SETTING CATCHMENT WATER QUALITY LIMITS AND IMPLICATIONS FOR NUTRIENT MANAGEMENT IN CANTERBURY

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Abstract

The management of agricultural diffuse pollution is at the heart of a debate facing Canterbury over pressure to intensify agricultural production and addressing the effects on the region's water resources.

In recognition that existing policies did not deal adequately with diffuse pollution, Environment Canterbury initiated a collaborative pilot project in 2009 to devise new approach (known as the 'preferred approach') for managing the cumulative impacts of land use on water quality. The outcome was a set of general principles and an agreement on the broad policy approach that underpin the process of setting catchment water quality and quantity limits with the local community and for the continuing task of managing to the limits. The principles of the preferred approach for setting environmental limits have been incorporated into the Canterbury Draft Land and Water Plan.

While overall statutory responsibility for setting limits and ensuring compliance rests with Environment Canterbury, the 'preferred approach' relies on the relevant Canterbury Water Management Zone Committee playing a central role in all aspects of the process. The involvement of the Zone Committees in this way is critical to ensure integrated water management in the region. Communities of interest and key stakeholders also have an important role to play by participating in the process and ensuring that a strong focus on community-agreed outcomes is maintained.

Once limits are set the challenge is managing diffuse and point source discharges to these limits. The preferred approach empowers those responsible for, or who benefit from, the use of land to develop their own property-specific or collective means to deliver on the agreed catchment objectives. At the farm level, a key component will be farm nutrient discharge allowances (NDAs). The impact of introducing NDAs at farm level will depend on the scale, nature and intensity of the farm operation and on the vulnerability of the soils to nutrient loss. A nutrient allocation system based on equal allocation is being considered for fully or over-allocated catchments.

The 'preferred approach' is markedly different to current management of diffuse pollution in Canterbury. It is a resource intensive process initially and will need to deal with challenges and opposing viewpoints in the community. However, the combination of a technically-informed collaborative approach, community agreed outcomes, and management to limits represents a big step forward in the sustainable management and use of resources in Canterbury. This is expected to deliver cost effective management of diffuse pollution in the long term.

Introduction

The management of agricultural diffuse pollution is at the heart of a national debate facing New Zealand between pressure to intensify agricultural production and the effects on the country's water resources. Nowhere is this more apparent than in the Canterbury Region. Seventy percent of the irrigated land in New Zealand is in Canterbury. This area is estimated to be about 550,000 ha, and represents just 50% of the potentially irrigable land in the region. The region's water resources already exhibit adverse impacts on both water quality and quantity in some areas.

The Canterbury Water Management Strategy (CWMS) came into effect in 2010 The Strategy was developed in response to the declining health of both surface water and groundwater, an ongoing loss of cultural value and recreational opportunities, as well as the declining availability and reliability of water for agricultural and energy users.

The CWMS establishes a collaborative framework for sustainably addressing these issues to enable present and future generations to gain the greatest social, economic, recreational and cultural benefits from Canterbury's water resources. It sets out targets for water management in Canterbury for the next 30 years. Ten zone committees are responsible for developing water management programmes that give effect to these targets for their respective areas.

One of the CWMS (2009) targets is to set catchment nutrient water quality limits, as a means of managing the balance between development and environmental values by 2015. The Report of the Land and Water Forum (2010) also recommended to Government the need for limits to manage water quality and quantity. With the gazetting of the National Policy Statement for Freshwater Management (July 2011), regional councils are required to have limits in place by 2015, or formally set out a programme to have limits in place by 2030.

We need limits, in short, because they are the key, in combination with other complementary methods, to effective management of cumulative effects, the long-standing Achilles' heel of water resource management. Establishing limits to resource use recognises that resources, in terms of both quantity and quality, have a finite capacity-for-use beyond which further use is unsustainable without resulting in harmful effects on the environment, values and other uses of the resource. Importantly, the available capacity-for-use can be taken up by multiple activities of different types (e.g. abstractions, dams, point and diffuse discharges, river works and land uses) that have cumulative effects. It is logical that as demand for resource use approaches capacity, it is impossible to effectively manage these multiple activities without defining limits that quantify that capacity for use.

