further in that catchment. (Caygill, 2014)

Increased effort going into monitoring water quality and reporting of this data for public scrutiny improves everyone's understanding and ECan accountability. Efforts are being made to motivate individual water users to play their part through farm management plans and good management guidelines, and the enforcement of rules is aimed at limiting and lowering nutrient losses. ECan encourages farmers to use the Overseer model (a nutrient-loss measurement tool) to predict their water and nutrient-use requirements to avoid over-watering and prevent leaching of excess nutrients. These efforts suggest that ECan will first take an educative rather than a prosecutorial approach to enforcing its new rules. But when the educating has been done, there must also be appropriate and effective use of sanctions when individuals do not play their part.

As an irrigation strategy for the region, the CWMS has enabled land-use changes and regional economic development on such a scale that environmental regulation has struggled to keep pace. This economic development has been based largely on a single commodity, milk, and fluctuating global prices have made this economic development appear more risky. Tightened requirements to consider water quality could be an incentive to encourage investors to adapt and move to higher-value propositions for the environment, the farmer and the economy as a whole. Alternatively, government and regulators could be tempted to soften the economic changes with increased environmental costs, both short and longer term.

Conclusion

The Canterbury experience might be seen to lend support to the government's proposals to amend the RMA to allow more participative processes, as recommended by the Land and Water Forum (2012), and limit the opportunities for appeal to something similar to what exists in Canterbury's current arrangements. The Canterbury experience definitely does not support any dilution of the RMA's focus on protecting the environment. Rather, it exemplifies just how much worse New Zealand's water quality could become with neglect and compromise of environmental outcomes. As ECan's regulatory screws begin to tighten on some individuals, as they must, there will be push-back from those reluctant to change their practices and meet more stringent requirements. Politicians and bureaucrats need to be ready for this and prepare to meet this challenge to their authority in a wider court of public opinion, as well as using all the regulatory powers they have to compel compliance. There is a long way yet to go to make a real difference in maintaining, let alone improving, water quality in Canterbury, and no one (ECan, central government, the population of Canterbury and the rest of us) can afford to take their eyes off the size and importance of the challenge to the quality and sustainability of our environment. Canterbury needs the help of a wider set of national bottom lines for freshwater ecosystem health.

Canterbury's efforts so far exemplify a number of things which have implications for water governance at the national and regional levels. First, under conditions of

changing economic development, failure to specify environmental bottom lines can very quickly lead to rapid decline in the quality of fresh water. Further, this deterioration is not a linear response that can be precisely linked to increments in intensification of water use. Freshwater ecosystems can quickly reach a point from which there is no qualitative recovery. Second, once damage to the environment has been done, through diffuse means as has occurred in Canterbury, it is a very complex, costly, multi-actor and long-term project to bring about any remediation, if it can be done at all. The jury will be out on that for some time yet, and those responsible for the damage could be long gone before the effects are realised. For other regions, the lesson is that a region-wide view of water resources is needed, one that takes a dynamic view of ecosystem health and its resilience and sustainability, and which recognises that there are bound to be episodic shifts in how water is used and how intensively.

1 Source: Statistics New Zealand and Census 2013.
2 According to Statistics New Zealand the total number of dairy cattle in Canterbury grew by nearly 84% to 1.3 million cows between 1995 and 2013, compared to the national average growth of 40.7%. See also Table 1.
3 Reflected at the national level in the Dirty Dairying campaign, prompting the Dairy and Clean Streams Accord 2003 and its successor, Sustainable Dairying 2013–2020.
4 Targets have been developed for: (1) ecosystem health/biodiversity; (2) natural character of braided rivers; (3) kaitiakitanga; (4) drinking water; (5) recreational and amenity opportunities; (6) water-use efficiency; (7) irrigated land area; (8) energy security and efficiency; (9) regional and national economies; (10) environmental limits.
5 Hurunui zone committee produced an interim regional plan early on to unblock an impasse created through the imposition of a water conservation order and High Court challenge, but have yet to do a fuller plan based on the work of the zone committee.
6 Te Rūnanganui o Ngai Tahu.
7 The expiry date for the temporary Canterbury legislation was extended to 2016. New legislation was introduced in August 2015 to create a hybrid council of seven elected and up to six appointed members until 2019.
8 The use of a macroinvertebrate community index (MCI) is advocated by the Parliamentary Pommissioner for the Environment and others as a desirable bio-indicator to be added to the national policy statement bottom lines.
9 Land and Water Aotearoa (LAWA) (http://www.lawa.org.nz/explore-data/freshwater/) is a joint project of the regional councils and unitary authorities in New Zealand, the Ministry for the Environment, the Cawthron Institute and Massey University.

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