Regulatory Impact Analysis

Action for healthy waterways

Part II: Detailed Analysis

6 May 2020

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Quality Assurance Statement

A review panel with representatives from Treasury's Regulatory Quality Team, the Ministry for the Environment and the Ministry for Primary Industries has reviewed the Regulatory Impact Analysis (RIA) that has been developed by the Ministry for the Environment for the action for healthy waterways package (dated 22 April 2019).

This is a complex package with twenty individual RIA corresponding to the sections in the package. An additional summary/synthesis section and implementation section was provided for the package as a whole.

The panel considers that overall, the package "partially meets" the quality assurance (QA) criteria. Within the individual RIA, twelve "meet" the QA criteria and eight "partially meet". The "partially meets" rating for the individual RIA and the overall package, reflects information and data constraints. The Ministry's approach to the analysis is generally sound and is based on relevant available data.

The panel's view is that the case has been made for change. While the benefits of the preferred options within the package have been clearly demonstrated relative to the status quo, the comparison between some of the preferred options and the alternatives is less clear.

Since most regional councils have yet to finalise plans that respond to the National Policy Statement for Freshwater Management (2017), it is difficult to predict how councils will choose to exercise their discretion (such as where to set objectives above national bottom-lines and the timeframes for achieving those objectives). Therefore, the degree to which some of the options in the package are likely to provide marginal benefits over and above expected outcomes under current policies remains unclear.

There is also uncertainty about the extent to which the package could impact on freshwater environments due to limits of available scientific analysis imposed by various lag times and soil composition and texture, as well as practical simplifications in the environmental modelling.

The ecosystem benefits, while difficult to quantify, appear very large relative to the costs for councils and regulated parties. The economic modelling indicates an impact on farm profitability that is likely to lead to land-use change in some regions. Some of that may be mitigated by farm specific responses that have not been captured in the modelling, but the economic and social impacts are going to be significant in some regions.

The adaptive management approach to implementation proposed in the RIA is key to managing the uncertainty and cumulative impacts of the reforms. It can provide flexible, iterative solutions that help to address implementation issues relating to capacity, capability and differing environmental situations across the country. It also provides for ongoing stakeholder consultation, which is important because there have been changes to some proposals in the package since public consultation occurred in 2019.

Given the complexity of the package, the governance arrangements need to be carefully designed and set-up to coordinate and oversee adaptive implementation of the healthy waterways package and linkages with other related government programmes.

Statement on Detailed Analysis

This document should be read in conjunction with *Regulatory Impact Analysis: Essential Freshwater Part I: Summary and Overall Impacts*. It provides detailed analysis of each of the policy areas and a

statement on the proposed implementation of the package. Part I contains more high-level information on the overarching problem and a summary of the impacts of the package as a whole.

The limitations and constraints on the analysis outlined in section 1 of Part I also apply to this analysis.

Proposed Implementation of the package

This chapter presents how the Ministry for the Environment (MfE) is planning to approach implementation support for the new, revised National Policy Statement for Freshwater Management (NPS-FM), new National Environmental Standard for Freshwater (NES-FM), new section 360 regulations and other related amendments to the Resource Management Act. The implementation programme will also explore a wider range of non-regulatory options to achieve the Government's objectives.

After briefly outlining the overarching strategy for detailed implementation planning, this chapter presents key timeframes, the main implementation risks and our proposed support package framework.

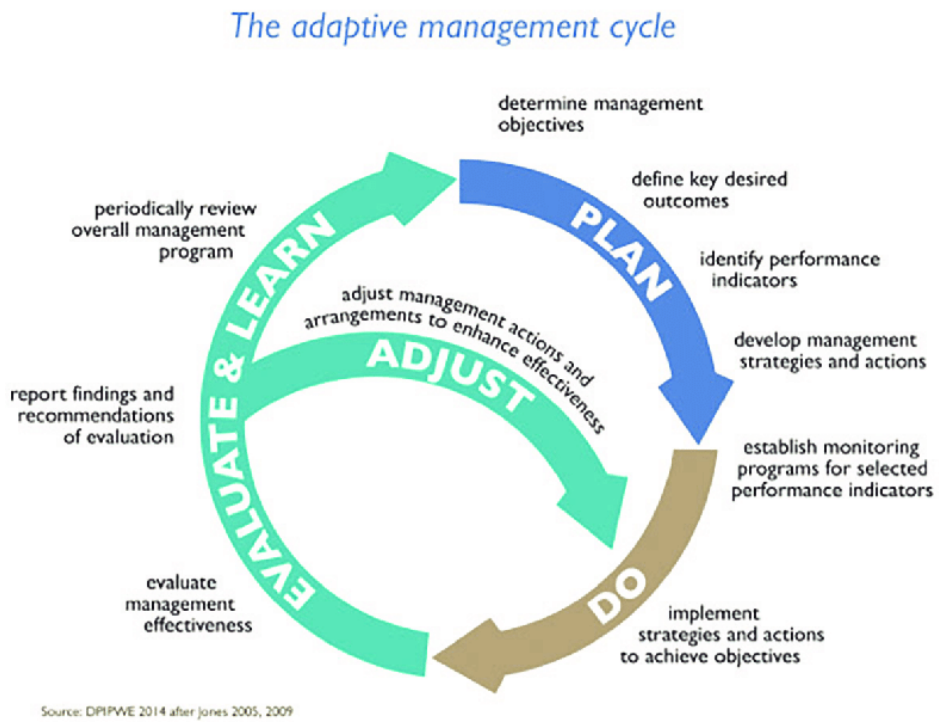
Please note that all initial ideas and plans outlined in this chapter are subject to final policy decisions, engagement outcomes and budget decisions.

Implementation kaupapa – An adaptive management strategy

The underpinning kaupapa (the principle or policy) for how the Action for healthy waterways Package will be implemented is a strategy of adaptive management and behavioural insights. This approach is essential to the successful implementation of the policies due to the complexity of the package as a whole and the varying issues of capacity, capability and differing environmental situations across Aotearoa.

Adaptive management is the approach of being flexible, working iteratively and collaboratively to ensure outcomes are achieved in the most effective and efficient ways possible. This requires solid feedback loops so that the implementation approach can be adjusted where problems arise. This fundamental kaupapa is inherent in all stages of implementation of the policy, and underpins the work within this document.

Figure 1: the adaptive management cycle



This implementation chapter outlines the key components of a proposed implementation strategy. Details of implementation initiatives for individual sections of the Action for healthy waterways Package are contained within the subject-specific chapters of this RIA.

The overall implementation strategy is a living document and is currently being developed. As noted above any final implementation plan will be subject to final policy decisions, budget constraints, and the results of our ongoing engagement with Treaty partners and stakeholders.

Detailed implementation plans for each component of the package are currently being prepared, drawing on the many ideas for implementation support raised in submissions, by the Independent Advisory Panel, Advisory Group reports and through broader collaboration and engagement. These ideas are in the process of being prioritised against a set of criteria, including the environmental benefit, strategic alignment across government initiatives, primacy and criticality (e.g. against regulatory timeframes), and achievability/cost-effectiveness.

MfE will undertake collaborative processes at various stages within this prioritisation process, as getting external input into the prioritisation and sequencing of the various implementation initiatives will be critical to successfully implementing a programme of this complexity.

Following the prioritisation phase, we intend to build the 'sector support plans' which look across the cumulative requirements and impacts of the regulatory package, and then refine/balance each package to ensure a range of key partners and groups will receive appropriate support.

Areas of focus for implementation and timeframes

From gazettal in mid-2020, implementing these policies will require substantial investments and ongoing action by a range of stakeholders over the next few years. Successful implementation will

also require support to address overarching capacity and capability constraints for councils and tangata whenua, in addition to targeted support to help landowners meet new policy requirements.

Regional councils will need to begin implementing the provisions in the revised NPS-FM, and, at the time of writing, would be required to have notified their plans by December 2023. While some provisions will simply clarify existing requirements (eg, the clarification around treatment of hydroelectric infrastructure), other changes will require regional councils to modify their existing plans (eg, the new sediment attribute).

While the Freshwater NES and section 360 regulations will take immediate effect, individuals will need to comply with the requirements of the regulations at different times for different policies. In some cases, the requirements will be phased in over time, starting with certain priority catchments or groups of land users (eg, the phased approach to stock exclusion requirements).

Figure 2 below shows how the Action for healthy waterways Package is proposed to be rolled out. Note that these timeframes are subject to final policy decisions and this table will be updated to reflect any amended dates. Some of these timeframes may be reviewed in light of the challenges imposed by the COVID-19 lockdown period.

Figure 2 Indicative timeframes for implementation for key components of the Action for healthy waterways Package.

<table>
<tr><th></th><th>2020</th><th>2021</th><th>2022</th><th>2023</th><th>2024</th><th>2025</th></tr>
<tr><td>NPS

RM Bill – Freshwater Planning process</td><td>Amended NPS gazetted

Freshwater commissioner appointed</td><td colspan="3">Regional councils give effect to NPS requirements (set objectives and limits) and notify freshwater plans by Dec 2023</td><td></td><td></td></tr>
<tr><td>NES

Intensification

High Risk Land Use (Winter Grazing, Stockholding)

Nitrogen Cap</td><td>Regulations come into force, councils must begin processing resource consents</td><td>Consent for IWG (mid-2021)

Farms get Overseer budgets & councils set thresholds (mid-2021)</td><td>Consent req’d if not below threshold after 12 months (mid-2022)</td><td></td><td></td><td>Interim regulations no longer apply</td></tr>
<tr><td>S360 regulations</td><td>Regulations come into force, councils begin processing resource consents</td><td>First tranche of stock excluded</td><td></td><td>Second tranche of stock excluded</td><td></td><td></td></tr>
<tr><td>Enforceable Freshwater Farm Planning legislation (RM Bill Supplementary Order Paper)</td><td>Freshwater Modules in Farm Plans requirements</td><td colspan="5">Central govt developing regulations</td></tr>
</table>

Where the new NES requires a resource consent and the activity was previously permitted under the regional plan, the individual will have up to 6 months to obtain consent for the activity. An individual with consent to carry out an activity that already had more stringent requirements than those set by the NES will be able to continue as originally consented. Where the section 360 regulations require specific actions, these actions will prevail over any existing consented activity where the section 360 regulations are more stringent.

If any decisions are taken to extend implementation timeframes, the overarching capacity and capability constraints are expected to progressively diminish.

What are the implementation risks?

The Action for healthy waterways Package contains a large number of policy changes and new regulations that will require immediate action. The size and complexity of the reforms will be challenging to deliver with existing resources and will require new investment by many parties.

Sector Risks

A significant risk to the successful implementation of the policy package is that regional councils may not immediately have the resources required to:

- hold meaningful engagement with tangata whenua
- carry out thorough consultation processes to set objectives and limits
- amend regional plans and policy statements by 2025 (or in exceptional cases 2030) to reflect the new NPS direction
- process resource consents where these are required by the Freshwater NES or section 360 regulations,
- monitor compliance with the new Freshwater NES and section 360 regulations, and
- administer new functions, such as approving farm planners to work in their region.

Another key risk is the lack of capacity for Māori to engage in the planning process. The new plans will need to give effect to Te Mana o te Wai and Māori compulsory values which will likely strain existing capacity for both tangata whenua and councils considerably.

A further risk is that compliance requirements for landowners present an additional cost and time burden for some and/or there may be a lack of industry capability and capacity to implement the proposed changes within specified timelines. For example:

- Fencing will likely be expensive on some farms, particularly for farms where there are large stretches of unfenced waterways
- Wide-spread fencing of waterways may increase demand for labour, leading to shortages in some parts of the country.
- Multiple consents may be required to undertake regular farming practices such as winter grazing and stockholding
- Implementation of freshwater modules in farm plans relies on there being a sufficiently-sized pool of suitability qualified persons to prepare and audit the plans. This pool of qualified persons will need to be built up over time.

Proposed Implementation Support

This section captures how MfE proposes to meet known implementation challenges and mitigate risks through guidance and non-regulatory support. This includes the proposed implementation approach for the NPS, NES, s360 regulations and other RMA amendments.

It will also include an assessment and solutions to address systemic problems relating to implementation of freshwater policy that have resulted from a regionally devolved system with limited central government coordination and support. These issues are broader than supporting the new provisions, but unless they are addressed these new provisions will not be implemented effectively. Key issues include a lack of capacity and capability in some councils, multiple approaches to information systems, data, monitoring, reporting and assessment across councils, along with inadequate compliance, monitoring and enforcement (CME). Addressing these wider issues requires the Implementation team to work closely with other parts of MfE, including the RM Reform team, as well as across multiple government agencies.

Approach to Implementation Support

MfE is developing this implementation support by:

1. **Undertaking collaborative processes to engage with councils, Treaty partners and stakeholders and scope implementation support needs for different groups**
2. **Procuring and producing implementation tools and technical guidance**
3. **Delivery of targeted implementation support**
4. **Evaluating implementation support using adaptive management**

The specific parts of the framework are discussed in the sub-sections below.

Undertaking a collaborative process to engage with stakeholders and scope support needs

MfE has started engagement with regional councils, Treaty partners, and stakeholders including the primary sector to identify relevant projects to support the successful implementation for the Action for healthy waterways Package. Many potential projects have also been identified through analysing submissions from our public consultation.

MfE is working to build on this engagement to develop detailed implementation plans

Support initiatives will be assessed against criteria for prioritisation. We are currently developing this process, but these criteria may include:

- Fitness for purpose (environmental outcome imperatives, robust evidence base, enables and empowers communities)
- Primacy and criticality (regulatory imperative, risk-based, phased approach)
- Strategic alignment of whole of government effort
- Practicability and cost (likelihood of success, value for money).

Naturally, the implementation programme will prioritise initiatives in relation to areas of the package where submitters raised significant concerns. This is expected to include early investments in support for wetland identification, trainings for freshwater commissioners, technical guidance on new attributes and action plan requirements, stock exclusion policies, and farm plan system development.[1]

Procurement and production of implementation tools and packages

Implementation support funding has been allocated through the 2019 Sustainable Land Use (SLU) package budget. This funding will ensure support is available for Treaty Partners and key stakeholders to address the challenges presented by the plan notification timeframes, additional

[1] For more detailed explanations of implementation concerns related to these policies, please see their individual RIAs in Part Two.

capacity requirements, skills shortages and other challenges in the implementation of this policy package. The budget provides $229m to MPI and MfE over four years to support delivery of the Government's broader sustainable land use goals. Of this, only $24 million has been specifically allocated to implementing the freshwater policies through supporting the NPS-FM planning process ($12 million) and farm plans and good management practice ($12 million). Even where additional funds are not directly assigned to freshwater projects, there are opportunities for other initiatives that will contribute positively to freshwater outcomes.

As key support initiatives are prioritised, MfE will facilitate the procurement and production of the tools and support packages as and when required. Initially, the Ministry plans to establish small and focused expert groups that collate expertise in areas where technical guidance or central direction are crucial to successful implementation. The key areas where these experts might usefully assist in the production of support products are being identified.

For example, a report by Castalia[2] identified that many councils currently lack the necessary expertise to implement some policies effectively and consistently. We also know from submissions analysis and MfE's ongoing engagement with the primary sector that farm planning and stock exclusion implementation could be challenging for many. Using an agile group of experts will help develop these initial support needs, while assisting MfE in its ongoing engagement to help identify additional issues and solutions as they arise.

As support products are developed, it will be important to have built-in reviews to constantly ensure outputs are fit for purpose. Ongoing engagement is also needed to enable MfE to produce support that is meaningful and facilitates successful outcomes on the ground.

Delivery of Implementation Support

Successful implementation support delivery will be crucial for ensuring the package improves freshwater outcomes. MfE is looking to provide support to facilitate the planning process, data and information collection and various on-the-ground actions. It will be important that MfE not only produces initial guidance and avenues for accessing relevant information and tools, but also has plans that balance implementation support across stakeholder groups. Some information of how this delivery might look, based on current spending allocations, is outlined below.

Guidance

MfE will prepare guidance for the different audiences to support the policy package (possibly including new and more accessible formats, such as guidance videos). We are also exploring providing a 'portal' to ensure different sectors can find the relevant guidance and other tools they need in one central place, as well as having a way to contact the Ministry to ask questions and relay any problems they are having. This will allow the Ministry to be more responsive and adaptive in our provision of support.

Supporting the regional council planning process

Regional Policy Statement and Regional Plan development plans for implementation support

Councils will be under increased time pressure to notify their freshwater plans by the end of 2023. Funding from the 2019 SLU budget of $12 million over four years has been allocated to support councils and others to accelerate the implementation of the new NPS-FM.

[2] *Administrative Cost of Proposed Essential Freshwater Package on Regional Councils*, Castalia report for MfE, February 2020.

Some of the implementation support cannot begin until final policy decisions are made but MfE have started procuring work related to an initial set of 'no regrets' projects. Regional council representatives have agreed that these projects should be priorities for central government investment as they are not policy dependent. One such project is an analysis of all regional plans and policy statements against the proposed NPS and NES rules. We know that some councils will need more support to update their plans to respond to the policy changes and this analysis will help identify where and when to target council implementation support. This is the first phase of a larger programme to assist councils.

In subsequent phases, MfE is investigating how best to support councils to develop their plans in time for notification in 2023, including the possibility of deploying expert planners to some regions to provide advice and help with scheduling and sequencing their work. MfE is also working with the regional sector to identify other tools to assist the regional plan work (e.g. possible templates, standardised methodologies, technical guidance, trainings, in-person expert support and information). This work will also identify best practice examples across NZ for sharing with the wider sector. But where there are new requirements, such as for action plans, this will require new guidance and templates to speed up implementation and ensure a consistent approach is taken.

Support for the new Freshwater Planning Process

MfE is also working to provide support for the new freshwater planning process which will enable regional councils to make decisions on the proposed new NPS-FM before 31 December 2025. The freshwater planning process establishes specialised freshwater hearings panels to make recommendations to regional councils on freshwater planning instruments, supported by a more streamlined appeals process. Initial preparations, including establishing support for freshwater commissioners, are underway. These arrangements need to take place prior to gazettal to ensure that regional councils can start using the freshwater planning process for any freshwater planning instruments that have already been drafted. We are also working to develop training modules for commissioners on select aspects of the new NPS, such as the Te Mana o te Wai framework and the Māori compulsory values.

Funding panels of commissioners for this planning process will require considerable investment by Government and could potentially absorb a significant portion of the originally allocated $12 million. The Ministry is currently costing this process in order to seek additional funding for other elements of council support.