Numerous commentators have described the deficiencies of New Zealand's regional water plans, including lack of specificity, consistency and justifiability of plan provisions and the inability to handle cumulative effects (e.g. OECD 1996 & 2007; OCAG 2005; Crawford 2007; Peart 2007; Oram 2007; Erickson *et al*. 2001; MfE 1998; Frieder 1997). Others have discussed from different perspectives, legal (e.g. Salmon 2007, Milne 2008, Simpson Grierson 2010) and science for the setting limits to manage cumulative effects in water management (e.g. Norton *et al*. 2010, Snelder and Hughey 2005, Norton and Snelder 2003 & 2009). The need for limits has become stronger as demand for water and land uses that affect water quality have increased in New Zealand, particularly in the last 20 years.

In recognition that existing policies did not deal adequately with diffuse pollution, Environment Canterbury initiated a collaborative pilot project in 2009 with Ngai Tahu and industry partners to devise a new approach (known as the 'preferred approach') for managing the cumulative impacts of land use on water quality (EnvironmentCanterbury, 2012). The pilot study was conducted in the Culverden Basin, Hurunui catchment, North Canterbury. The outcome was a set of general principles and a general policy approach that underpin the process of setting catchment limits with the local community and for the continuing task of managing to the limits, Figure 1.

This paper briefly describes the approach to setting water quality and quantity catchment limits being undertaken in Canterbury and the impact of limits on nutrient management in the area. It is 'work in progress' and the ideas and concepts discussed here will change and be refined over time.

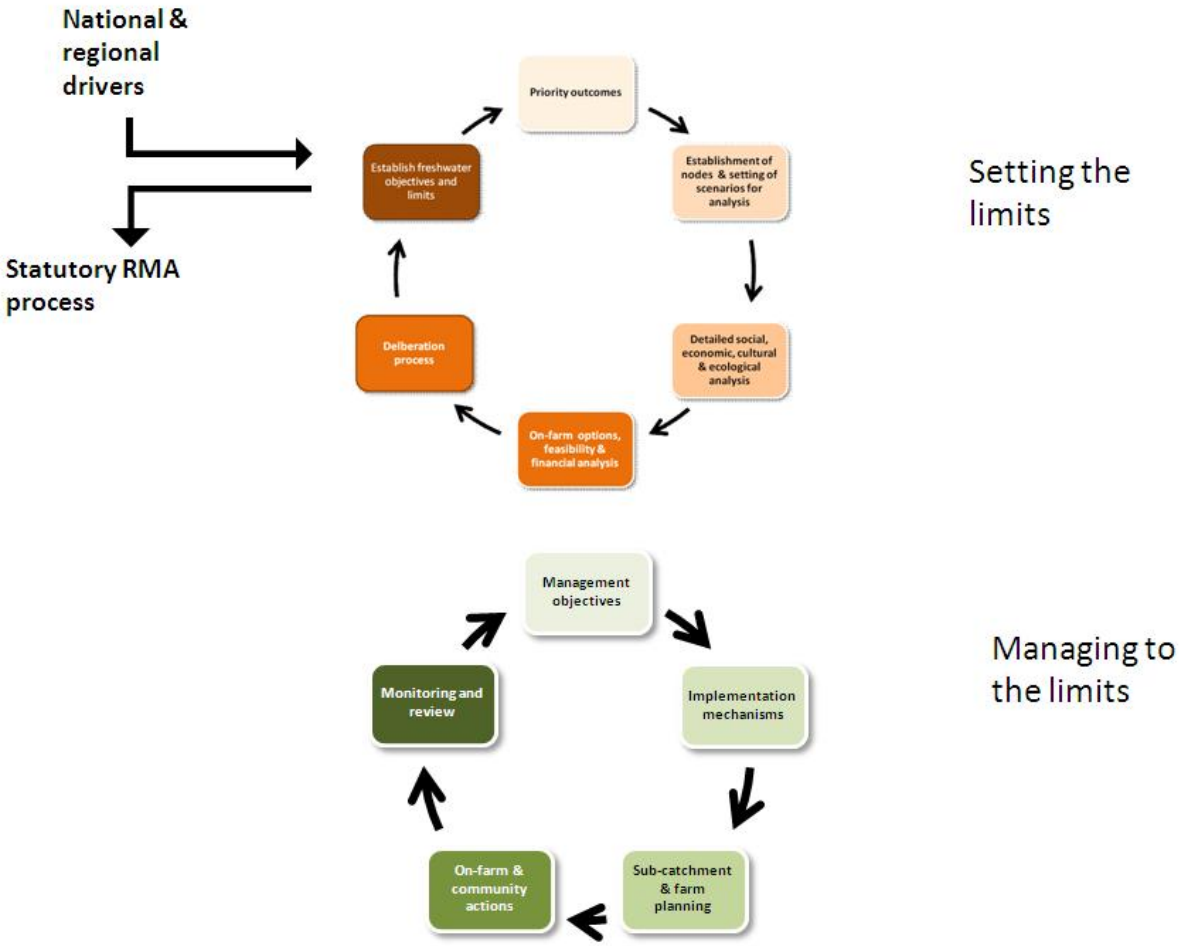

Figure 1 . The 'Preferred Approach' for setting and managing to limits

Setting catchment limits

The complexity and uncertainty that surrounds managing environmental outcomes while taking into consideration community values associated with social, cultural and economic outcomes means that a science-centric approach on its own will not address the issues

(Bremer 2010). The three key components of the limit setting process derived from the preferred approach are:

- Community involvement
- Technical assessment
- Use of limits in statutory plans

Community involvement

While overall statutory responsibility for setting catchment nutrient load limits and ensuring that these limits are met rests with the regulatory authority, Environment Canterbury recognises that to set environmental limits that acknowledges the integral place that water plays in our society, culture and economy, the community needed to be central in the process. In the limit setting process, Environment Canterbury uses two types of community group:

- Local Canterbury Water Management (CWMS) Zone Committee (a joint district /regional council committee set up under the Local Government Act 2002
- Community focus groups

The CWMS is a non statutory strategy designed to assist Environment Canterbury in the sustainable management of water in the region. As a part of the strategy a series of local Zone Committees were established to make recommendations and assist in integrated water management at the local level. The involvement of the Zone Committees in this way is critical to ensure integrated water management in the region. They also play an important implementation oversight role. The Zone Committees are made up of elected regional and district council representatives, appointed local Runanga representatives and other community members.

The community focus groups represent the suite of community interests in the area and typically cover a broad range of interests e.g., primary sectors, recreation, irrigation, environmental NGOs, community boards, local government, energy, tourism, rural women, education. Communities of interest and stakeholders have a key role to play by participating in the process and ensuring that a strong focus on community-agreed outcomes is maintained. The existing networks of these groups and organisations are actively used to extend the reach of the limit setting process. The role of the Zone Committee is to make a recommendation to Canterbury Regional Council (currently Environment Canterbury Commissioners) on agreed environmental outcomes for the catchment and a package of strategies for achieving those outcomes. The agreed outcomes will involve a value judgement made through attempting to balance across the often competing outcomes. The community focus groups inform the Zone Committee through structured discussions via a deliberation process.

Stakeholder Deliberation

The deliberation process provides a structured platform for dialogue and learning between stakeholders that makes transparent their perspectives, competing outcomes and associated tradeoffs that will be required if a balance of competing outcomes is to be achieved. It provides an opportunity to test the acceptability of environmental, social, cultural and economic outcomes with the community and helps identify remaining areas of conflict. The framework can also be used to test acceptability of various policy and/or industry strategies to meet intended outcomes prior to implementation thus adding value to strategic planning. The deliberation process used in the preferred approach follows a six step iterative process, Fig. 2.

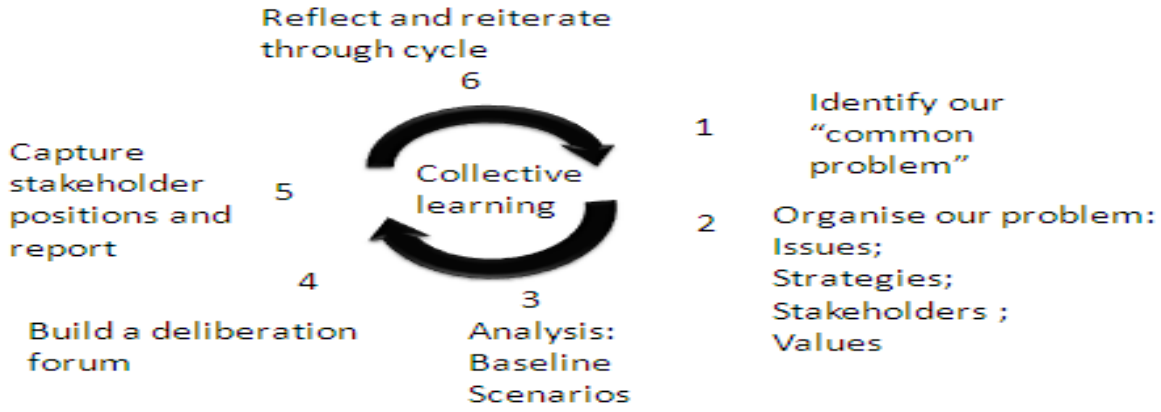

Figure 2. Integrated systems thinking deliberative process

The problem was organised into a Deliberation Matrix in which stakeholder groups each assessed the acceptability of scenarios against a suite of outcomes that represent an aspect of environment, economic, social or cultural well being. These outcomes are taken from the local CWMS committee's Zone Implementation Programme. The range of scenarios is agreed with the Zone Committee and focus groups. The scenarios are structured to have starting points focused on economic development or environmental performance thus offering a range of plausible futures for exploration.