Support for implementing different methods to achieve freshwater outcomes (new NES consenting, farm plans and non-regulatory support)

New NES consenting requirements and the freshwater modules in farm plans will also require additional resourcing for councils. Support in these areas will be needed to ensure that the important work councils do to support stakeholders improve freshwater outcomes on the ground is not compromised. The regional sector has asked for support in collecting and managing data (including science support and mapping), technical guidance on specific policy topics and good management practice and capability and capacity support for implementation. Many of these ideas align well with some of the primary sector's requests for implementation support tools.

Funding of $12 million over four years has been identified in Budget 2019 to support the successful implementation of farm plans and the uptake of good management practices, specifically focussing on providing the practice standards that will be an important component of farm planning. MfE is working with MPI to establish a workable farm planning architecture that enables councils to carry

out their freshwater functions. We anticipate involving councils in the process of developing this system over the next 18 months. The farm plan system will ultimately need to provide councils with access to farm planning information to implement their compliance efforts. Such a system will need to include standardised data collection and reporting standards that also align with central government environmental reporting needs. There will also need to be clear guidance on the role of farm planners (Suitably Qualified and Experienced Persons or SQEPs) and the role of Regional Council CME functions within the farm planning regime.

Other aspects of the NES requirements will also require councils to undertake new functions, and MfE is exploring how to best support this. For example, regarding the NES wetland requirements, MfE intends to provide identification and mapping support, along with clear guidance to ensure a consistent approach is taken to consenting. Similarly, technical guidance as well as process or policy interpretation guidance will be required for other new NES consented activities such as stock exclusion, winter grazing, stock holding areas, intensification, stream loss and flows. MfE is looking at ways to support councils that will experience particular capacity issues from increased consenting and CME workloads. Projects related to these challenges are currently being scoped or under evaluation.

Working with and supporting our Treaty partners

The proposed new NPS requirements will likely strain the already stretched capacity of local iwi and hapū. Our Treaty partners are asking for additional capacity and capability support to help them be part of the values identification process. The $12 million of funding MfE is administering for accelerating the implementation of the new NPS-FM will also be used to support Māori participation in plan preparation. We are looking at how to prioritise existing resource within our 2019/20 budget as well as scoping additional resource needs. These may result in new budget bids. This will include recommendations on how best to build capacity for Māori.

For successful implementation there will need to be close and comprehensive engagement with Māori on the requirements to uphold Te Mana o Te Wai and to identify and manage Māori values in freshwater. MfE are holding implementation hui to help access the necessary technical expertise and understand how best to target capacity support. There are a lot of existing good examples that could be provided as best practice. There is the potential to work with Māori to produce guidance documents that can be adapted for local situations. Particular care is needed in developing these products to ensure that any centrally provided guidance is adaptable and does not detract from the need to provide bespoke solutions that reflect each iwi and hapū's unique situation and solutions.

Implementing policy reform and supporting the adoption of good practice within the primary sector

The primary sector is seeking support for developing freshwater farm plans, additional financial support or longer timeframes for those who require bulky investments to comply with NES rules, and greater support for collectives and catchment groups. MfE is currently scoping a range of possible support projects in line with submitters' suggestions. At a minimum, this will include guidance on good farming practice in relation to the NES rules and support for a new freshwater farm plan system.

Besides the 2020 freshwater regulations, the primary sector may soon face several new environmental policy changes (e.g. the Zero Carbon Bill, NPS for Indigenous Biodiversity). Landowners and rural communities will need support to transition to the new freshwater NES and NPS requirements, as well as with identifying alignment and co-benefits with other upcoming

environmental policies. Our implementation approach is considering the likely collective impacts on these communities and how our implementation can be aligned across policies.

Support for the farm planning system and engagement with existing industry efforts

MfE has funding for $12 million to develop good practice standards and support farmers with farm plan development and applying these standards. We anticipate some of these standards will be developed collaboratively over the next few years, in line with ongoing policy work related to the farm planning system.

MfE and MPI are currently scoping what 'architecture' will be required for farm planning. This includes the databases or other tools that will be used to log and store the completed farm plans, the data standards needed to capture relevant information consistently, and other technical specifications needed to make this system robust and transparent. This scoping work is taking into account the needs of central government (e.g. environmental reporting), regional councils (e.g. access to data relevant for their CME functions) and industry groups (e.g. protecting commercially sensitive data). We are also exploring how such a system might link with existing industry farm plan platforms and databases.

Support for the wider farm plan regime and training and certifying farm plan advisors will also be required. MfE is working alongside MPI to co-fund and ensure alignment of this implementation support. MPI has $5 million specifically targeted to develop the competency, training and qualification framework of farm plan advisors, and work is underway to develop a certification scheme for farm planners.

Targeted support for 'At Risk Catchments'

A related MfE work stream is the At-Risk Catchment work which has funding of $12 million. This provides on-the-ground implementation support, targeted to specific catchments. Government support will accelerate and leverage community work that is already underway — we are taking a 'whole of government' approach to support 'whole of community' action. A set of '*Exemplar Catchments'* identified as part of this approach provides us with the opportunity to learn and develop partnerships in place, while we continue to build national-level information to direct our investments. The Kaipara Harbour and Te Hoiere/Pelorus catchments are the first catchments identified as part of this process where on the ground support will be provided to multiple stakeholders.

Support for 'catchment groups' and other collectives

MfE and MPI recognise the role that groups of land and water users play, and we are exploring options to support their role in implementation. This includes building on NZ Landcare Trust's (the Trust) work to support catchment groups through the *Promotion of sustainable land management* funding relationship with MfE (1 December 2019 to 30 June 2023). Under this deed of funding, the Trust will deliver sustainable land and water management resources, including a strategic catchment management group planning resource and a capability building programme for catchment coordinators. Complimentary to this MfE funding arrangement, MPI is also exploring potential opportunities to fund the Trust to assist with catchment management extension services.

Additional support for on-farm support tools

MPI are funded for several different programmes of work to support the primary sector become more resilient and sustainable. While these initiatives are broader than just freshwater

implementation work, some projects will be closely related and will further the Action for healthy waterways outcomes. A large amount, $59.6 million, has been earmarked to improve decision tools including Overseer and on-farm data and monitoring. MPI also have $47.3 million for on-farm support, including the $12.2 million allocated for Māori Agribusiness. This funding is to provide direct farmer outreach and leveraging of existing sector services. Ultimately, the Action for healthy waterways implementation plan will dovetail with many of MPI's related programmes.

Information and other support for the public and other groups

The public, local communities and Environmental Non-government Organisations (ENGOs) are also very invested in improving freshwater outcomes. MfE and MPI are working on how to better engage various groups throughout the implementation phase. MfE is also looking at the role citizen science can play. Again, the Trust may have some role in supporting citizen science under the existing funding agreement with MfE (e.g. promoting the use of stream health monitoring and assessment kits (SHMAK), which will help to build further citizen science capability and data).

Creating a sound information base

The data required to make informed decisions about resource use and allocation needs to be of high quality, reliable and consistently collected across the country. For successful implementation of the package, as well as to monitor and report progress, it is imperative that information systems and data collection are reviewed, standards established and potentially, national systems developed.

At present, councils have different systems for data collection and management, with varying scales of capacity and capability to manage these systems. It is essential that the Ministry undertakes a review of these systems to identify improvements. From this review, the Ministry will then work with council's to determine how to improve the data available for decision making.

This has direct implications beyond resource allocation, for example the reporting of Compliance Monitoring as well as National Monitoring and Farm Management Plans. An initial scoping of existing information systems and data collection indicate there are four categories that will need to be reviewed;

- Water – Quantity and quality
- Natural Environment – including mechanisms of geospatial mapping
- Built Infrastructure – for example meters, fish passage/screens, fencing
- Management – Farm Management Plan information, CME grading

This work is fundamental in that it underpins the ability to implement and monitor the impact of the policy changes in the Freshwater package. It is aligned with other work streams such as the national monitoring and broader CME objectives under the RMA reforms. MfE will also work with other agencies to ensure that where there are multiple data, information, mapping or research requirements (eg, across climate policy, the NPS Biodiversity and NPS-FM), this information is collected in such a way as to reduce effort, cost and minimise disruption to landowners.

Linkages between this implementation chapter and individual RIA chapters

As mentioned above this implementation chapter outlines the key components of a proposed implementation strategy. While further detail regarding individual policy implementation is included in the following chapters, there are a number of implementation activities that we are exploring that we anticipate will apply across multiple policy areas. Table 1 below summarises these. Please refer to the subject-specific chapters of this RIA for details of implementation initiatives for individual sections of the Action for healthy waterways Package.

Table 1: Proposed Interventions to support successful implementation of the NPS-FM, NES, Farm Plans and section 360 regulations

Potential Implementation Intervention (subject to final policy decisions, budget, and engagement outcomes)	**NPS-FM (relates to RIA chapters 1-13)**	**NES/Farm plans/section 360 regulations (relates to RIA chapters 13-20)**
Guidance- policy explanation	• Guidance- policy explanation for each component in the NPS-FM, including definitions • Guidance to show which national direction and regulation takes precedence and how they interact • Information portal	• Guidance- policy explanation for each provision, or group of provisions, in the NES, section 360 regulations. • Guidance to show which national direction and regulation takes precedence and how they interact • Information portal
Guidance - technical	• Guidance on running a good NOF setting process • Guidance on developing a long-term vision • Detailed guidance on various NOF attributes • Technical guidance on limit setting and flows • Produce standard methodologies	• Guidance on processing resource consents • Technical guidance on good practice
Templates	• Examples/templates for standard plan provisions required in NPS • Standard reporting templates e.g. for ecosystem health	• Templates for NES consents (e.g. winter grazing) • Standard reporting templates • Action plan templates
Model provisions	Develop model plan provisions	Develop standard consent conditions
Share best practice	• Produce national guidance for content for objectives, policies and methods for RPS and plans • Host workshops for knowledge sharing	• Produce national best practice standards for farm plans and NES consent conditions • Education materials on sustainable land use • Case studies of early adopters of best practice
Support for capacity and capability	• In-house support for councils as develop plans • Support for tangata whenua to work with regional councils in planning process • Support for catchment groups to be involved in planning process • Financial support for modelling flows	• Support for tangata whenua to work with regional councils during consenting processes • Support for catchment groups and extension services related to consenting requirements and uptake of good practice • Capacity building for consent processing, compliance, monitoring and enforcement
Training and certification	Training across various topics such as Te Mana o te Wai, Mātauranga Māori, Treaty of Waitangi	• National certification programme for farm planners • Training for farmers across various topics • Certification/training for water sensitive design/green infrastructure in urban environments
Mapping and information	For wetlands and threatened species: • Provide assistance to ensure consistent mapping. This will include producing a methodology for mapping. It may also include support to carry out the mapping at either a national or regional level. It will require guidance and support on collecting and recording this mapping data.	• Investment in mapping relevant for farm plans • Mapping and quantifying remaining stream habitat
Data systems and digital architecture	Investigate ways to ensure consistent and transparent data systems provided for reporting NOF information.	• Look at nationally consistent accounting system to collect consistent information for flows, water quality data and biodiversity loss etc. • Centralised database/portal, templates, mapping, for farm plan data
Additional science and research	• Ad hoc	• Ad hoc
Compliance, monitoring and enforcement	• Guidance to support consistent approach	Capacity building within regional councils
On-the-ground projects (initial examples only)	• Fund or support natural wetland restoration • Increase number of constructed wetlands	• Fund or support fence construction and riparian planting • Support for on-farm actions e.g. mitigating nitrogen loss • Work with farmers and councils on provisions of telemetry systems

Evaluation and Adaptive Management

To ensure that the implementation support needs are being met, MfE will monitor and evaluate throughout implementation to ensure effectiveness of significant projects. It is imperative, as the adaptive management kaupapa suggests, that there is consistent feedback throughout the delivery, given that some elements of the support package will be delivered over long timeframes, as well as involving cross-agency collaboration. Furthermore, the variation of capability and capacity across councils, sectors, treaty partners and stakeholders adds a level of complexity which will impact on priorities and overall delivery.

A number of ideas are being developed, or are under consideration, to ensure proactive and continuous evaluation, these include:

- The development of an interactive portal where stakeholders can ask questions, provide feedback and highlight problems they are having. This portal could allow MfE to be adaptive to stakeholder needs throughout implementation.
- The co-design, with councils, of Key Performance Indicators (KPI's) not on environmental performance, but on relevant processes and council performance. These KPI's will be first line indicators of issues that may be developing, as well as red flags where more implementation support or direction is needed. These could include indicators on consenting processing timeframes or compliance monitoring of nationally significant consent holders. These KPI's could again be captured through an interactive portal ensuring openness amongst councils of the successes and issues that they face in implementation. Note this idea is currently only at the scoping stage.
- Regular surveys of partners and stakeholders on the effectiveness of implementation support, although difficult to quantify, could be utilised to ensure that MfE is providing the right calibre of support and direction.

The ultimate evaluation of effectiveness of implementation will be through the Action for healthy waterways outcomes, however an adaptive management approach requires ongoing and regular evaluation of the mechanism of delivery at the central and local levels. The ongoing and regularity of evaluation will ensure that the trajectory towards the desired environmental outcomes is tracking positively, with relative and appropriate adjustments and modifications along the way. Similarly, the effectiveness of regional policies and methods in achieving the NPS objectives will need to be tracked and effectively communicated over time to the public by regional councils. MfE will work with councils on the most effective and streamlined way to provide this regional and catchment-based picture of freshwater health.

Monitoring, Evaluation and Review

How will the impact of the new arrangements be monitored?

Regarding direct environmental impacts, we will work to build on existing environmental reporting processes. The Environmental Reporting Act 2015 requires the Ministry for the Environment and Statistics New Zealand to provide six-monthly reports on the state of New Zealand's environment over a three-year cycle. The reports are a valuable source for monitoring the environmental impact of policies from across environmental domains.

The three-year cycle includes five 'domain reports': air, atmosphere and climate, freshwater, land, and marine, and a synthesis report covering all five domains.

The last freshwater domain report *Our fresh water 2017* was published in April 2017 and the next report is due in April 2020 (around the time the policy package will come into force).

Future reports including the 2022 synthesis report and 2023 freshwater domain report will give some indication of the overall trends in water quality since these policy proposals come into force. However, trends in freshwater quality and ecosystem health can take a long time to change so some improvements may not be evident for decades (due to the lag of nutrient loads working their way through soils into freshwater systems).

In addition, the website Land Air Water Aotearoa (www.lawa.org.nz) compiles environmental information from across the 11 Regional Councils and five Unitary Authorities. These organisations regularly publish their water quality data on this website. Over the long term this will be a useful resource for allowing people to monitor the effectiveness of the interventions contained within the Action for healthy waterways Package.

For large implementation projects, we will also identify relevant anticipated outcomes (including process outcomes) and KPIs where relevant, and will review progress against these objectives/indicators to ensure effectiveness of our programme.

When and how will the new arrangements be reviewed?

The existing NPS-FM itself requires a review of its implementation and effectiveness. The date of this review is currently 1 July 2020. Due to the close proximity to these amendments, it is proposed to extend the date of this review to a date within the next five years. That will allow for a better picture as to how the proposed interventions are functioning.

Furthermore, a comprehensive implementation support programme will allow us to monitor how councils are progressing with implementation and if further changes or refining is needed.

Implementation programme governance

The existing Action for healthy waterways programme governance structure is currently providing direction for the implementation work during its scoping phase. The existing governance arrangements include Ministerial oversight by the Sustainable Land Use Ministers group, inter-agency governance structures at the steering group level, and internal MfE governance forums.

This arrangement is currently being reviewed and may be updated depending on the needs of the future implementation programme. Specifically, there may be the need to expand the existing governance structures to include representation from a range of partners or sector groups on technical working groups surrounding some aspects of the implementation package. There are also elements of the package, such as the further development of a farm planning system or the accelerated planning process, which are substantial and complex enough to potentially require new dedicated governance structures.

Chapter 1: Ecosystem health – Update on Interim Analysis

This section is an update to the corresponding section on pages 5 to 29 of the Interim Regulatory Impact Analysis available here: www.mfe.govt.nz/sites/default/files/media/Fresh%20water/interim-regulatory-impact-analysis-for-consultation-essential-freshwater-part-2.pdf .

1) Summary of policy issue

The National Policy Statement for Freshwater Management (NPS-FM) directs councils to provide for ecosystem health in all freshwater management units, and to improve the integrated management of fresh water, including by recognising the interactions between environments connected to water, and managing cumulative effects. Despite this, freshwater management approaches for ecosystem health can be fragmented and narrow, and fail to promote restoration or manage risks to indigenous and threatened species.

Action for healthy waterways proposed six amendments to the NPS-FM to address this problem. These were:

a. Amend the description of the ecosystem health value to recognise all components of ecosystem health.
b. Fish passage - Direct objectives and considerations for consenting structures.
c. Fish passage - Assess existing structures, maintain records, and prioritise mitigation.
d. Threatened species - Add a compulsory value for threatened species.
e. Action plans – Enable adaptive management to deteriorating trends.
f. Attribute tables - Require councils to monitor and respond to specific ecosystem health metrics (fish IBI score, macroinvertebrate score, dissolved oxygen, ecosystem metabolism, lake macrophytes).

The combined effect of these changes is to direct councils to take a more holistic and less reductionist approach to ecosystem health management. This approach is intended to support the proposed changes to make Te Mana o te Wai the fundamental concept of the NPS-FM, where the needs of the waterbody come first, and where healthy ecosystems are assessed as a whole.

The outcomes of consultation and recommendations to address submissions are presented under the topic headings below.

2) Amend the description of the ecosystem health value

Status quo and problem definition

A healthy freshwater ecosystem is made up of five important and interlinked components:

- Aquatic life - the indigenous biodiversity of freshwaters including invertebrates, aquatic plants, microbes, fish and water birds.
- Water quality – this includes the physical and chemical measures of the water (e.g. temperature, dissolved oxygen, pH) and the level of specific pollutants (e.g. nutrients, heavy metals).
- Water quantity – the quantity, timing and variability in water flows and levels.
- Habitat – this includes the form and extent of habitat, connectivity (how well species can move from one habitat patch to another), the substrate and riparian vegetative cover.
- Ecological processes – the extent to which ecosystems retain their natural function, resilience and capacity to deliver a range of benefits, biogeochemical processes and the interactions between organisms.

The NPS-FM 2017 set out the definition of ecosystem health as:

> *The freshwater management unit supports a healthy ecosystem appropriate to that freshwater body type (river, lake, wetland, or aquifer).*
>
> *In a healthy freshwater ecosystem ecological processes are maintained, there is a range and diversity of indigenous flora and fauna, and there is resilience to change.*
>
> *Matters to take into account for a healthy freshwater ecosystem include the management of adverse effects on flora and fauna of contaminants, changes in freshwater chemistry, excessive nutrients, algal blooms, high sediment levels, high temperatures, low oxygen, invasive species, and changes in flow regime. Other matters to take into account include the essential habitat needs of flora and fauna and the connections between water bodies.*

This definition focuses on the maintenance of ecosystems as they are, and does not include any direction about how stringently ecological processes should be maintained. While the matters to take into account do identify issues that relate to the five components of ecosystem health, the value description does not expressly state what those components are. Further direction in the NPS-FM to manage specific water quality attributes and establish minimum water flows or levels, has meant that to date councils have tended to focus their freshwater management efforts at the components of water quality and quantity to the detriment of the other three components.

A particular issue raised by the Science and Technical Advisory Group (STAG) is that some healthy, naturally occurring ecosystems may be fragile, and some degraded ecosystems may be highly resilient to change – including where that change is a restorative one.

Proposal for Consultation

The draft NPS-FM put forward for consultation the following description of ecosystem health:

> *"In relation to a waterbody in an FMU, ecosystem health refers to the extent to which the FMU supports an ecosystem appropriate to the type of waterbody (eg, river, lake, wetland, or aquifer).*
>
> *There are 5 biophysical components that contribute to freshwater ecosystem health, and it is necessary that all of them are managed. They are:*

Water quality – *the physical and chemical measures of the water, such as temperature, dissolved oxygen, pH, suspended sediment, nutrients and toxicants.*
Water quantity – *the extent and variability in the level or flow of water.*
Habitat - *the physical form, structure and extent of the waterbody, its bed, banks and margins, riparian vegetation and connections to the floodplain.*
Aquatic life – *the abundance and diversity of biota including microbes, invertebrates, plants, fish and birds.*
Ecological processes – *the interactions among biota and their physical and chemical environment such as primary production, decomposition, nutrient cycling and trophic connectivity.*

In a healthy freshwater ecosystem, water quality, quantity, habitat and processes are suitable to sustain appropriate indigenous aquatic life, as would be found in a minimally disturbed condition (before providing for other values)."

The addition of the five components is intended to make clear to councils that ecosystem health in fresh water environments is not exclusively related to the state of the water itself, and activities which impact all five of these components must be managed in order to successfully manage for this value.

A report[3] commissioned by the Ministry for the Environment identified that the combined national cost to councils of 'recognising all components of ecosystem health' in general would be $2 million. Castalia estimated that these requirements would require an additional 0.45 FTEs for the average Regional Council. However, the report recognises that some councils may incur higher costs than others. The report considers that these provisions would impose additional planning, science and management costs on regional councils.

Another report[4] assessed the impacts of the Government's proposed freshwater management reforms[5] on Māori cultural values. It concluded that the ecosystem health value is grounded in biophysical determinants of freshwater health and focuses on a western view of freshwater health.

The same report notes that while clarifying the definition of ecosystem health and requiring management of the five components will contribute to supporting the mauri of freshwater, non-physical indicators of mauri may be diminished due to their lack of focus in the ecosystem health value. The report notes that the focus on the health of aquatic life, including by removing restriction to fish passage[6], will ensure a more holistic approach to freshwater management and enhance the mauri of the water.

Summary of submissions on the ecosystem health value

Submissions were generally in favour of the proposed amendment, especially the inclusion of the five specific components of ecosystem health, although there were some concerns from the primary sector. Some submitters called for trout and salmon to be included in the amended description of the ecosystem health value. A number of submissions raised concerns that the proposed amendment would leave too much room for interpretation and as result not achieve the objective of providing greater protection of ecosystem health.

[3] Castalia Limited (2020). Administrative Costs of Proposed Essential Freshwater Package on Regional Councils: Report for the Ministry for the Environment (draft). Castalia Limited.

[4] Poipoia Ltd. (2020). Essential Freshwater – Action on Healthy Waterways: Impacts on Māori Values: Final Report for the Ministry for the Environment. Poipoia Ltd.

[5] As set out in *Action Plan for Healthy Waterways*, Ministry for the Environment 2019

[6] Fish passage is discussed below in section 4.

The Independent Advisory Panel (IAP) supports the proposed amendments with a few minor changes for clarity, robustness and to ensure all components are considered holistically. The proposed amendments discussed below are consistent with the tenor of the IAP's recommendations, while not always mirroring them directly.

Changes incorporated as a result of public submissions

The proposed "habitat" component of the value was described as "the physical form, structure and extent of the waterbody, its bed, banks and margins, riparian vegetation and connections to the floodplain". Submitters and the IAP pointed out that this description does not reflect that groundwater is connected to surface waterbodies. Groundwater recharges surface water, helping to ensure healthy flows and levels to maintain freshwater habitat. Expressly including groundwater in the description of habitat also affirms the interconnected nature of fresh water as demonstrated through the tenet of *ki uta ki tai* – from the mountains to the sea.

This oversight can be addressed by rewriting the description as follows:

> *"the physical form, structure and extent of the waterbody, its bed, banks and margins, riparian vegetation and connections to the floodplain and to groundwater."*

As well as identifying the five components of ecosystem health, the proposed amendment to the ecosystem health value included the following sentence: "In a healthy freshwater ecosystem, water quality, quantity, habitat and processes are suitable to sustain appropriate indigenous aquatic life, as would be found in a minimally disturbed condition (before providing for other values)."

The phrase "minimally disturbed condition" was intended to convey a meaning akin to 'in the absence of human alteration' and provide a reference state for councils, i.e. what would the state of the ecosystem be if not for human interference. Submitters made it clear that its meaning is unclear and does not distinguish between human and natural disturbance. It is not the intent of this NPS-FM to have councils manage waterbodies for degradation which may be caused by storms or other natural phenomena, making it important to focus this definition only on human activities that cause degradation, and which councils can manage.

Submitters raised concerns that including the adjective "appropriate" to describe "indigenous aquatic life" creates a risk that councils could use the ecosystem health value description to justify continued degradation, as indigenous species that are not present but would be if not for human disturbance might not be considered 'appropriate'. We consider this risk to be low, but it was not the intent of the policy to create the risk.

Removing the word "appropriate" and replacing the phrase "minimally disturbed condition" would improve the clarity of the value description.

> *In a healthy freshwater ecosystem, water quality, quantity, habitat and processes are suitable to sustain ~~appropriate~~ indigenous aquatic life, ~~as would be found in a minimally disturbed condition~~ expected in the absence of human disturbance or alteration (before providing for other values).*

3) Fish passage

Status quo and problem definition

Habitat connectivity and its importance to overall ecosystem health is not adequately recognised and safeguarded. About one-third of New Zealand's indigenous freshwater fish species need access to the sea, and both indigenous and sports fish require access between and within habitats to complete their life cycles. Currently, there are many existing structures such as culverts, dams and tide gates that can delay or prevent fish movement and stop them from accessing critical or otherwise suitable habitats.

Rough estimates from DoC[7] suggest that there are at least 120,000 in-stream structures in our waterways, and that were an assessment to be undertaken, up to half of these would likely present a barrier to fish passage. The loss of habitat connectivity has contributed to decline of indigenous fish species, with approximately 76 per cent of all assessed species now classified as threatened or at risk of extinction[8].

The Action for healthy waterways Package proposed to provide for fish passage by making an amendment to the NPS-FM and adopting new regulations in a new NES. The proposals:

- Direct regional councils to amend their regional plans so that they have regard to principles of good design for fish passage when considering consents (section 3.17 of the Draft NPS-FM);[9]
- Direct regional councils to amend their regional plans to introduce minimum fish passage design standards for consents (Subpart 3 Sections 19, 20, 22, 23, 24 of the Proposed NESF);[10]
- Direct regional councils to assess existing structures, maintain records and develop rehabilitation strategies (Section 3.17(4), (5) and (6) of the Draft NPS-FM).[11]

Further detail on these options is in the Interim Regulatory Impact Analysis for Consultation: Essential Freshwater Appendix One in options 2 and 3.

Summary of submissions on fish passage

A high number (about 90 per cent) of submitters supported the overall direction of the proposals.

Submitters address the following issues and themes:

- General support that councils would be required to set objectives for fish and valued species.
- Support for both applying requirements and exempting existing instream structures from fish passage requirements.
- Consider remediation of existing structures to be essential to fish passage, desire for this work to be undertaken quickly, however concerns of costs raised by landowners and councils due to the number of potential barriers requiring remediation.
- In general, power companies and local government consider that there should be an exclusion. Iwi and hapū representatives and individuals oppose an exclusion of hydro-electricity from fish passage requirements.

[7] Through conversations with DoC officials

[8] https://www.stats.govt.nz/indicators/conservation-status-of-indigenous-freshwater-species

[9] Ministry for the Environment 2019 Draft National Policy Statement for Freshwater Management https://www.mfe.govt.nz/publications/fresh-water/draft-national-policy-statement-freshwater-management

[10] Ibid.

[11] Ibid.

- General support that data should be collected and reported on.
- Submitters consider that providing fish passage for the foreseeable life of the structure is critical. Monitoring and maintenance of the structures for the purpose of providing fish passage should be required.
- Some submitters requested amendments and clarifications to the fish passage requirements, including some of the conditions and wording used in the NESF and NPS-FM.

The Independent Advisory Panel support the inclusion of provisions to improve fish passage in the NPS-FM and the NES. The Panel has recommended some clarifications of the policies. These recommendations are predominantly about details in the drafting, rather than changes to the intent of the policy which the IAP support.

These are:

- Clarifying the relation between Fish Passage provisions in the NPS-FM and those in both the Freshwater Fisheries Regulations 1983 and the Conservation Act 1987.
- Reviewing the drafting of the NPS-FM to relate 'aquatic life objectives' to 'environmental outcomes', and 'work programmes' to 'action plans'.
- Local authority infrastructure (such as drinking water supply dams) should not be exempted from fish passage requirements
- The draft provisions mandating consent conditions should be reviewed in case some of the subject of the conditions might be better expressed as criteria for judgement on granting or refusing consent.
- Considering whether ss21-24 of the NPS should be redrafted to move technical provisions into external guidance.

Changes incorporated as a result of public submissions and consultation

We recommend proceeding with options two and three of the Interim RIS, and make some amendments to address feedback from submissions and consultation, and reflect the further engagement and analysis that we have conducted since consultation on the policies.

The recommended amendments below seek to address comments around:

- How remediation is dealt with in the NPS-FM
- How new consents contribute to the objectives for aquatic life and ecosystem health
- How risk of new structures further impeding fish passage over time is prevented and how fish passage is ensured for permitted structures
- How data on existing and new structures is gathered and used

While these are not substantial changes to the proposed approach, these amendments will provide additional clarity and strength to how the policies are applied. These amendments may incur minor additional impacts. Potential additional impacts are detailed in the options below.

Enabling remediation of existing structures through planning

Remediation of existing instream structures is a critical issue for submitters, DoC and regional council representatives. Some submitters considered that the NES consent conditions should apply to existing structures. Some submitters also considered that remediation efforts should happen quickly (ie, within 5 to 10 years). We understand from discussions with DoC and council staff that good intentions from communities to remediate barriers can be hindered by council plans requiring consents for any form of remediation (with results often having non-complying status).

In contrast, other submitters were concerned about the potential added costs to structure owners if remediation of existing structures is required. This was particularly a concern for larger roading and

infrastructure providers where these costs could be greater due to the number of structures that they have.

Any options to address remediation need to be cognisant of potential impacts on structure owners and be assured that the option would have the necessary impacts.

We do not propose to specify that the NES rules apply to existing structures, because, as highlighted in the interim RIS, we cannot evaluate the magnitude of the impacts associated with requiring existing consents to meet these standards and do not have information of all current existing instream structures.

However, we consider there are ways in which remediation could be further supported, enabled or facilitated through implementation of the remediation work programme, which may impose the potentially significant impacts (costs) to structure owners in the short-term.

In discussions with DoC, we have identified two options to address the problem:

1. Option 1: Include new rules in the NES for low-risk remediation activities that:
    - set restricted discretionary or controlled statuses for some remediation activities in order to reduce current consenting costs and encourage applications for remediation activities, and
    - require councils to sign off on the design to ensure that the right remediation approach is adopted for that catchment and to avoid any potential unintended consequences are mitigated.

2. Option 2: Require councils to set rules for remediation as part of the NPS-FM remediation work plan requirements. We would clarify aspects of the work programme and specify that:

    - Regional councils must at least include objectives, policies and rules as part of their work programme to support the remediation of instream structures
    - The work programme may also include other approaches that are external to planning (for example supporting community groups or subsidising particular fixes).
    - Regional councils must set a target for remediation in their work plan, to ensure that the work plan is time bound and has a specific goal. This would also increase the public accountability and transparency of the work programme.

Criterion	Option A: Include new rules in the NES for low-risk remediation activities
Effectiveness	- While this option would enable communities remediate in-stream structures in 2020, and would provide a head start to the fish passage remediation work programme and contribute faster to the improvement of ecosystem health, there are risks to this option. This option could be ineffective and may have unintended consequences if councils do not have the necessary oversight over consent activities and the necessary information to make decisions on best approach remediation. Nationally set rules may also not be appropriate solutions for every in-stream structure and fish species in that catchment. Added to this fact, regional councils will not have determined habitat locations of desirable and undesirable species by 2020, and would therefore not have the necessary information to determine whether particular existing in-structures should be remediated to protect specific habitats in that catchment. This option is unlikely to address bigger risk activities that are causing barriers to fish, and may have only limited material positive impacts but could have significant unintended consequences.
Timeliness	**0** This option may have positive ecological impact within the next five years, however unintended consequences outlined above may outweigh the benefits.
Fairness	**0** This option would treat all stakeholders equally. It allows individuals and community groups to have the ability to remediate without the undue burden of having to go through a timely and costly consenting process, on top of the cost of the remediation, to address barriers.
Principles of the Treaty of Waitangi	**0** This option does not have implications in relations to the principles of the Treaty of Waitangi. If ineffectively applied this may impact on taonga species and mahinga kai habitat if passage to undesirable species are provided passage to those sites.
Te Mana o Te Wai	+ This option would prioritises the health and wellbeing of water and its ecosystems.
Overall Assessment	**0** Well-intentioned remediating of structures and setting standard rules at a national level may have potential impacts and unintended consequences that will outweigh the benefits of this option.

Criterion	Option B: Require councils to set rules for remediation as part of the NPS-FM
Effectiveness	+ This option would enable councils to set bespoke rules for the catchment, based on the information gathered through the remediation work programme required in the NPS-FM. This would provide the councils with the responsibility to ensure that remediation efforts are efficient and directed at the most problematic barriers. This option will ensure that councils will have sufficient time to identify and map the desired and undesirable species and ensure the councils is sufficiently informed on appropriate and effective remediation options for different in-stream structures, fish species and catchments. The Government could provide examples of rules in guidance and enable councils to adapt these to the different catchments and situations.
Timeliness	0/+ This option would delay setting rules to facilitate remediation activities by five years. Barriers to fish passage are unlikely to be remediated in this time, unless regional councils and structure owners do so of their own accord. However, we may see more effective approaches and improved ecosystems once implemented. The additional requirement of setting a target for the remediation work programme will also encourage remediation works to be done in a timely and efficient way.

Fairness	**0** This option treats stakeholders equally. Communities wanting to remediate existing structures may continue facing high consenting costs if rules in plans make low-risk remediation activities non-complying. However, with this option, communities will be able to be involved in setting, or will be consulted on, the rules that councils set in their plans to enable remediation. Councils may also enable communities to be involved in other approaches or projects that aim to support the target of the work programme.
Principles of the Treaty of Waitangi	+ There will be a greater opportunity for tangata whenua to be involved in the work programme and setting rules for remediation.
Te Mana o Te Wai	+ This option would prioritises the health and wellbeing of water and its ecosystems.
Overall Assessment	+ This option strengthens and clarifies the intent of the work programme, and enables councils to set local bespoke rules that apply to their catchment. This option does not carry the similar risks of option A, but may have the same (albeit slightly more delayed) benefits to ecosystem.

We recommend option B because this option strengthens and clarifies the intent of the work programme, and enables councils to set local rules that apply to their catchment. This will also provide councils with a bit more time to focus on identifying potential remediation solutions for their region, and identify existing structures that may require remediation. Ensuring councils have a target for their work programme will add certainty to communities and structure owners what structures will be remediated and by when.

There are also some complexities around Option A. Remediating structures and setting standard rules at a national level may have potential impacts and unintended consequences such efforts can bring.

Require councils to set an objective for fish passage (or aquatic life) as set out in the NPS-FM

Regulation 21 in the NES for freshwater requires regional councils to consider whether the consent application is consistent with that objective in their plan. Councils have raised concerns that the Freshwater NES will be in effect prior to the NPS-FM having been given effect to in plans. This would mean the councils would not have a specific objective to assess the consent applications against prior to plans becoming operative.

Requiring councils to include an objective directly in their regional policy statement, as enabled by section 55 of the RMA[12], can provide more direction to councils in terms of what they should be considering the consents in the interim of having an objective in their plan in place. If an objective is adopted in the NPS-FM, and required to be adopted in regional policy statements in accordance with section 55 of the RMA, the objective will be in place as soon as the NES is in effect. This is consistent with the approach in the Streams and Wetlands proposals in section 3.15(2) of the NPS-FM. The requirement would be in addition to the objectives for aquatic life that councils will be required to set as part of the NPS-FM fish passage requirement (section 3.7 of the draft NPS-FM).

***Recommended objective**: Structures in rivers provide for the improved passage of fish where this is needed for the protection or enhancement of desired species habitat.*

[12] Section 55 of the RMA allows national policy statements to require a specified objective or policy to be included in policy statements or plans without using the consultation process in Schedule 1 of the Act

Encourage a more standardised approach to collecting information on instream structures

The Freshwater NES currently proposes that structure owners provide information to the council. We recommend adding to these requirements and directing councils to collect standard information (or key parameters based on the Fish Passage Assessment tool[13]), and require these to be provided as part of the consenting requirements. The parameters would be consistent with the Fish Passage Assessment tool requirements that assess the risk of the structure, and would be easy to use by structure owners and councils.

This option is consistent with some submissions, including from the New Zealand Fish Passage Advisory Group, that standard parameters should be collected in order to encourage a standard way to collect structure information and assess the risk of these structures. This will support building a nationally consistent information base, and support research into understanding present barriers to fish passage at a national level and best practice remediation tools.

This would not add material impact to structure owners or regional councils. This is building on existing requirements and using tools that are already available.

Enable a local approach to how customary weirs are managed so that these are not captured by potentially more stringent rules in the NES

Customary fishing activities involve the seasonal construction of weirs to harvest certain fish. These include customary eel weirs (Pa Tuna) and weirs for kanakana/piharau (lamprey) (utu piharau).