The resulting impact of a single scenario, derived from technical modelling, and qualitative analysis, is presented to the community groups in both written and presentation form with time for questions. Following the presentation of the scenario, the stakeholders adjourned into their groups with a facilitator and assessed the acceptability (yes, no, don't know) of the scenario impacts against their outcomes and associated indicators. These assessments were then shared collectively.

The deliberative process, through a collective learning experience, allows for the building of relationships including trust as stakeholders build their understanding of each other's perspectives and positions. For instance where a particular scenario impact was judged unacceptable the community of stakeholders participating can explore mechanisms that could be applied to turn the judgement to acceptable. These types of exercises allow stakeholders to focus on solutions as well as issues.

The information generated through the community focus groups, their assessments of the acceptability of scenarios, reasoning and solutions are fed back to the Zone Committee. The Zone Committee will use this information, together with all the relevant supporting environmental, economic, social and cultural data, to inform their discussions and decisions on the water quality and quantity outcomes. The Zone Committee then make recommendations to the Environment Canterbury commissioners on these outcomes and the package of solutions and policies that support these outcomes, both regulatory and non regulatory.

Technical assessment

To support and inform the stakeholder discussions around consequences of various water quality and quantity futures; technical work is also undertaken. The technical work spans the four well-beings; environmental, social, cultural and economic. In addition, the technical work is complemented by work on farm analysis and mitigation and off farm or catchment intervention and mitigation. The rationale for this additional work is that on farm and off farm mitigations and interventions can be applied to any of the scenarios. On-farm analysis is a crucial step in the process of understanding the implications of different scenarios. If the limit setting process is not fully informed about both farm scale and cumulative impacts (from an economic and social consequence and opportunity viewpoint alongside environmental and cultural aspects) this will potentially impose unintended constraints or perverse consequences upon existing and future farming activities.

A key output from the technical analysis is the translation of model outputs into community values e.g. concentration of dissolved N and P translated into the ability to swim. Many of the outcomes that are desired by the community cannot be modelled and the uses of other means of informing have to be explored e.g. social and cultural impact assessment. Although the technical analysis is important in the limit setting process, through making transparent the consequences and implications of different futures across the well beings, the technical analysis alone will not produce decisions. Value judgments are required to decide on the acceptable balance between multiple, sometimes conflicting, values and levels of acceptable risk (Environment Canterbury 2012). The technical analysis will inform and support the community discussions and assist in understanding trade-offs or gifts and gains.

A suite of models and assessment tools are used to understand the implications across the wellbeings of different scenarios, and identify the direction and likely scale of change and supporting a narrative on the impacts of the change against the community's identified values. All the models and assessment tools will be subject to uncertainty. The uncertainty must be recognised, acknowledged, and communicated to the community and reflected ultimately in the implementation of the limits through the statutory plans, through an adaptive management regime. The outputs of the technical assessments are assessed in terms of likelihood of meeting regulatory and community identified objectives for water quality, quantity and other key areas of interest.

Use of catchment limits in statutory plans

A catchment limit defines the assimilative capacity of a receiving environment at an agreed environmental state taking into account diffuse and point sources and unmanageable contributions.

In order for this catchment limit to be interpreted, all contributors[1] should understand their individual obligations to meeting this limit. If they do not, it is hard to see how the agreed outcome will be achieved or maintained. Therefore the limit should be allocated, or by some means translated back to the enterprise level. By doing so, the catchment limit broadly links nutrient losses from land use practices and other catchment activities with a water quality or quantity outcome.

[1] A plan will need to take account of and manage discharges from other contributors, such as sewage treatment works, urban discharge, and industrial discharges, as well as the contribution from natural sources.

One of the consequences of setting limits on a natural resource is providing an agreed method of allocating the resource among existing and potential users. In Canterbury a regional approach to nutrient allocation is being pursued, with the view that an agreed allocation methodology will from part of the Land and Water Regional Plan. Once an allocation approach has been agreed to, it would be used to set a nutrient discharge allowance (NDA) for all landowners, based on the assimilative capacity of the resource.