Our analysis of treaty settlements has highlighted that the Waikato and Te Awa Tupua settlement legislation expressly enable Waikato-Tainui iwi and Whanganui iwi to carry out authorised customary activities on the respective rivers despite sections 9 to 17 in the Resource Management Act 1991, rules in a regional plan or district plan, and other legislation as listed in the Act. This means that the NES rules would not apply to authorised customary activities outlined in the settlement acts.

We understand that other iwi do not have the same provision in their settlement legislation. This means that the fish passage requirements as currently consulted on would apply to iwi and hapū who have not yet settled. The same would apply to iwi and hapū who have settled but do not have an exemption in their settlement. We have also identified that some local agreements (for example Joint Management Agreements) identify that councils and iwi would work together to determine whether customary activities could be included as a permitted activity in local plans.

This constitutes a risk that the NES rules as currently written may restrict the use of customary weirs, which may have a negative social and cultural impact on Māori and limit the ability of iwi and hapū to determine themselves through working with councils how customary weirs are managed.

It is not the intent of our policies to restrict customary activities, and we would not want to risk undermining the ability of councils to work with iwi and hapū to determine whether customary activities should be a permitted/controlled or restricted discretionary activity in their plans.

To avoid this impact, we propose that the NES requirements should not prevent local authorities from setting less stringent rules for customary eel and lamprey weirs if these are for the purpose of tikanga. How this is addressed will be determined in drafting, but may require including a definition of a weir and stating that customary weirs do not apply for example.

We expect that councils would work through these with iwi and fisheries agencies if these activities should be set as a permitted, controlled or restricted discretionary activity.

[13] https://niwa.co.nz/freshwater/management-tools/fish-passage-assessment-tool

Require monitoring and maintenance and providing for fish passage for the lifetime of the structure

Submitters and council representatives made apparent the issue of potential for in-stream structures to deteriorate and impede fish passage over time, particularly in the wake of flood events. Submitters were over the view that structures do not become additional barriers to fish passage overtime.

While monitoring may already be required by regional councils as part of some consent conditions, this is not currently required as part of the NES rules that were consulted on. We consider that monitoring is a crucial part of consent requirements to address potential deterioration of structures, as it will require structure owners to ensure that the same fish passage is provided for throughout the lifetime of the structure.

We recommend requiring, as part of the NES rules, that structure owners:

- Have in place monitoring and maintenance strategies that are commensurate to the size and assessment of risk to the structure
- Monitor after a flood (for example after 1 in 20 year event) and at least every five years
- must ensure the structure provides the same quality of fish passage for the lifetime
- Provide this information to the council.

Detailed monitoring and maintenance strategies may not be required if, for example, the structure is assessed as low-risk and therefore may not require significant monitoring and maintenance. For larger structures that may have high risk rating (ie is more likely to impede fish passage over time) will require more robust monitoring and maintenance plans to demonstrate that the structure will be maintained overtime if the structure does deteriorate and at risk at no longer meeting its consent requirements. Developing monitoring and maintenance strategies will be very low cost. The costs of monitoring and maintenance will depend on the size of the structure and if deterioration does occur.

We recommend a requirement that monitoring should occur after a 1 in 20-year flood event and at least every five years because a 1 in 20-year flood event is a standard measure of probability – a 1 in 20-year flood event is a potentially very large flood event, which could damage structures. These events are rare, however, if a flood happens a year after the structure has been constructed, this condition will ensure structure owners know check the structures for potential damage. Without such a condition, structures may be left unattended until the next scheduled monitoring. In the absence of such events, we expect structure owners to assess the structures every five years at least. Five years is consistent with the reporting requirements in the NPS-FM, however, councils may require more frequent monitoring if they assess that the structure may be at risk of deteriorating or require maintenance more frequently.

Monitoring could require inputting new data into the fish passage assessment tool for example and/or providing information to councils in the format that they request it to be in. The monitoring would be for the purpose of assessing the structure and whether it has changed or decayed overtime, and whether it possibly poses additional risks to fish passage than when the structure was first constructed. The monitoring will not require assessing whether the structure provides for fish passage or doing an assessment of the fish species and habitat in the area. The monitoring will only be in relation to the structure design.

Ensuring that the structure provides the same quality of fish passage for the lifetime of the structure will avoid structures being left to degrade to the point they perform poorer than intended when consented or built.

Section 3.17 (3)(e) of the draft NPS-FM proposed that councils have regard to 'any proposed monitoring and maintenance plan for ensuring that the structure meets the council's aquatic life objective for fish now and in the future'. The additional direction as part of the consent conditions in the NES would further connect these requirements.

We do not consider these changes would have a significant impact on structure owners or councils, but will ensure greater benefits to fish passage, and subsequently habitat and ecosystem health overtime.

Amend the permitted consent conditions for weirs to ensure that weirs installed do not impede fish passage upstream and downstream

Feedback that we have had from DoC and NIWA and other submitters have signalled that a fall height of 4m appears high for a permitted activity, and may have consequential impact on the river environment and passage of certain fish species in that river.

We would want to ensure that only those weirs that provide fish passage throughout are permitted activities where possible. Currently the permitted activity for a weir enables a fall height of under four metres, this would not necessarily provide for fish passage for all species.

This is a minor change and will not have significant impact on regional councils, however, will mitigate possible unintended consequences on the environment and freshwater ecosystems. It will also mean that developers wanting to build a weir of a certain height (even if below 4m) may face higher consenting costs than if the weir were considered a permitted activity.

Hydroelectricity

Hydroelectricity was a regular topic in the submissions on fish passage. Many submitters interpreted that hydroelectricity would be exempt from the policies. While some submitters (particularly hydroelectricity providers) considered that there should be an exemption, while others opposed a potential exemption for hydroelectricity.

The hydroelectricity exceptions apply to specific hydro schemes listed in in subpart 4 (3.22). The exceptions state that:

> "(2) When setting limits or developing action plans, and when making plan changes required by this National Policy Statement, regional councils must have regard to the importance of not adversely impacting the generation capacity, storage and operational flexibility of a Scheme."

The hydroelectricity policies also allow regional councils to set target attribute states that are below the national bottom line.

The fish passage policies do not specifically exempt hydroelectricity from providing for fish passage. Regional councils would be required to make or change their plans to require that regard is had to at least the requirements set under 3.17 (3) on all consents (including hydroelectricity structures) and consider hydroelectricity structures in their remediation work programme. The fish passage policies, however, do not set specific design standards for structures above 4 meters in the NES. Councils would then need to consider setting appropriate consent conditions and activity status for in-stream structures (including hydroelectricity) based on the requirements under 3.17 (3).

We do not recommend making any changes to the proposal with regards to hydroelectricity structures and fish passage. The fish passage provisions did not propose an exemption to these structures and we do not recommend changing these provisions to include an exemption.

In practice, the policies for hydroelectricity and fish passage would need to be considered simultaneously and regional councils (along with communities and tangata whenua) would need to use their judgement and discretion on changes to plans by considering the need to secure New Zealand's security of electricity within the context of climate change and their NPS-FM obligation to improving the health of our ecosystems.

We would also expect councils to work with hydroelectricity providers to address, where possible, potential barriers for fish migration from hydro structures if these are identified as a priority for remediation in the council remediation work programme.

Improve some drafting matters

The Independent Advisory Panel recommend that we clarify in guidance how different regulations interact. We accept that this would be a valuable change to avoid confusion. However, we consider this is better done through guidance than in the instruments themselves.

We do propose to require councils to take advice from (rather than consult with) DoC for the purpose of fish passage, in order to further enable alignment between the functions of the different parties involved. This would be an amendment to section 3.17 (2) e) of the Draft NPS-FM 2019.

Other drafting improvements include:

- clearly acknowledging the need to provide passage to habitat upstream and downstream in the NPS-FM
- amending and providing additional definitions for culverts and weirs, for example, to further ensure a nationally consistent approach on definitions of different structures. This change would be consistent with what we have heard in submissions and from regional councils.
- specifying that NES conditions apply to the construction and use of the structures, and clarifying who would be responsible for providing the consent information to councils.
- clarifying that the plan rules may still impose controls on the structure for other reasons (that are not fish passage related), for example to protect a high value stream.

Updated impact information

The additional options above will not significantly change the impacts of the proposals that were identified in the Interim RIS.

Impacts of remediation of existing instream structures

We have gathered some additional information through submission and consultation in terms of the impacts of remediation. Some submitters have raised concerns of potential impacts of remediation and the work programme, particularly for companies or agencies that may have a significant number of structures requiring remediation. There are concerns that some fixes could cost a significant amount, particularly for operators of existing extensive linear infrastructure such as roading authorities and district councils.

Because the work programme will be developed and implemented by councils, we are unable to identify the impacts of council work programmes on structure owners. We would expect that councils would work with structure owners in terms of the appropriate and cost effective approaches to remediation if these are required. However, we assess some potential impacts below.

Costs of remediation of small structures to structure owners

The interim Regulatory Impact Statement did identify some costs associated with remediation of small structures[14], which councils may require the use of as part of their work programme.

Some councils have addressed the issue of remediation requiring a consent by granting global consent for remediation of fish barriers. The proposal to require councils to enable remediation through rules may help alleviate potential additional consenting costs and increase remediation activity.

Costs to regional councils

Remediation may also require additional resources for regional councils. Councils are at different stages of remediation work and addressing fish passage. Some are in the process of collecting data to understand where the structures are and assess their risk of restricting fish passage. Others are in the process of remediating structures in the region.

For example, Tasman District Council has remediated about 3000 instream structures over 10 years, using about 60 weeks of staff and contractor time. The council expect that they have remediated about 30 to 40% of all similar structures in the district. Some councils have encouraged remediation of barriers (such as providing subsidies for some barriers or advice about how to remediate and prioritising fixes that will have the most ecological benefit).

Benefits to the environment

Amendments requiring remediation to be enabled through planning will, we expect, improve the habitat access for fish, and therefore have subsequent improvements to the ecosystem health of that catchment to a **medium/ large** extent over the long-term.

Impacts of fish passage provisions on Māori cultural values

A report commissioned by the Ministry for the Environment[15] has identified that 'removing restriction to fish passage is key to supporting the mauri of aquatic life and in turn, the mauri of freshwater health. Many mahinga kai species require access to the sea and freshwater to complete their lifecycles and therefore, removing restrictions also supports the mauri of mahinga kai.'

Implementation

We are considering providing implementation support in the form of:

- tools to collect and maintain data for barriers to fish passage
- Refining tools to identify fish species location and habitat requirements
- Establishing a training and certification scheme, and
- Providing guidance and oversight in approaches to resourcing, investment prioritisation and remediation options.
- provide additional information and research into effective remediation tools for different structures.

4) A compulsory value for threatened species

Status quo and problem definition

Freshwater fish are highly valued as taonga and mahinga kai, and for supporting cultural, recreational and commercial fisheries. Despite their importance, 39 of New Zealand's native freshwater fish

[14] See page 11 of the Interim Regulatory Impact Statement Part II.

[15] DRAFT ONLY: Essential Freshwater - Action on Healthy Waterways: Impacts on Māori Values

species are threatened or at-risk.[16] There are eight threatened native birds that live in or around freshwater bodies (particularly braided rivers and wetlands), with another nine that are at-risk. Wetlands provide habitat for most of New Zealand's threatened or at-risk plants.

At the freshwater management unit scale, although regional plans may manage for the health of indigenous ecosystems generally, they do not consistently provide for the particular needs of threatened species populations in that unit. Their habitat may require a more particular management approach than that required to sustain indigenous aquatic life more generally, but at present that habitat (including where populations are surviving in isolated wetlands, farm drains and urban streams) is not always identified and managed.

Action for healthy waterways proposed adding a new compulsory value for threatened species to Appendix 1 of the National Policy Statement for Freshwater Management. Threatened species are defined as all indigenous flora and fauna that are Nationally Critical, Nationally Endangered, and Nationally Vulnerable Species".[17] The intent of this amendment would be to require regional councils to identify the location of threatened species in their regional plans, set an environmental outcome which specifically accommodates for the value, and adopt appropriate policies and methods to achieve it.

Summary of submissions on the compulsory value for threatened species

Over 200 people submitted on this proposal, with almost all (85%) in support. The remainder were neutral (10%) or opposed (5%). The main themes raised in submissions were

a. The scope of the value should be broadened to include all indigenous species or at-risk species.
b. The description of the value should apply more clearly to indigenous freshwater species and their habitat
c. There are some factors that affect threatened species that are controlled through other legislation.
d. Local government needs guidance to help with implementation.

Analysis of themes and options to address submissions

Broaden the scope of the value from threatened species

Ngāti Mutunga submitted that all indigenous species need the same level of protection, and Forest and Bird, the Freshwater Sciences Society and others requested that the scope of the value be broadened to include indigenous species that are classified as "At-risk". The Independent Advisory Panel did not recommend a change to the scope of the value.

Expanding the scope of the value to include all indigenous freshwater species could undermine the intent of the value, which is to require councils to manage specific conditions which the most vulnerable species may need to survive. If the Threatened Species value were expanded, it would be reduced to a replication of the Ecosystem Health value, under which councils must manage all freshwater to provide for the extent to which water quality, water quantity, and habitat sustain indigenous aquatic life in an FMU, but as noted above may not consistently provide for the particular needs of threatened species populations in that unit.

[16] Nicholas R. Dunn et al. Conservation status of New Zealand freshwater fishes, 2017. NEW ZEALAND THREAT CLASSIFICATION SERIES 24, Department of Conservation

[17] Townsend et al. (2008). The New Zealand Threat Classification System Manual. Department of Conservation

Expanding the scope of the value to include all at-risk species, all at-risk and declining species, or only all at-risk freshwater fish species, would significantly increase its reach because many are still present throughout the country.

- Of the 22 freshwater fish classified as threatened, two (the lamprey and shortjaw kokopu) are present throughout New Zealand, four are in two or four regions, with eleven found only in the Otago region, three only in Canterbury, while Northland and Southland have one each.
- There are another 17 freshwater fish species that are at-risk (declining or naturally uncommon). Six of these, including the longfin eel, giant kokopu and torrentfish, are found throughout New Zealand, but five are present in only one region each.
- There are eight threatened native birds that live in or around freshwater bodies (particularly braided rivers and wetlands), with another nine that are at-risk (declining, recovering or naturally uncommon). Most of these are widespread and found in most or many regions.
- We have not quantified the threatened and at-risk flora, but there are plants that would fall into both categories. Wetlands and some lakes provide habitat for most of the threatened or at-risk plants.

Since 1992, threat rankings have seen an increase in the number of threatened freshwater fish species. The increasing number is related in part to taxonomic revisions that have identified new taxa but also to the continuing decline in the abundance and distribution of freshwater fish. See below for a summary of changes in status over the last ten years.

	Conservation Status	Allibone et al. 2009	Goodman et al. 2014	Dunn et.al 2017	Change: 2009 - 2017
	Extinct	1	1	1	0
	Data Deficient		1	0	-1
Threatened	Nationally Critical	2	5	4	+2
	Nationally Endangered	3	6	6	+3
	Nationally Vulnerable	7	10	12	+5
At-risk	Declining	13	14	11	-2
	Naturally uncommon	6	5	6	0
	Not threatened	16	12	12	-4

An analysis of the two options is provided below.

Analysis against RIS criteria

Criterion	1. Compulsory national value for indigenous threatened species	2. Broaden the scope to include at-risk species, or at-risk declining species, or at-risk fish species
Effectiveness	+ Indigenous freshwater flora and fauna that are nationally critical, nationally endangered, and nationally vulnerable are at reduced risk of extinction because the environmental conditions necessary for their existence will be better safeguarded.	++ The habitat of flora and fauna that are currently declining would be provided better protection in regional plans. This will be particularly beneficial to indigenous fish populations that are declining in prevalence and abundance and at risk of becoming nationally vulnerable (the first step in the "threatened" category). Including at-risk species provides a more precautionary approach and reduces the risk of their numbers declining further, resulting in more effective protection of the species.
Timeliness	0 Relies on councils amending their regional plans (objectives already apply to most FMUs; this direction can only apply to new plan changes)	0 Relies on councils amending their regional plans (objectives already apply to most FMUs; this direction can only apply to new plan changes)
Fairness	**0** All stakeholders treated equitably, with some potential to disrupt/impact activities such as flood management.	**0** All stakeholders treated equitably, with more potential to disrupt/impact activities such as flood management.
Efficiency	++ Targets actions at places where threatened species live. Allows councils to introduce comprehensive protective measures through their planning processes. There may be implementation issues, with councils lacking capability and capacity.	+ Risks a less targeted approach because of the relative prevalence of at-risk species. A significant amount of habitat would need to be identified and managed in regional plans (because some species are found in many regions). There may be implementation issues, with councils lacking capability and capacity. Would incur greater costs to councils – mapping and then monitoring the habitat.
Principles of the Treaty of Waitangi	+ Indigenous species are a taonga, unique to Aotearoa. The extent to which this option takes into account the principles of the treaty will depend on the extent to which councils work with tangata whenua in identifying the needs of the threatened species and have opportunities to exercise control	+ Indigenous species are a taonga, unique to Aotearoa. The extent to which this option takes into account the principles of the treaty will depend on the extent to which councils work with tangata whenua in identifying the needs of the threatened and at-risk species and have opportunities to

Criterion	1. Compulsory national value for indigenous threatened species	2. Broaden the scope to include at-risk species, or at-risk declining species, or at-risk fish species
	over this taonga as provided for in article two of the treaty.	exercise control over this taonga as provided for in article two of the treaty.
Te Mana o te Wai	+ Recognises that the first obligation is to the water before providing for the needs of people.	++ Recognises that the first obligation is to the water before providing for the needs of people. The broader application may better provide for the mauri of the water body.
Overall Assessment	+ Improves the management of habitat according to the most vulnerable species	+ Improves the management of habitat according to vulnerable species

The description of the threatened species value should apply more clearly to threatened indigenous species that rely on freshwater habitat.

Twenty-four submitters sought changes to the description of the value so that it applies more clearly to threatened indigenous species that rely on freshwater habitat, including for spawning.

The suggestions improve the policy intent of the proposed value. In addition, the definition of threatened species in the interpretation of the NPS-FM would more logically be part of the threatened species value description.

Councils and other submitters asked for central government guidance and technical support to help them identify and manage the habitat of threatened species, particularly of any migratory species. The individuals (mainly farmers) were concerned that trout and salmon were a threat to indigenous species. Some Māori and Iwi submitters asked for central government to work with Māori, and one wanted central government to ensure all the pieces of legislation on indigenous species 'work together'.

The Department of Conservation and MfE will provide implementation support to councils and will work with them to help identify places with threatened and at-risk freshwater species.

Factors affecting threatened species that are controlled through other legislation, and the need to help councils with implementation

Concerns from submitters about the management controls that are exercised in legislation other than the RMA, particularly the requirements of the Biosecurity Act in relation to plants and animal pests, is associated with the concerns that councils need assistance with identifying the locations and habitat needs of threatened species.

The Department of Conservation will work with the Ministry to hep councils with implementing this new compulsory value. This will be part of their work implementing the National Policy Statement for Indigenous Biodiversity (once it is adopted).

Changes recommended as a result of public submissions

Retain the scope of the option as proposed.

At-risk freshwater fish species would still have improved conditions for survival through the Ecosystem Health value and other parts of the Action for healthy waterways Package, particularly the proposals for preventing further loss of wetlands and streams, improving fish passage, clearer

direction for setting environmental flows, and the requirement to prepare action plans for the deposited sediment attribute.

Change the description of the value as follows:

Threatened indigenous species

This refers to the extent to which an FMU or a water body that supports a population of threatened indigenous species has the critical habitats and conditions necessary to support the continued presence and survival of the threatened species. The components that must be managed are ~~basic conditions relate to~~ aquatic habitat, water quality, and flows or water levels, ~~but~~ and may also include specialised habitat or conditions needed for only part of the life-cycle of the threatened species.

Threatened species includes any species (flora and fauna) that rely on fresh water bodies for at least part of their life-cycle, and meet the criteria for Nationally Critical, Nationally Endangered, and Nationally Vulnerable Species in the New Zealand Threat Classification System Manual.

Impacts of the recommended changes

Most of the impacts of this new compulsory value will be fall on regional councils in their identification of the places where the threatened species are present. This work will be assisted by central government.

5) Action plans

Status quo and problem definition

The existing NPS-FM requires councils to set objectives for ecosystem health using the attributes (such as nitrate toxicity) in Appendix 2 or and where attributes are not provided in the NPS-FM the council must set objectives using attributes they consider are appropriate. The council is then required to set limits on resource use to achieve those objectives (and therefore manage the value of ecosystem health).

This limit-setting approach works well conceptually with water takes and discharges of contaminants (particularly nitrogen) where there is sufficient certainty between an individual's resource use and its effect on the attribute and a sustainable quantum of resource use can be allocated to achieve the freshwater objective. However, there are attributes measuring very important parts of ecosystem health that cannot easily or accurately be used to set limits on resource use.

To ensure attributes lacking the level of certainty required to set limits on resource use are still managed[18], we proposed requiring councils to monitor these attributes and in response to evidence suggesting that the current state is unacceptable or deterioration is occurring, develop an action plan to investigate and at least halt the decline. Additionally, if a council detects a trend that a desired environmental outcome (for a value, e.g. ecosystem health or component of a value, e.g. habitat) will not be achieved, it must develop an action plan to halt and, if possible, reverse the deterioration.

Summary of submissions on action plans

Submitters were generally supportive of the action plans proposal, recognising that it requires councils to adopt an adaptive management approach. However, many raised concerns about how they would be created and their enforceability, with some suggesting the action plans should be

[18] Several such attributes are recommended for inclusion in a new NPS-FM and are discussed below in section 6.

incorporated into regional plans. It was recommended that action plans include the environmental outcomes sought, as well as the target attribute state.

Councils were concerned that action plan requirements for some attributes, such as Lake Submerged Plant Indicators (LakeSPI) and lake dissolved oxygen, would have unintended consequences. This is because improving the score of one of these attributes, in isolation, could have negative consequences for other components of the ecosystem. For example, removing exotic weeds from a lake would improve the LakeSPI score, but may cause algal blooms, which would negatively impact other lake attributes.

The Independent Advisory Panel said that "based on our conceptual catchment management approach, that rather than developing action plans to improve specific attributes individually beyond their target grades, action plans should seek overall achievement of agreed catchment objectives (using adaptive management where applicable). This would include the compulsory values of Ecosystem Health, Human Health, Threatened Species and Mahinga Kai – that is, catchment action plans rather than attribute action plans."

Changes incorporated as a result of public submissions

Submitters' concern that councils would not have any legislative obligation to implement their actions plans does not recognise that the action plans are a means to achieve a target attribute state that is set in the regional plan, and also that the RMA requires councils to monitor and review the efficiency and effectiveness of its regional plans and report on this every five years (section 35(2)(b) of the RMA).

Incorporating action plans into each council's regional plan would limit their ability to adapt to changing circumstances, and would limit its ability to include actions that cut across multiple organisations and legislation (for example, addressing poor levels of dissolved oxygen in the water that may be caused by a pollution incident, or lack of shade, or consented activities).

However, communities need assurance that councils will follow the actions set out in the action plan. The proposed Section 3.14 of the NPS-FM could be amended to require action plans to state how the actions in the plan will achieve the relevant target attribute state set in the regional plan.

Recommendation: change proposed policy 3.10 of the draft NPS-FM (relating to identifying limits on resource use and preparing action plans) as follows:

> *(6) Action plans must set out what the council will do to contribute to the environmental outcomes for the compulsory values and to achieve the relevant target attribute state for the value. Action plans may be published either by including them in a regional plan, or by being published separately.*

6) New attributes for ecosystem health

Status quo and problem definition

The NPS-FM requires councils to monitor and manage attributes that generally only relate to water quality, which is just one of the five components of ecosystem health.

We proposed additional attributes that relate to other components of ecosystem health (aquatic life, ecological processes, and habitat).

The proposed new attributes are:

- Fish Index of Biotic Integrity (in wadeable rivers)
- Macroinvertebrates (in wadeable rivers)
- Dissolved oxygen (in lakes, seasonally stratifying lakes, and rivers)
- Ecosystem metabolism (in rivers)
- Submerged plants (in lakes)

A national bottom line was proposed for each of the new attributes, except for ecosystem metabolism. If the attribute state is below the target attribute state or is deteriorating, councils must develop an action plan to respond and achieve the target state, or halt the decline.[19]

The draft report commissioned by MfE to assess the impact of the Government's proposed freshwater reforms on Māori cultural values[20] states that the information collected from monitoring of native fish and macroinvertebrates aligns with mātauranga Māori and will enhance the mauri of the water. It raises concerns, however, that the focus on biophysical/non-mātauranga Māori methods may restrict the incorporation of Māori ways of knowing into freshwater management though does state that "widening the direction and scope of the [NPS-FM] to compel councils to better manage all aspects of ecosystem health does capture more measures of freshwater health that align with mātauranga Māori".

Summary of submissions on new attributes for ecosystem health

Most submitters supported the monitoring of fish, however many raised concerns with using the Fish IBI as a national attribute. Some submitters suggested the requirements to monitor and manage native fish species should be extended to trout and salmon.

The vast majority of submitters support a measure for macroinvertebrates in the NPS-FM-FM. While some submitters specifically support the three proposed macroinvertebrate metrics, others question the need for three separate metrics. Some submitters believe having three separate metrics would increase complexity without delivering ecosystem health gains. Shifting the MCI bottom line from 80 to 90 was questioned by some submitters.

There is general support for expanding the dissolved oxygen attribute to apply in all rivers rather than at the location of point source discharges only. Many submissions note that dissolved oxygen is essential for aquatic life and is an important indicator of ecosystem health. One council recommended a different metric for dissolved oxygen in rivers and suggested that a classification system was needed.

Councils supported measuring lake dissolved oxygen, but note that some lakes will have naturally low dissolved oxygen concentrations.

[19] Discussed above in section 5.

[20] The same report as discussed above in section 2.

Some submitters recognise the importance of ecosystem metabolism as an ecosystem health measure, while others question its usefulness in comparison to the other attributes. Some submitters recommended a bottom line and bands for this attribute.

There is support from some submitters for including lake submerged plants, either in an attribute table as has been proposed, or as a monitoring requirement. Councils are raising concerns with the use of LakeSPI as a national measure, noting that it was unsuitable for many shallow lakes. They express the view that including this measure would unnecessarily raise monitoring costs.

Changes incorporated as a result of public submissions

We agree with submissions that the Fish IBI is not sufficiently robust to use for a national bottom line. However, we consider it important to monitor native fish species and respond to declining trends in their diversity, and that the Fish IBI is the best metric currently available. We propose retaining the Fish IBI attribute but removing the national bottom line, meaning that councils would have to develop an action plan if monitoring of the Fish IBI demonstrated a decline in diversity of native fish species.

We disagree that salmonids should contribute positively towards the Fish IBI score. The definition of Ecosystem Health is based on a minimally disturbed state, and the introduction of salmonids represents a shift away from that state. Councils are free to introduce other attributes that take into account the value of salmonids if they wish. Guidance will be produced to help councils interpret their Fish IBI scores and formulate action plans.

The STAG did not recommend any changes to the proposals for macroinvertebrate attributes. We consider that the additional information provided by the more quantitative metrics (QMCI and ASPM) will be necessary for councils to be able to formulate their action plans. Nearly all councils already collect data in a way that allows the calculation of all three metrics. STAG recommends that the lower of QMCI or MCI is used to assess attribute state, and ASPM should be calculated separately. We will produce guidance for councils on working with the three metrics.

The STAG recommended not lowering the proposed bottom line for MCI from 90 to 80. An MCI score of 80 indicates ‘severely degraded conditions’ and is inappropriate as a minimally acceptable state. Based on advice from the STAG and because submissions were supportive, we do not recommend changing the proposals for the dissolved oxygen attributes in rivers. STAG’s advice was that the metric was the most appropriate one available and that a classification system is not justified. The STAG recommended changing the dissolved oxygen attribute table to reflect that some lakes exhibit naturally low dissolved oxygen levels. Making this change will reduce compliance costs for councils and is consistent with the existing exemption in the NPS-FM for naturally occurring processes.

The STAG had mixed views about whether there should be a national bottom line for ecosystem metabolism. We do not recommend any changes to the proposals for ecosystem metabolism because the science on how ecosystem metabolism responds to management actions is not sufficiently advanced to include a bottom line or bands for ecosystem metabolism.

The STAG recommended adding a clarification to Table 17 that removing exotic macrophytes is not required in circumstances that will cause adverse environmental outcomes, such as destabilising the beds of shallow lakes. This change would improve the outcomes for ecosystem health.

Chapter 2: Preventing further loss of streams

Context

What is a stream ecosystem?

The Resource Management Act defines a river as:

> *A continually or intermittently flowing body of fresh water, and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal).*

Any activity that disturbs the bed of a river requires a resource consent unless allowed by a rule in a regional plan. The land at the top of the river banks is not included in the definition of the bed of a river and activities on that land are allowed unless restricted by a rule in a regional plan or a district plan.

However, the river or stream *ecosystem* is not just the area where water flows, and the entirety of the river or stream ecosystem impacts on the quality of water within the stream. Riparian margins (the areas next to the stream) are also important for stream habitat quality and ecosystem function. Riparian vegetation provides shading which helps regulate stream temperature, it filters and slows down runoff, and it provides inputs of organic matter such as sticks and leaves, which in turn provide habitat and food for aquatic animals. A stream's connection to the soil below it, and the groundwater, is also important for maintaining a functioning ecosystem.

Benefits of streams

Stream (or river) extent constitutes a form of ecological stock, which provides a range of ecological services. Benefits derived from stream extent include amenity, shared space for recreation and active transport, resilience to natural hazard risk, reduced pressure on stormwater infrastructure, improved water quality in downstream receiving environments, benefits for biodiversity and ecosystem health, and opportunities for people to be better connected to the natural environment, and for tangata whenua to express kaitiakitanga.

Reduction in the extent or degradation of streams necessarily results in a reduction in loss of the value derived from this stock.

What is meant by "stream loss"?

Stream loss means the destruction of natural stream habitat quality or extent, and may occur through:

- Piping streams
- Reclamation
- Permanent diversion.

Urban streams have been piped to a large extent: Auckland's headwater streams are largely piped, and in Wellington, the Kumutoto, Pipitea, Tiakiwai, Tutaenui, Waipira, and Waitangi streams have all been piped to allow for urban development, resulting in the loss of at least 5 km of stream habitat.[21] In the catchments of Porirua at Porirua East and Takapuwahia/Elsdon, Wellington, approximately 9.6 and 3.9 km of stream have historically been piped.[22] The loss of stream habitat continues, though we do not have exact figures nation-wide. From 2003-2008, 15 km of stream loss was consented in the

[21] Greer MJC, Grimmond D and Fairbrother P. 2017. The environmental and economic costs and benefits of the pNRP stream piping provisions. Greater Wellington Regional Council, Publication No. GW/ESCI-T-18/6, Wellington.

[22] Greater Wellington Regional Council, unpublished data

Greater Wellington region.[4] Greenfield development in particular (ie, in areas with no existing infrastructure) can result in stream loss through piping and reclamation to increase the amount of useable land, and it can increase impervious surfaces like roads and roofs, which changes stream flow patterns.

Stream loss is not confined to heavily urbanised centres. In Southland, there was 4.9 km of stream habitat modification (piping and reclamation) consented over the last ten years (including river bank reclamation of about 3,000 m^2 on the left bank of the Whitestone River), and an additional 1.1 km has been applied for.[23] Taranaki Regional Council reported a sharp increase in stream piping and diversion for the purposes of increasing the available land area for farming, coinciding with the increasing intensification of dairying in 2006-2008.[24] Between 1995 and 2009, Taranaki Regional Council issued 267 consents involving modification of 43.6 km of stream, and an analysis of aerial photography showed that a substantial amount of additional modification was carried out under permitted activity rules or without resource consent.

Damages of Stream Loss (Problem Definition)

Piping, diversion and reclamation of streams causes damage that is difficult and expensive to reverse. These activities affect multiple aspects of ecosystem health and function. All three of these activities therefore constitute destruction of natural stream habitat quality or extent, which if undertaken badly can be severe. Particularly because many of New Zealand's native aquatic species are threatened with or at risk of extinction, habitat degradation and loss in streams and rivers is a problem.[25] Many native ecosystems and habitats have been destroyed or altered, and this is continuing.

Reclamation

When land has been reclaimed by filling in the stream channel without providing a new channel or pipe for the water flow (which can happen to ephemeral streams without consistent flow), stream extent is self-evidently removed. This is sometimes done to create a flat space for building, or create additional productive land on farms[26]. Smaller and intermittent streams are particularly vulnerable to reclamation without new channel being provided. Consent holders may seek to utilize offsetting in these cases, but there is no overarching framework specifying how this should be done, meaning offsets are not always effective. Particularly where the offsetting of loss to stream extent is done by improving habitat quality elsewhere, total stock of stream extent is still reduced.

Piping

Streams that have been piped show some of the most pronounced adverse effects of stream modification, replacing naturally formed habitat with artificial, and cutting off the stream from its surroundings. This interrupts natural stream functions and processes, and causes piped streams to be characterised by a reduced range of species that can live there, food availability (macroinvertebrates and leaf litter), fish (and other species) passage up or downstream. Piping streams also affects the flow patterns and sediment transport in the downstream sections of stream.

[23] Environment Southland, unpublished data.

[24] Taranaki Regional Council. 2010. Small Stream Modification in Taranaki. Taranaki Regional Council, Publication No. 537059, Stratford

[25] Ministry for the Environment & Stats NZ. 2019. New Zealand's Environmental Reporting Series: Environment Aotearoa 2019.

[26] Taranaki Regional Council. 2010. Small Stream Modification in Taranaki. Taranaki Regional Council, Stratford.

Diversion

Permanently diverting or relocating streams and rivers is less damaging than piping but can still result in a net loss of habitat.[27] This usually involves some form of reclamation, and necessarily carries a risk that the new channel does not provide the same amount or quality of stream habitat. In effect, diversion is a form of offsetting of the damage done to a stream or river's original course, and suffers from the same inconsistent use that often results in a decline in ecological health of streams and rivers.

Remediation

It is more efficient and cost-effective to maintain existing ecosystems than to try and create new ecosystems at a later date. One example of remediation is the "daylighting" of previously piped streams, which involves significant earthworks, possible removal of structures, and expertise in the restoration of previous habitat. This is expensive, difficult, and does not always achieve the ecosystem health that was present prior to the stream being piped.

Impact of current regulations

As stated above, any activity that disturbs the bed of a river requires a resource consent unless allowed by a rule in a regional plan. Currently, all regional plans allow some activities in the beds of rivers, or in ephemeral streams. The land at the top of the river banks is not included in the definition of the bed of a river and activities on that land are allowed unless restricted by a rule in a regional plan or a district plan.

Existing regional plan provisions vary in both complexity and the level of protection afforded to streams and rivers. For example, the Auckland Unitary Plan identifies areas where significant adverse effects on streams, lakes, wetlands and other ecological areas must be avoided, and specifies stricter activity statuses for more damaging activities such as new reclamation or drainage (see example in Option 3). A more permissive example is the Proposed Southland Water and Land Plan, which provides little policy direction to encourage the preservation of existing stream and river habitat.

Even in regions that have planning provisions seeking to avoid or minimise the loss of aquatic habitat, the way that adverse effects on streams are dealt with in resource consents is allowing continued loss of streams. That is because resource consent conditions often require that existing stream habitat is improved to offset the removal of stream habitat through piping or reclamation in another location. However, these actions are only a partial offset or mitigation of the activity because it does not compensate for the quantity of habitat removed, only the quality. In addition, there is a risk that mitigation actions will not be as successful as intended, may not account for some of the wider effects (such as the barrier effect of piping), and can take a long time to establish an environment in the state intended (eg, riparian planting takes time to grow).[28]

Adverse effects on streams are not being adequately avoided, remedied or mitigated in consenting processes and that is leading to a cumulative and ongoing loss of stream habitat. As stated above this loss reduces the overall health of freshwater ecosystems and contributes to loss of biodiversity as well as human use values. Replacing and restoring lost stream habitat is much more difficult and expensive than protecting it from damage in the first place.

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[27] Streams and rivers may be diverted temporarily during construction projects to allow works to be carried out in dry stream or river beds. Temporary diversions are a means of avoiding adverse effects and so are considered separately to permanent diversions.

[28] Brown MA. 2014. Towards Robust Exchanges: Evaluating Ecological Compensation in New Zealand (Thesis, Doctor of Philosophy (PhD)). University of Waikato, Hamilton, New Zealand

Urban areas expanded in area by 10 percent between 1996 and 2012. Population growth is expected to continue; projections estimate New Zealand's population may reach 5 million in the next five years.[29] This will result in ongoing pressure on native habitats and biodiversity.

This results in continuing cumulative loss of stream habitat. We can conclude that under the current regulatory regime set by regional councils, gradual loss of stream and river habitat will continue.