An 'equal allocation' approach to nutrient allocation is currently being considered. This approach in effect applies a 'polluter pays' principle. Those land owners who are contributing most to a water quality problem through the intensity of their land use and/or the poor capacity of their land to minimise nutrient losses will need to find ways to reduce their nutrient losses.

The allocatable nutrient load would be equally divided across all the productive land within the zone or catchment giving a NDA value in kg/ha/yr. A suggested refinement is to recognise two categories of productive land where land that is capable of intensive land use is separated from land that can only be extensively farmed. If the latter is unlikely to ever use its full nutrient allocation then its 'spare capacity' could be reallocated to the land capable of intensive land uses. Both types of land are then given an NDA.

Each farm enterprise would need to show, using nutrient budgeting modelling, that their management practices were such that their nutrient losses were within their allocation.

Implications of limits for nutrient management in Canterbury

The setting of, and management to, catchment limits in Canterbury is likely to have significant consequences on nutrient management throughout the region and farming practices, both on farm and for the support industries.

Where catchment water quality limits are put in statutory plans, farmers will be required to record on farm activities and assess their nutrient losses. Where the catchment load has been allocated to the enterprise level, the recording of farm management activities and reporting of nutrient losses will be required. These losses will be assessed against the farm NDA and cumulatively, against the catchment limit.

In terms of performance, the plans will require farmers to meet at least good practice. A look up table to articulate nutrient losses under good practice is being developed with Environment Canterbury, industry partners and Crown Research Institutes. There may be some catchments where good practice alone will not deliver the environmental outcomes that have been agreed by the wider community. As a consequence, the Zone Committee and community focus groups will have to consider a suite of measures to achieve the desired outcomes for water bodies. These may require additional resources, including financial contributions from the community to implement these measures.

If adopted, the implications of the equal-allocation approach for land owners will vary according to the soil services supplied by their land and the zone or catchment allocation status. Under a low or limiting NDA, land with less capacity for regulating nutrient loss (land with low natural capital in relation to nutrient retention in the root zone) will require intense application of nutrient loss avoidance or mitigation strategies to attain equivalent productivity, compared to land with high capacity. In some cases the cost of mitigation strategies on the land with limited nutrient regulating soil services may mean that only less

intensive land uses are economically feasible on this land in order to achieve the agreed environmental objective for the zone. On land with high capacity for limiting nutrient losses, relatively few measures would be required.

For supporting industries, consultancies and research organisations, the intent for the proactive management of diffuse pollution has been signalled clearly. This is likely to mean a greater focus on mitigation measures, management practices and strategies that increase resource use efficiency and reduce nutrient losses, in terms of both research and implementation on farm.

For Environment Canterbury, the adoption of the preferred approach will impose additional monitoring requirements as the contribution from point and diffuse sources ('the load to come') will need tracked to ensure that over all land use change and new activities stay within the catchment load limit.

Conclusion

Canterbury accounts for 70% of irrigated land in New Zealand, approximately 550,000 ha, this being only of the potentially irrigable land in the region. Many of the region's waterways and resources already exhibit adverse and unacceptable impacts on both water quality and quantity. There is community desire to both increase Canterbury's production and profitability and to restore and improve Canterbury's waterways. Establishing limits to resource use recognises that resources, in terms of both quantity and quality, have a capacity-for-use beyond which further use is unsustainable. The 'preferred approach' developed by Environment Canterbury, Ngai Tahu and other primary sector parties articulated a set of principles to setting and managing to limits. The three key components of the limit setting process derived from the preferred approach are:

- Community involvement
- Technical assessment
- Use of limits in statutory plans

The community are engaged in the limit setting through a deliberative process, where they record their values and views on the technical assessments is through the use of a Deliberation Matrix. The structured discussions allow stakeholders to focus on solutions as well as issues.

At the farm level, a key component will be farm nutrient discharge allowances (NDAs). The impact of introducing NDAs at farm level will depend on the scale, nature and intensity of the operation and on the proneness of the soils to nutrient loss. A nutrient allocation system based on equal allocation is currently being developed and tested.

The 'preferred approach' is markedly different to current management of diffuse pollution in Canterbury. It is a resource intensive process in its initial stages and will need to deal with challenges and conflicts. However, the combination of a technically-informed collaborative approach, community agreed outcomes, and management to limits represents a big step forward in the sustainable management and use of resources in Canterbury. This is expected to deliver cost effective management of diffuse pollution in the long term.

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