Objective

The objective of this policy therefore is to preserve freshwater quality levels and ecosystem health, and through that protect the benefits which derive from that stock. This relates directly to the government's Essential Freshwater objective to stop further degradation and loss, with a side benefit of easing the reversal of past damage.

The intervention logic of this policy is that by restricting the ability for applicants to acquire consents for these activities, and placing additional conditions upon those who do acquire consents, the total contribution to freshwater degradation and reduction of the current stock of stream extent resulting from piping, diversion, and reclamation, will be avoided or properly mitigated.

Linkages

Proposed National Policy Statement for Indigenous Biodiversity

These proposals are consistent with recommendations in the National Policy Statement for Indigenous Biodiversity to at least maintain certain ecological attributes relating to indigenous biodiversity, for example, species occupancy across their natural range.[30] The proposals on stream loss are also consistent with the National Policy Statement for Indigenous Biodiversity's recommendations relating to compensation and offsetting.

The reporting requirement would complement the accounting requirements for water quality and water quantity already required by the NPS-FM.

Proposed National Policy Statement for Urban Development

The proposed National Policy Statement for Urban Development (NPS-UD) focuses on providing direction to local authorities to ensure their RMA plans enable and support beneficial growth and development. The NPS-UD contains proposals intended to provide for the efficient use of land and infrastructure, which could help to incentivise green infrastructure.[31]

The NPS-UD proposal requires local authorities in the major urban centres (Auckland, Hamilton, Tauranga, Wellington, Christchurch and Queenstown) to work with infrastructure providers (including Three Waters providers) and others to create a Future Development Strategy (FDS) to identify how and where development capacity can be provided and where it should be avoided.

This could have positive outcomes for urban water bodies if restrictions are placed on areas where Te Mana o te Wai would be adversely affected by urban development, for example by preventing the loss of waterbodies. The FDS will also require RMA plans to give effect to it, which could help regional and territorial authorities integrate their freshwater management and land use functions.

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[29] Stats NZ. (2016). National Population Projections: 2016 (base) – 2068 Key facts. Retrieved from https://www.stats.govt.nz/informationreleases/national-population-projections-2016base2068

[30] Draft National Policy Statement on Indigenous Biodiversity. Proposals for consultation November 2019.

[31] Any system that uses a combination of natural and built environments to retain or restore natural ecosystem processes and reduce the environmental impact of the built environment, eg, stormwater systems allowing for soakage and storing of water in a way that mimics natural systems.

The NPSUD contains proposals that are intended to enable intensive urban development in areas where it is most appropriate. Intensive development is broadly considered to have better overall outcomes for urban water provided that good practices are implemented at the same time. Higher urban density will provide efficiencies in the provision, operation and maintenance of three waters infrastructure and services. It may also reduce the amount of contaminants in urban water runoff per capita compared to less intensive development, thereby placing less pressure on urban water bodies. Although we expect the NPSUD will have beneficial effects for streams in urban areas, it is not the purpose of the NPSUD to directly address the management of freshwater and the Ministry does not consider the NPSUD on its own will provide adequate protection for urban streams.

National Direction on Rural Land-use

As part of Action for healthy waterways, there is a proposal that regulations are introduced to exclude stock from waterways. It is also proposed that all stock crossings where animals cross more than twice per month will need to be bridged or culverted.

Without strong direction to discourage activities that damage streams, the policy measures above may have the unintended consequence of increasing the incentive to pipe or divert waterways to reduce or avoid the need for fencing. This is more of a risk in regions with more permissive consenting requirements for stream piping and modification.

Options assessment

This proposal's objective is to stop further degradation and loss of stream habitat caused by reclamation, piping, or diversion.

This fits within the following overarching policy objectives:

- Te Mana o te Wai and the hierarchy of obligations – putting the rights of the river first
- Considering all components of ecosystem health

Summary assessment

Criterion	Option 2: Objective and policy tin NPS-FM	Option 3: Regulation of damaging activities in NES-FM	Option 4: Offsetting and compensation	Option 5: Review the SEV technique	Option 6: Monitoring and reporting
Effectiveness	++	+	+	++	+
Timeliness	+	++	+	+	+
Fairness	++	++	+	+	+
Efficiency	+	++	+	+	+
Principles of the Treaty of Waitangi	+	+	**0**	**0**	**0**
Te Mana o te Wai	++	++	**0**	**0**	+
Overall Assessment	++	++	+	+	+

Option 1: Maintain status quo

The status quo would be expected to result in further loss of stream habitat, particularly in regions with more permissive planning frameworks. Effects of stream habitat loss are likely to continue to be mitigated inadequately, leading to a cumulative decline in habitat and contributing to decline of aquatic species.

Impacts of status quo:

- Consent applicants need to demonstrate that they have avoided, remedied and mitigated damage to streams to comply with regional planning requirements; these requirements are inconsistent and result in cumulative loss of streams
- does not place the wellbeing of the water first as it places greater value on allowing for development
- imposes substantial costs for rehabilitation and restoration on future generations
- likely to lead to the continuing loss of natural habitats in urban areas, reducing the ability of urban communities to connect with natural freshwater ecosystems.

Option 2: Policy in the NPS-FM

This option would introduce an objective in the NPS-FM to halt the loss of river[32] habitat and ecosystem function, with an accompanying policy directing councils to make or change regional plans to:

(1) maintain river extent and ecosystem health; and
(2) establish monitoring methods to evaluate the effectiveness of the plans in achieving this objective.

The intent is for this option to apply to resource consenting decisions.

This option is intended to address the continuing decline in stream habitat by requiring a higher and more consistent standard in resource consenting decisions.

This option would set the high-level direction for councils, but allow them to decide how to give effect to the policies and objectives in their plans.

Sub-options: where would the policy apply?

Several details relating to definitions would need to be resolved to aid implementation of the policy.

Urban streams and rivers

The policy is intended to apply everywhere, because stream loss is occurring in both urban and rural areas. Urban streams and rivers are at greater risk of modification, but urban areas cover approximately 0.8 percent of our land[33], and there are many more rural streams overall. This suggests that it would be appropriate to apply the policy to all land use types.

Restricting the policy to urban areas would be difficult to define and could lead to perverse outcomes by encouraging loss of stream habitat that was outside the definition of the policy. Much of stream and river loss occurs in urbanising catchments during development of greenfield areas, in many cases through private plan changes in areas that are not previously defined as urban.

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[32] We propose to use the RMA definition of a river in this policy; the RMA does not specifically define a stream although it is captured by the definition of a river. A 'river' is defined in the RMA as "a continually or intermittently flowing body of freshwater; and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation or farm drainage canal)". Streams are included in this definition and therefore rivers and streams are both referred to. See Additional Information 1 for definitions.

[33] Ministry for the Environment & Stats NZ. 2019. New Zealand's Environmental Reporting Series: Environment Aotearoa 2019.

Permanent, intermittent and ephemeral streams and rivers

The intent is for this option (and for Option 3) to apply to the RMA definition of a "river" and therefore apply to permanent and intermittent streams and rivers everywhere. It is important to protect intermittent streams and rivers because they are valuable ecologically but are particularly at risk from hydrological alteration, piping and reclamation.

Applying the policy to artificial waterways could have perverse outcomes by encouraging the piping of drains rather than creating open channels that might provide some habitat value.

Where does river habitat stop and start?

The RMA defines the river bed as "the space of land which the waters of the river cover at its fullest flow without overtopping its banks". This definition can be difficult to apply in braided rivers and other rivers that do not have clearly defined banks. However, many councils have existing methods for defining the spatial extent of different water bodies. A policy requiring councils to maintain river extent and ecosystem health would be well supported by a consistent and robust definition of where river habitat ends, with guidance on how to measure this.

Though not defined in legislation, stream ecological function can be quantified using the Stream Ecological Valuation technique, which was developed in Auckland and requires further development to apply at a national level (see Option 5).

Natural and artificial streams and rivers

The intent of this option is to apply to natural streams and rivers, which is consistent with the RMA definition of "river" and excludes artificial waterways such as farm drainage canals. Determining whether a stream is natural or artificial is not always straightforward and there is a lack of consistent guidance on defining artificial waterways. In any case, many artificially constructed waterways are the last vestiges of aquatic habitat where there was previously a stream or wetland. They can provide habitat for threatened species such as longfin eel and black mudfish. It is recommended that policy direction takes into account, and provides for the protection of, the ecological values of such habitats.

Monitoring

Option 2 would require councils to establish monitoring methods to evaluate the effectiveness of the plans in achieving no net loss of river habitat and ecosystem function.

In addition to the broad direction above, we recommend requiring councils to collect and report information from new resource consents on gains and losses in river habitat, and the causes of the gains and losses (eg, as part of existing accounting requirements).

Methods for quantifying stream modification, eg by remote sensing, are being developed currently, and as these techniques become more widespread, it will become easier for councils to quantify current and historical modification of waterways.

Criterion	Option 2: Policy specifying no net loss of habitat or ecosystem function
Effectiveness	++ Provides high level direction but councils may interpret this differently leading to inconsistent outcomes.
Timeliness	+ Would take time for Councils to incorporate into plans, if not accompanied by rules in National Environmental Standard.
Fairness	++ This would apply to all councils, and allow councils to develop rules that align with local circumstances.

Efficiency	+ Would be a flexible approach to rule setting (councils would be able to develop rules that suit local circumstances).
Principles of the Treaty of Waitangi	+ Depends on how councils chose to implement the objectives and policies. However, would likely prevent further habitat loss which would help protect waterways for cultural use (eg, mahinga kai).
Te Mana o te Wai	++ Would likely prevent further loss of waterways which would help protect them for cultural use (eg, mahinga kai).
Overall Assessment	++ Likely to be better than status quo.

Case Study: Greater Wellington Regional Council's Proposed Natural Resources Plan

This case study shows that making consenting conditions stricter can affect the area available for urban development compared to a situation where stream are reclaimed. However, we don't expect to unreasonably restrict urban development, because stream loss can be avoided if subdivisions are designed with a range of housing typologies.

Greater Wellington Regional Council (GWRC) recently introduced more specific direction on stream reclamation in its proposed Natural Resources Plan (pNRP), with a rule specifying that the reclamation of the bed, or any part of the bed, of a river or lake, associated with the piping of a stream, is a non-complying activity.

A case study in the Greater Wellington region indicates that protecting urban streams from piping and reclamation would be likely to reduce the number and/or the size of lots available in a new urban development, which can reduce income for developers. The study compared scenarios with (1) no development, (2) full urban development with all streams piped, and (3) full urban development with no streams piped. Scenarios 2 and 3 are at extreme ends of the spectrum, and therefore will over-estimate the lost profits, because it is unlikely in practice that all streams in a development would be piped.

The case study found that reduced profits for developers would be partly offset by reduced earthworks costs and increased values of properties close to streams, but could still be substantial (around $26,700 per 500m^2 section, based on a reduction in the number of sections from 3007 to 2572). This figure represents a worst case scenario because this study assumed a 15 m corridor around every stream (including ephemeral waterways). In this catchment, retaining ephemeral streams as well as permanent and intermittent streams would more than double the stream length that would require protection, compared to only retaining intermittent and permanent streams. This study did not consider the possibility of balancing the loss of available land by providing for more intensive development to provide additional house lots.

Using the cost of restoring a piped stream as a proxy for the ecosystem services provided, the Greater Wellington Regional Council study found around a 31 percent probability that social benefits to the community would outweigh the lost income of the developer.

The study above suggests that market forces on their own would be unlikely to provide sufficient incentive to protect urban streams. It also suggests that regulation that strongly discouraged stream loss, but didn't prohibit it entirely, would be appropriate. It is important to note that the reduction in potential area for construction will vary widely between sites.

It is possible to avoid the need to reclaim or pipe streams through the way urban developments are designed. A report commissioned by GWRC concluded that "requiring the retention of streams

within urban developments will not unduly hinder the provision of additional housing capacity within the Wellington Region". [34] The report reviewed two recent subdivision consent applications that resulted in stream loss, examining how a proposed policy change to avoid stream loss would affect housing lot yield. The report showed that it is possible to design subdivisions that incorporate alternative housing typologies that adapt to the topography, limit earthworks and the need to reclaim streams.

Option 3: Targeted regulation of damaging activities in the NES

This option would restrict the most destructive activities through regulations in a National Environmental Standard (NES) and National Policy Statement that would direct councils what course of action to take when issuing resource consents. An example of this type of regulation is the river crossing regulations in the National Environmental Standards for Production Forestry.

This option is intended to address the continuing decline in stream habitat by requiring a higher and more consistent standard in resource consenting decisions, coming into effect immediately upon gazettal.

This option would set activity statuses in regional plans for the most destructive activities to rivers. The targeted activities might include:

- piping
- reclaiming the bed of a lake, or any river
- permanently diverting a river that results in a net loss of habitat or ecosystem function.

An example would be to set the default activity status as non-complying in the first instance and then provide exceptions where more lenient activity statuses might be appropriate.[35] This would set a higher bar for applicants to demonstrate that the effects of their activities were being adequately addressed. If a non-complying activity status is introduced in the NES, it would also be necessary to amend the NPS-FM to introduce policy direction on the circumstances in which councils may approve a resource consent application to pipe or reclaim a river bed, or permanently divert a river.

In several existing plans, councils specify areas of high preservation value where activities are restricted more than in the generally applicable plan provisions. There is a risk that setting a minimum standard in an NES or similar regulation would provide a justification for councils to relax their standards in the next iteration of their plans. This risk can be mitigated by ensuring there is higher level policy preventing the net loss of streams as described in Option 2, and by including a clause stating that councils may impose more stringent regulations.

The intent of this approach is not to duplicate or undermine existing planning frameworks that manage various activities in rivers effectively. An example is where a regional plan directs dimensions and design specifications for culverts to avoid flooding or fish passage issues.

The intent is also not to prevent actions aimed at returning more 'natural' functions and processes to systems with a high degree of historic modification (eg, straightened and channelised streams). Where appropriate, a more lenient activity status could be applied to these activities.

Criterion	Option 3: Targeted regulation of damaging activities

[34] Clarke, C., Burns, A., Thompson, N. 2018. Stream retention through subdivision design alternatives. Prepared for Greater Wellington Regional Council by Morphum Environmental Ltd, McIndoe Urban and Wraight + Associates

[35] This is a similar approach to the NES on Air Quality and is similar to the proposed approach for wetlands.

Effectiveness	+ Likely to be more effective than status quo in councils where existing rules are inadequate for protecting stream habitat. There is a risk that councils will have less ability to impose stricter conditions.
Timeliness	++ Rules would come into effect quickly through a National Environmental Standard.
Fairness	++ This would apply to all councils and consent applications equally.
Efficiency	++ Activities that cause the most damage are targeted.
Principles of the Treaty of Waitangi	+ Would likely prevent further loss of waterways which would help protect them for cultural use (eg, mahinga kai).
Te Mana o te Wai	++ Councils are already required to give effect to Te Mana o te Wai. The additional objectives and policies won't change these obligations. However, regulation of damaging activities will mean that the needs of the waterbody are given greater consideration in consenting decisions.
Overall Assessment	++ Likely to be better than status quo as will limit damaging activities without imposing additional plan amendments for councils.

Case study: Earthworks, stream and wetland works consent, Auckland Council

The case study below shows how a non-complying activity rule directs consent applicants to avoid stream reclamation if possible, then only offset stream loss where absolutely necessary. This results in greater preservation of the current stock of streams.

Auckland Council specifies in their Unitary Plan that new reclamation and drainage of a waterbody is a non-complying activity, and there is policy direction to avoid the reclamation and drainage of lakes, rivers, streams and wetlands unless conditions are met that would justify an exception. The plan also has provisions for offsetting of significant residual adverse effects when these cannot be avoided, remedied or mitigated.

A recent consent application for a residential development provides an example of how these policy provisions were applied. This example illustrates that it can be challenging to provide an adequate biodiversity offset within the property where the activity is taking place. This is particularly the case when riparian planting is the sole restoration action proposed.

The proposal was to fill in 135 lineal metres (41.15 m^2) of intermittent stream and 72 m^2 of wetland. The applicant developed the plan for the development to avoid the majority of the watercourses on site, showing that the reclamation applied for could not practicably be avoided. An assessment using the SEV technique[36] showed that an outcome of no net loss in ecological function could not be demonstrated by riparian planting of streams within the development. The applicant had not located a suitable restoration site outside the property to make up for the shortfall. It was considered that the residual impacts not accounted for would result in significant adverse effects, when taking into account the permanent nature of the impact being the complete loss of stream habitat. The conclusion was that these residual impacts would provide grounds for withholding consent for the development.

[36] The Stream Ecological Valuation (SEV) is a tool for offsetting ecological function, assessments of ecological effects, identifying streams of high natural value, prioritising streams for restoration works and identifying the most effective restoration actions.

Storey RG, Neale MW, Rowe DK, Collier KJ, Hatton C, Joy MK, Maxted JR, Moore S, Parkyn SM, Phillips N, Quinn JM 2011. Stream Ecological Valuation (SEV): a method for assessing the ecological function of Auckland Streams. Prepared by NIWA for Auckland Council. Auckland Council Technical Report 2011/009.

Examples such as the one described above can encourage the perception that there are not enough urban streams left to restore to offset for the effects of urban development. This is based on the assumption that riparian planting is the preferred and most straightforward method for offsetting or compensation. However, riparian planting does not address all drivers of stream degradation in urban catchments, such as flashy flows, and will not increase the amount of habitat available. To address these issues, Auckland Council provides an option for consent applicants to contribute funding towards council-led restoration projects that are aimed at addressing the specific causes of stream degradation at the site. An advantage of this approach is that restoration actions are carried out in accordance with best practice, and the gain in ecological value is likely to be higher compared to many small, isolated restoration projects.

Option 4: Offsetting and compensation in the NPS

Where damaging activities such as reclamation and piping need to occur and cannot be avoided, offsetting and compensation provide a method of balancing the losses with gains elsewhere.

Offsetting and compensation are being used in resource consents now, but in an inconsistent way that often results in a decline in ecological health of streams and rivers. The effects management hierarchy provides a consistent way of ensuring a good outcome that aligns with best practice.

This option would amend policy to require offsetting of a particular adverse effect where the effect cannot be avoided, remedied, or mitigated, and require compensation where offsetting is not possible. The intent of this option is to address development proposals applying for resource consents under the RMA, and to provide high-level principles and a framework to improve consistency and environmental outcomes compared to the current situation.

This option is intended to bring clarity and consistency to the way adverse effects are dealt with in resource consents by putting a national guiding framework in place where there currently is none.

In practice, offsetting is proposed by consent applicants as part of their Assessment of Environmental Effects and is part of how they demonstrate that their proposed activity complies with planning rules. The offsets are designed by technical experts such as freshwater ecologists. The proposals are assessed by council staff, often with input from their own technical experts.

Biodiversity offsetting is "*measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground*".[37]

Offsetting is only appropriate to consider after all potential possibilities to avoid, remedy, or mitigate adverse effects of an activity on-site have been ruled out. We recommend that this is made clear in the policy. This is because *"It is more efficient and cost-effective to maintain existing indigenous ecosystems than to try and create new ecosystems. There are inherent difficulties and risks in seeking to recreate or reconstruct indigenous habitat in order to mitigate for continuing removal of indigenous habitat for development projects, and that mitigation may not result in an ecosystem of equivalent richness of function".*[38]

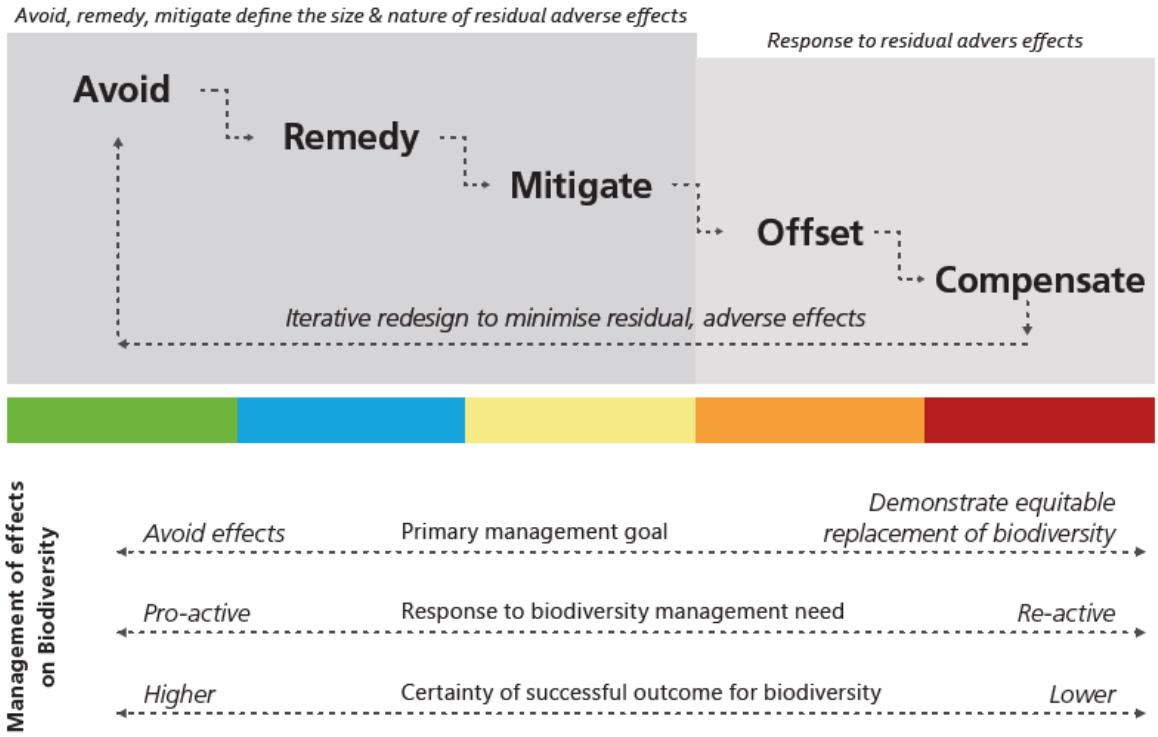
There are different options for specifying at what level offsetting should be applied. In relation to terrestrial habitats, some of the Biodiversity Collaborative Group recommended that "significant" is an appropriate level of adverse effect to focus offsetting and compensation measures on. Others

[37] BBOP, 2013. An overview of the BBOP programme. www.forest-trends.org

[38] Biodiversity Collaborative Group. 2018. Report of the Biodiversity Collaborative Group. Biodiversity (Land and Freshwater) Stakeholder Trust. Wellington.

considered that offsetting should apply to all more than- minor adverse effects. They note that the Guidance on Good Practice Biodiversity Offsetting[39] refers to 'significant' residual adverse effects but goes on to clarify that this means 'ecologically meaningful' rather than a 'significant effect' as used in the RMA.

Figure 1. The continuum of responses for the management of effects. Certainty about achieving successful outcomes for biodiversity decreases at each step along the continuum (moving left to right).[40]



This option will provide direction on what can and can't be offset, and will specify that the preferred approach is for like-for-like options to be defined on the basis of stream functions, ie, riparian planting is not adequate to offset all types of stream habitat loss.

There are also limits to what can be compensated. The Environment Court confirmed the proposed Otago Regional Policy Statement provisions to consider the offsetting of indigenous biological diversity offsetting under certain conditions.[41] Further, the Court directed Otago Regional Council to add a policy detailing limits to compensation.

This option is intended to be progressed together as a package with Option 2. Policies on offsetting and compensation are not sufficient for halting decline on their own because they only deal with the residual effects of an activity and do not direct where certain activities are to be avoided.

There needs to be a robust method of ensuring the gains elsewhere are commensurate, so that the policy avoids facilitating further degradation. If this policy is progressed it will also be necessary to provide further guidance, which is detailed in Option 5 below.

[39] New Zealand Government. 2014. Guidance on good practice biodiversity offsetting in New Zealand. New Zealand Government, Wellington.

[40] Maseyk, F., Ussher, G., Kessels, G., Christensen, M., Brown, M. 2018. Biodiversity offsetting under the Resource Management Act: A guidance document. Prepared for the Biodiversity Working Group on behalf of the BioManagers Group.

[41] Oceana Gold (New Zealand) Limited vs. Otago Regional Council [2019] NZEnvC41

Criterion	Option 4: Offsetting and compensation
Effectiveness	+ Only deals with residual effects after all options to avoid, remedy, or mitigate have been exhausted.
Timeliness	+ Depends on types of offsetting or compensation implemented. Time lags in restoration need to be accounted for at the planning stage.
Fairness	+ May lead to loss of ecosystems in one area and gains in other areas if not implemented strategically.
Efficiency	+ Creating policy guidance for offsetting and compensation will clarify expectations and reduce the need for negotiating offsetting and compensation requirements.
Principles of the Treaty of Waitangi	**0** Unlikely to change significantly from status quo where offsetting and compensation is already being carried out.
Te Mana o te Wai	**0** Unlikely to change significantly from status quo where offsetting and compensation is already being carried out.
Overall Assessment	+ Likely to be better than status quo but not effective at halting loss on its own.

Case Study: Use of the Stream Ecological Valuation (SEV) [42] to offset the effects of stream reclamation

This case study shows how in a typical resource consent for urban development under the current regulatory framework, riparian planting was used to compensate for reclaiming a stream.

> *"An original plan for a subdivision involved the establishment of 32 residential lots over the site. The proposal involved the infilling of part of a gully system and subsequent loss of a 106 metres of stream length, equating to 47 m^2 of stream area. Using the SEV model, the environmental compensation ratio determined that 726 m^2 of relatively high-quality stream area needed to be restored from an existing lower quality stream habitat to compensate for the loss of 47 m^2 of impacted stream. Allowing for a 5 m wide riparian buffer on each side of the stream an area 4840 m^2 of stream side vegetation would need to be rehabilitated. As a consequence, the developer agreed to yield a potential residential lot where an unaffected but degraded, part of the same stream and gully could be reserved and restored to achieve the offset area determined by the SEV analysis."*[43]

Option 5: Produce guidance and review the Stream Ecological Valuation technique

To support national direction on preventing further stream loss, we intend to review the Stream Ecological Valuation (SEV) technique and prepare new technical guidance about calculating the amount of mitigation or offsetting required to compensate the adverse effects of human activities on rivers and streams.

This option is intended to assist councils and practitioners in accounting for stream losses and gains, and will provide a nationally consistent framework to encourage best practice.

[42] Storey RG, Neale MW, Rowe DK, Collier KJ, Hatton C, Joy MK, Maxted JR, Moore S, Parkyn SM, Phillips N, Quinn JM 2011. Stream Ecological Valuation (SEV): a method for assessing the ecological function of Auckland Streams. Prepared by NIWA for Auckland Council. Auckland Council Technical Report 2011/009.

[43] Maseyk, F., Ussher, G., Kessels, G., Christensen, M., Brown, M. 2018. Biodiversity offsetting under the Resource Management Act: A guidance document. Prepared for the Biodiversity Working Group on behalf of the BioManagers Group.

The first step of the project would be to review and evaluate current practises in terms of their effectiveness and adherence to established best practise biodiversity offsetting principles. The next step would be to develop a consistent, nationally mandated method for determining the amount of mitigation or offsetting required to compensate for adverse effects in streams and rivers, building and improving on existing approaches. The guidance developed would also be consistent with the Biophysical Ecosystem Health Framework which was developed in 2018 for MfE.[44]

The benefit of developing this guidance would be to encourage consistent and transparent mitigation and offsetting provisions that are targeted towards, and adequately address, the specific adverse effects of the activity.

Criterion	Option 5: Produce guidance and review the Stream Ecological Valuation technique
Effectiveness	**++** Will improve outcomes at the local scale.
Timeliness	**+** Guidance will take time to be developed but can be implemented immediately once complete.
Fairness	**+** Development costs borne by central government.
Efficiency	**+** Efficiency can be improved by making sure the new methods are taken up, eg by workshops.
Principles of the Treaty of Waitangi	**0** Unlikely to change significantly from status quo.
Te Mana o te Wai	**0** Unlikely to change significantly from status quo.
Overall Assessment	**+** Likely to be better than status quo but not effective at halting loss on its own.

Options ruled out of scope, or not considered

Short culverts that comply with minimum design specifications are often permitted under regional plan rules. Culverts are short sections of piping usually inserted into a stream to allow some form of crossing. We have not made recommendations on permitted activity rules for culverts because permitted culverts are typically short, so have less of an impact on stream health than longer piped sections, and if designed and installed properly do not have the same barrier effect as piping entire reaches of streams. Short culverts are often installed to reduce the adverse effects of other activities, eg, to prevent bank damage and water quality degradation caused by vehicle or stock crossings.

One option considered was to direct councils to modify their plans to avoid stream loss entirely without any possibility of offsetting. This option would be the most protective of stream habitat, but was ruled out because it would have significant impacts in terms of loss of available land for housing and national infrastructure.

We also considered the issue of inadequate monitoring and compliance of consent conditions leading to the loss of stream habitat. However, this issue was ruled out of scope as the problem is not unique to streams and is a symptom of the wider resource management system, and is better dealt with by reforms at this level.

[44] Clapcott J, Young R, Sinner J, Wilcox M, Storey R, Quinn J, Daughney C, Canning A, 2018. Freshwater biophysical ecosystem health framework. Prepared for Ministry for the Environment. Cawthron Report No. 3194.

Recommendation

The Ministry recommends that options 2, 3, 4, 5 and 6 are progressed as a package.

The Ministry considers this combination of options provides the most practical, enforceable and timely way to prevent further degradation to stream habitat. The recommended options are aimed to encourage a more holistic view of streams and rivers rather than focusing on water quality and quantity, consistent with direction in the Action for healthy waterways Package to consider all the components of ecosystem health.

Implementing the options in isolation will not address the whole problem. For example, Option 4 needs to be progressed as a package because offsetting and compensation are unlikely to completely halt reduction of stream extent on their own. They only deal with the residual effects of an activity and do not direct where certain activities are to be avoided.

Progressing these options as a package will ensure that all aspects of the issue are addressed. They will ensure a minimum standard is applied to provide fair and consistent outcomes across the country, clarify the requirements for resource consent applications, and minimise the time spent negotiating mitigation requirements, a process that can be costly and impose delays. We do not anticipate the costs on councils or applicants for resource consents being significantly changed by the progression of all options as a package.

It is recommended that the bulk of the policy is enacted through the NPS-FM, to allow councils to decide how to best implement the policies taking into account existing planning frameworks. At the same time, regulating stream reclamation in the NES will address the most damaging activity quickly, as NES regulations apply immediately upon gazettal. It is not feasible to progress detailed rules in the NES for all aspects of stream loss because doing so would interfere with existing planning frameworks.

What do stakeholders think?

Stakeholders were supportive of the policy intent to maintain the extent and ecosystem health of rivers.

The Land and Water Forum recommended preventing further loss of urban streams (unless the loss can be offset by improvements elsewhere in a freshwater management unit).

Fish & Game New Zealand provided Minister Parker with a redrafted NPS-FM on 4 May 2018, which recommended preventing net loss of streams.

The Freshwater Leaders Group supported direction to halt loss of stream habitat. The Science and Technical Advisory Group noted that habitat loss is a significant issue and major driver of decline in streams and rivers. In relation to offsetting and compensation, they noted that it's important to have guidance on how to quantify losses and gains, and that offsetting may not be appropriate for some types of ecosystems.

The Resource Manager's Group supported strong direction to avoid stream loss. They noted that redirection of streams was also potentially a damaging activity, as well as piping and reclamation of streams. There are other modifications to river habitat that would not be dealt with by the proposed policy, such as river stop banks. They noted the need to align stream habitat loss policy with other central government policy.

Department of Conservation officials recommended that it was important to articulate that the policy should apply everywhere. They noted that the severity of the effect of piping will vary depending on catchment characteristics, species present and the amount of prior modification. They

noted the importance of addressing the broader issue of how stream and river habitat is measured and managed; this is an area for further work.

The Biodiversity Collaborative Group (BCG) recommended:

> *"The BCG has not been able to draft and propose a policy to address impacts of human activities on indigenous freshwater fauna and their habitat and recognises this needs to be linked to the approach taken to identifying (and potentially separately managing) ecologically significant freshwater environments. It considers that such national policy direction is urgently required. An integrated approach to managing effects on indigenous freshwater biodiversity is required, taking into account the interplay between RMA functions, the NPS-FM's objectives, policies, and national values for freshwater, and fishery and biosecurity functions of councils and other agencies. The BCG expects that this will involve measures for inclusion in an NPS (either the NPSIB or NPS-FM), but may also include other complementary measures that may prove more effective in determining fishery management priorities or dealing with issues such as pest fish.*
>
> *Recommendation 2. As a matter of priority the Ministry for the Environment, in conjunction with DOC, regional councils and freshwater ecology experts, should:*
>
> *(a) Develop the policy needed to control adverse effects as necessary to protect section 6(c) matters and indigenous freshwater biodiversity more generally, and include such policy in the NPSIB or NPS-FM.*
>
> *(b) When developing this policy focus on matters that are currently not controlled under the NPS-FM.*
>
> *(c) Consider a range of options or mechanisms when developing policy.*
>
> *(d) Consult with national stakeholders when developing this policy."*[45]

[45] Biodiversity Collaborative Group. 2018. Report of the Biodiversity Collaborative Group. Biodiversity (Land and Freshwater) Stakeholder Trust. Wellington.

Summary table of costs and benefits of the preferred approach

Affected parties	Comment:	Impact	Evidence certainty
Additional costs of proposed approach, compared to taking no action			
Regulated parties	Increased costs / reduced returns for developers and other resource users highly variable; varies with development design, topography of land, amount of streams present, and ecological values that need to be offset.	Medium	Low
Regulators	Will increase consenting, monitoring and compliance costs for some councils	Medium	Medium
Wider government	Minor one-off costs of improving guidance	Low	High
Other parties	N/A	N/A	N/A
Total Monetised Cost	N/A - varies based on design decisions	N/A	N/A
Non-monetised costs	Vary based on design decisions and stringency of current local regulations to councils with permissive regulations.	Medium	Low
Expected benefits of proposed approach, compared to taking no action			
Regulated parties	Will increase certainty for consent applicants and encourage innovation	Low	Medium
Regulators	Will increase certainty for regulators assessing consent applications	Low	Medium
Wider government	Potential benefits to Government's urban development and rural land use initiatives; encourages efficient use of land and infrastructure, and strategic consideration of locations for housing intensification.	Low	Medium
Other parties	Benefits to ecosystem health of maintaining habitat and connectivity (immediate effect; ongoing). Social and cultural benefits to general public (medium to long term)	High	Medium
Total Monetised Benefit	N/A – benefits of maintaining natural environments are difficult to quantify	N/A	N/A
Non-monetised benefits	Environmental, social, and economic benefits of retaining natural ecosystems	High	Medium

What other impacts is this approach likely to have?

Currently, the cost of stream loss is largely being borne by the environment and general public. The main impact of these recommendations will be to shift the cost of stream damage to those that are causing the damage.

Benefits would mainly be enjoyed by the wider community and environment. They are likely to include amenity, shared space for recreation and active transport, resilience to natural hazard risk, reduced pressure on stormwater infrastructure outside of the development, improved water quality in downstream receiving environments, benefits for biodiversity and ecosystem health, and opportunities for people to be better connected to the natural environment, and for tangata whenua to express kaitiakitanga. These benefits can be difficult to quantify in financial terms, and can be highly site-specific. However one Australian based study found that:

- the value of pollution reduction is estimated to be worth more than the lifecycle cost of water sensitive urban design assets.
- the potential avoided waterway rehabilitation life cycle costs are estimated to be worth around 70 percent of the lifecycle cost of water sensitive urban design assets
- the potential property premiums are estimated to be around 90 percent of the capital cost of water sensitive urban design assets
- the capital costs of implementing water sensitive urban design in residential developments are typically less than 1 percent of the cost of a new dwelling.[46]

Impacts on tangata whenua

The recommended approach will have a net benefit on Māori values compared to the status quo.[47] The proposals will:

- neither enhance nor diminish mana motuhake, because they do not change decision making power and tino rangatiratanga of tangata whenua is not supported
- neither enhance nor diminish mātauranga Māori, because no mātauranga Māori indicators are proposed for considering consent applications
- enhance mauri to a low extent, because restricting activities that affect the natural patterns of streams and wetlands will help to support mauri
- Enhance whānau ora through halting further reduction, though benefits are low in extent because there is a possibility that competing values are prioritised over stream health.

Rural land uses

We anticipate these proposals will have limited impact on rural land uses. Specific planning restrictions would also provide greater certainty to farmers about how to undertake future farm development.

Urban development

Compared to a situation where stream loss is permitted, preventing the loss of an urban stream within a new development can reduce the amount of land available and result in less land being available for purchase (by land area). This could result in higher costs per property being passed on to purchasers, or a reduced return for the development as a whole, impacting decisions about the feasibility of the project.

[46] http://pnrp.gw.govt.nz/assets/Uploads/HS5-ROR-Beds-of-Lakes-and-Rivers-Appendix-E-Stream-Retention-Report-13-July-2018.pdf

[47] Essential Freshwater - Action on Healthy Waterways: Impacts on Māori Values. Final Report for the Ministry for the Environment. February 2020

The design of new development can mitigate these higher costs and reduced return. Incorporating stream corridors into green open space networks and reserves, providing more compact development using smaller lot sizes and higher density, and providing green alternatives to piped stormwater infrastructure can make urban development more cost-effective. These types of design approaches are consistent with the urban development outcomes the National Policy Statement for Urban Development (NPS-UD) is seeking to encourage.

Design-based solutions for development would be unlikely to mitigate the full cost impacts, and overall this policy would be likely to increase property prices in new greenfield developments where there are streams. Where housing yield cannot be maintained in a development (eg, through design or increased density) the reduction in land available could also mean that more land is required to accommodate the same number of dwellings.

Reduced return to developers could be mitigated in part by the premium that properties close to urban streams would be likely to attract due to the amenity provided by the stream; however this would further add to the cost passed on to property purchasers.

How can Councils provide for urban development while maintaining streams?

The following information, provided by Auckland Council, illustrates how councils can use structure planning to enhance and restore the natural environment when green field areas are developed. It also highlights the need for regulation applying to the plan change and consenting stages, which would be provided by the recommended changes in the NPS and NES.

Urban development processes such as structure planning for green field areas, provides an opportunity to provide for growth in a way that identifies, protects and enhances or restores the natural environment. For positive environmental outcomes to be achieved, these opportunities need to be identified from the outset in order to influence subsequent decisions and plan changes made to implement the structure plan.

Structure plans which aim at a high level to enhance and restore the natural environment, however, those which lack specific mechanisms for achieving this fail to do so. For example, details on implementation options such as wider than standard setback along streams for protection purposes, prioritisation of some stream systems for restoration and higher than normal standards for controlling contaminant runoff, are not often included in the structure plan. Due to this, they become a matter to be considered at the regulatory stage through plan change or even resource consenting which limits the ability to achieve integrated and positive environmental outcomes for the wider area and instead takes a more site or rule specific approach, often undertaken within strict timelines.

When the identification of natural features such as wetlands and streams as well as associated objectives to enhance or restore and implementation options are identified from the beginning of the structure plan process, then these are prioritised. Additionally, if the multiple benefits associated with enhancing the natural environment are expressed and provided for, then this also assists in achieving the desired outcomes. An example of this is the Warkworth Structure Plan which was completed in 2019. As this structure plan has only recently been completed, development in line with the structure plan has not yet been initiated. Key points included in the structure plan are as follows:

- Areas that are important for ecology, stormwater, heritage, and cultural values are set aside from any built urban development. These areas have been excluded from the development yield (they are assumed to have no dwellings or businesses on them).
- Recognition that Auckland's natural environment is our primary infrastructure and the ability for it to function well and be of high quality is important in supporting biodiversity,

improving water quality, reducing air pollution and protecting against severe weather and flooding.

- Recognition that a healthy natural environment plays an important role in creating quality built environments and in creating communities that are resilient to anticipated impacts of climate change.
- Importance of protecting Warkworth's environment (particularly the Mahurangi River) as the town grows was a clear expectation from public consultation on the structure plan project in April 2018.
- Provision and identification of green areas allow the creation of continuous 'green corridors' across the growth area which can be restored with riparian planting to create ecological corridors that connect small, fragmented patches of native vegetation within Warkworth and its immediate surrounds.
- Recognition that restoring these green corridors provides a key linkage between the Dome Valley Forest in the north, the Mahurangi River, and out into the Mahurangi Harbour and the pest-free islands of the Hauraki Gulf.
- Clear connection between the green network and the role this will play to improve the health and quality of the Mahurangi River, which is consistent with the Warkworth Structure Plan planning principles and the messages from the public.
- Multiple benefits of the green network including visual amenity and public access recognised and expressed.
- Benefits of healthy rivers and streams and green infrastructure in urban environments including increased resilience to climate change impacts, reduced impacts of stormwater runoff from urban areas (e.g., sediment and contaminants) on streams, and increased quality of the living environment are recognised and provided for.

Impacts on other resource users

Other providers of infrastructure such as landfills, mines, quarries and roads will be impacted by these recommendations. There are often physical constraints on the location of these activities that mean that stream loss cannot be avoided. The recommended options take these situations into account by providing for a consenting pathway for activities that are unable to avoid stream loss.

Impacts on councils

Regional Councils and Unitary Authorities (Regional Councils) are tasked with integrated management of the natural and physical resources of a region under the Resource Management Act 1991 (RMA). Regional Councils have the primary regulatory functions for freshwater resources.

The recommendations on preventing stream loss will lead to additional consenting, monitoring and compliance costs on Regional Councils. The annual cost to regional councils of implementing the recommendations are $8,260,000.[48] It was estimated that Waikato Regional Council would need a total of four additional FTEs, and the average councils would require 1.85 additional FTEs. Costs will be higher for those councils with a higher rate of land use intensification.

The recommendations on preventing loss of streams will also result in benefits for councils in terms of their responsibilities for integrated management of catchments. Preventing stream loss will preserve natural capital and retain streams that can provide "green infrastructure" that can contribute to flood attenuation, stormwater management and other ecosystem services. The recommendations will also help to avoid future costs of restoring and rehabilitating ecosystems.

[48] Administrative Costs of Proposed Essential Freshwater Package on Regional Councils. Draft Report to Ministry for the Environment. February 2020

Additional Information 1: Definitions

Artificial watercourses are constructed watercourses that contain no natural portions from their confluence with a river or stream to their headwaters.

Includes: canals that supply water to electricity power generation plants; farm drainage canals; irrigation canals; and water supply races. Excludes naturally occurring watercourses

Culverts are pipes with an inlet from a watercourse and outlet to a watercourse, designed to convey water under a specific structure (such as a road).

Ephemeral streams only flow for brief periods following rainfall and do not have a defined bed or banks.

Intermittently flowing rivers may dry out occasionally but have a defined bed. We propose to adopt the Auckland Council definition which has been developed following extensive research on intermittent streams and their values:

> *Stream reaches that cease to flow for periods of the year because the bed is periodically above the water table. This category is defined by those stream reaches that do not meet the definition of permanent river or stream and meet at least three of the following criteria:*
>
> > *(a) it has natural pools;*
> >
> > *(b) it has a well-defined channel, such that the bed and banks can be distinguished;*
> >
> > *(c) it contains surface water more than 48 hours after a rain event which results in stream flow;*
> >
> > *(d) rooted terrestrial vegetation is not established across the entire cross-sectional width of the channel;*
> >
> > *(e) organic debris resulting from flood can be seen on the floodplain; or*
> >
> > *(f) there is evidence of substrate sorting process, including scour and deposition.*

Permanent streams and rivers have year-round continual flow or standing water.

Reclamation is any permanent filling of an area previously inundated by water, for the purpose of creating dry land. Reclamation excludes any area of surface water impounded by a dam. Includes filling associated with piping a stream.

Rivers are defined in the RMA as "a continually or intermittently flowing body of freshwater; and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation or farm drainage canal)". The NPS-FM uses the term 'rivers and streams'. Calling smaller watercourses rivers is contrary to common usage and could be misleading for the public, so here, we include rivers and streams in the definition.

Chapter 3: Directing clearer ecological outcomes of river flows and water levels – Update on Interim Analysis

This section is an update to the corresponding section on pages 54-67 of the Interim Regulatory Impact Analysis (available here: https://www.mfe.govt.nz/more/briefings-cabinet-papers-and-related-material-search/regulatory-impact-statements/interim*).*

Summary of policy issue

Since 2011, regional councils have been required to avoid over-allocation, and phase out existing over-allocation of freshwater (this requirement has been in the National Policy Statement for Freshwater Management since 2011, and is retained in proposed policy 7 of the draft NPS-FM). Over-allocation is defined as when a water body is not meeting its freshwater objectives. These objectives must, at a minimum, provide for ecosystem health. Regional councils must have regional plans that fully implement the NPS-FM in place by 2025.

In order to avoid over-allocation and phase out over-allocation, councils need to be able to tell whether ecosystem health is provided for. However, the most current regional plans generally do not include measurable ways to test whether limits and flows effectively safeguard the ecosystem health of the water body.

This problem is becoming critical in regions where there is increasing pressure to take water, and regions where water resources are becoming scarcer as a result of more frequent or more prolonged droughts. While it continues there is a risk of significant adverse effects on the ecosystem health of some water bodies, and potential new users cannot access water in catchments that are not fully allocated.

Proposal

Action for healthy waterways includes proposals to:

- amend the NPS-FM to require regional plans to set out clear environmental outcomes relating to river flows and water levels;
- put the needs of the water body at the forefront of choices about minimum flows and allocation limits; and
- require councils to adopt environmental flows and water take limits in their regional plans that do not frustrate environmental outcomes for any connected waterbody.

The proposals are set out in sections 3.11 and 3.12 of the draft National Policy Statement for Freshwater Management.

Limitations or constraints on the effective implementation of the flows policy

The flows policy will be implemented by regional councils through changes to regional plans.

Decisions to apply any reductions in allocations to individual consent holders can only be made by regional councils. The NPS-FM cannot, and does not, direct councils to review water permits.

Regional councils have sought more guidance on setting flows and levels for ecosystems health. Until this is provided, some may need extra capacity and capability to implement the package. Once the guidance is available, councils can use their existing data to set appropriate thresholds to provide for ecosystem health.

Summary of submissions on topic

Around 6419 submitters commented on proposals relating to flows and levels in lakes, rivers and groundwater. This included 485 unique submissions, and 5934 pro-forma submissions from Forest and Bird, Wellington Fish and Game, NZ Fish and Game, and Horticulture NZ.

Submissions raised the following issues and themes:

- the need for more guidance on setting flows
- how to recognise the hierarchy in Te Mana o te Wai, especially in providing for the essential health needs of people
- the need to recognise other values alongside ecosystem health and the essential health needs of people, in particular, the values of hydroelectric generation and recreation
- suggestions for improving the drafting so that there is better connection between setting flows and levels, total take limits, and other policies
- the view that communities will face high costs in setting new minimum flows and limits, or on the other hand the view that existing minimum flows are inadequate and should be reviewed. Submissions did not provide any estimates of impacts.
- concerns about the effects of the Manapouri Power Scheme on flows in the Waiau River.

Changes incorporated as a result of public submissions

While there are no changes to the policy proposal recommended as a result of public submissions, the proposed amendment to the NPS-FM will be redrafted to provide more clarity that does not alter the intent of the proposed policies.

The need more guidance on setting flows

The need for more guidance on setting flows was identified in the Interim RIS (see page 65). The Science and Technical Advisory Group recommended in its report that the current framework for freshwater management has important gaps relating to ecological flows (variability and minimum flows) for rivers and levels for lakes, wetlands and groundwater. Submissions confirmed the need for this guidance to be progressed as a priority. Technical guidance will be progressed as part of the implementation package being prepared by the Ministry.

Conclusion: prepare implementation guidance on setting flows and other technical matters raised in submissions.

How to recognise the hierarchy in Te Mana o te Wai, especially in providing for the essential health needs of people

The hierarchy in Te Mana o te Wai is proposed in section 2.1 of the draft NPS-FM as follows

The objective of this National Policy Statement is to ensure that resources are managed in a way that prioritises:

a) first, the health and wellbeing of waterbodies and freshwater ecosystems
b) second, the essential health needs of people
c) third, the ability of people and communities to provide for their social, economic, and cultural wellbeing, now and in the future.

The proposed policy would replace the existing policy to recognise and provide for Te Mana o te Wai. The proposed policy for Te Mana o te Wai is assessed separately.

The issue of providing for the essential health needs of people after providing for the water body was largely a concern of city and district councils because of their obligations to provide domestic drinking water to people, including during droughts. This particular issue can be addressed by water suppliers building resilience into their reticulated water supplies. This includes promoting ways for

communities to conserve water, calculating drought risks, and building water supply storage. Water suppliers currently do this, but some may need to increase their water supply storage if restrictions become more frequent.

The Ministry is also preparing guidance for implementing the policies for Te Mana o te Wai, including the hierarchy.

Conclusion: prepare implementation guidance on the hierarchy in Te Mana o te Wai.

The need to recognise other values alongside ecosystem health and the essential health needs of people, in particular, the values of hydro-power generation and recreation

The existing NPS-FM already includes direction for making decisions about values and how they are all provided for within a catchment. This direction is proposed to be retained.

Conclusion: retain policies 3.11 and 3.12 as proposed (with changes to drafting to provide more clarity that do not alter the intent discussed below).

Suggestions for improving the drafting so that there is better connection between setting flows and levels, total take limits, and other policies

One submitter provided alternative drafting for the policies as proposed in policies 3.11 and 3.12. Their suggestions remove the need for cross-referencing to policy 3.9 and provided a logical process for setting environmental flows and take limits.

The suggested drafting does not alter the policy intent and will be discussed with the legal drafters.

Conclusion: retain policies 3.11 and 3.12 as proposed, with changes to drafting that do not alter the intent.

The view that communities will face high costs in setting new minimum flows and limits versus the view that existing minimum flows are inadequate and should be reviewed

Some submitters felt that existing rules in regional plans about environmental flows and limits had been set after considerable consultation, hearings, and sometimes appeals to the Environment Court and should therefore remain unchanged, while others felt that existing rules are proving to be insufficient in terms of safeguarding life-supporting capacity of the river.

The RMA requires councils to review the effectiveness of their regional plans every five years. Alongside this requirement, they will need to assess the rules in their regional plans that restrict taking, damming and diverting water, and if necessary change them to give effect to the proposed policies. These rules are contentious, and will remain contentious. The proposed policies have been drafted to direct durable decisions that recognise the need to safeguard ecosystem health and provide for other relevant values.

Conclusion: retain policies 3.11 and 3.12 as proposed, with changes to drafting that do not alter the intent.

Concerns about the effects of the Manapouri Power Scheme on flows in the Waiau River.

Submitters, including the Guardians of Lakes Manapouri, Monowai and Te Anau and over 100 school children, expressed concerns for the health of the Waiau River because of the diversion of most of its flow through the Manapouri Power Scheme.

The proposed policies direct councils to set “take limits” and flow levels that provide for flow variability as part of ecosystem health. But alongside the proposed flow policies, councils will also need to give effect to proposed policy 3.22 of the draft NPS-FM. Policy 3.22 directs councils to have regard to the importance of not adversely impacting the generation capacity, storage and

operational flexibility of the scheme. It was this proposed policy potentially allowing water bodies downstream of specified hydro-schemes to breach national bottom-lines that concerned submitters.

The proposed policy 3.22 about allowing exceptions for large hydropower schemes is assessed separately.

Potential impacts and an indication of likelihood and order of magnitude of costs

The only costs or impacts identified in submissions were the potential costs to regulated parties and regional councils of re-litigating new limits, where those set in a regional plan are re-assessed and the council decides they should be changed to give effect to the policy. Changing limits in the regional plan is a public process, and will be done alongside any other changes the council needs to do to give effect to the NPS-FM as a whole.

The recommended changes will mean that regional councils, affected parties (regulated parties), and environmental advocates will be clearer on what is required in the regional plan. The costs to a council to develop a new policy in its regional plan will be similar to the status quo. Councils are already required to manage flows and levels in water bodies by setting limits – so as to safeguard the life-supporting capacity, ecosystem processes and indigenous species of the water body and its associated ecosystems.

New ecological flows and levels, and total take limits that give effect to the proposed policy can only affect existing permit holders if the regional plan states that their consents will be reviewed. The decision to review a consent is for the regional council to make. It cannot be directed by the NPS-FM. If the council decides to review consents, the regulated parties would be required to cease their abstraction earlier (if the ecological flow is increased), or decrease their total take (if the take limit is decreased). The costs and impacts of this decision must be assessed by the regional council prior to notifying its regional plan change.

Summary table of costs and benefits of the preferred approach

Affected parties *(identify)*	**Comment**: *nature of cost or benefit (eg ongoing, one-off), evidence and assumption (eg compliance rates), risks*	**Impact** *$m present value, for monetised impacts; high, medium or low for non-monetised impacts*	**Evidence certainty** *(High, medium or low)*
Additional costs of proposed approach, compared to taking no action			
Regulated parties	There may be changes to minimum flows and allocation limits as a result of the more specific direction. In areas where access to water is already tight, clearer objectives may result in reductions in allocations and water permit holders may need to store water. On the other hand, the clearer objectives may allow larger allocations from some areas, or new users may be granted permits to take water. Impacts cannot be monetised, because changes to water abstraction restrictions are made by regional councils in their regional plans and cannot be predicted	Potentially medium costs if conditions on water permits are made more restrictive, or lower costs if larger water allocations are made available.	Low

	at a national level. Regional plans must be prepared following the public processes of the RMA.		
Regulators	Councils are already required to evaluate the effectiveness of their current approaches. The recommended approach may require increased monitoring of the ecosystem as affected by human-induced changes in water levels in rivers, lakes, and groundwater. Councils may need new staff to assess the effectiveness of their existing flow regimes in relation to the proposed policy.	Potentially medium costs in determining new flow regimes and allocation limits and adopting these in regional plans where this is required.	Low
Wider government	The largest cost is in preparing guidance.	$200,000 (approx.)	Medium
Other parties		No costs	
Total Monetised Cost		$200,000	
Non-monetised costs		Medium	

Expected benefits of proposed approach, compared to taking no action			
Regulated parties	More certainty about their allocation.	Low	Medium
Regulators	More defensible decisions on minimum flows and allocation limits. Better integration of policies about ecosystem health in regional plans	Low	Medium
Wider government	Better able to analyse current water allocation, to prepare for future parts of the government work programme relating to water allocation.	high	Medium
Other parties	All parties involved in public processes for regional plan development will have a higher level of certainty for the process	Low	Medium
Environment	Better recognition of ecosystem health in terms of the flows and water levels in the water bodies.	Medium	Medium
Total Monetised benefit		None	
Non-monetised benefits		Low	Medium

Note: it is difficult to estimate the ecosystem benefits for this proposal, which is primarily enabling. The ecosystem benefits are estimated in Part 1 of the RIA: Summary and Overall Impacts.

Appendix 4: Nutrient attributes for managing ecosystem health

Context

Nutrients in fresh water

Nitrogen and phosphorus are nutrients that are necessary for all plant growth and are present naturally at low levels in freshwater ecosystems. However, excessive nutrients can:

- contribute to problematic growth of periphyton (slime) or macrophytes (rooted plants), affecting ecosystem health and people's use and enjoyment of the waterbody
- change the ways that microbes and invertebrates break down and recycle organic matter (such as leaf litter) in rivers, which alters the way ecosystems function.

Some forms of nitrogen can also have direct toxic impacts on animal health.

Nitrogen and phosphorus are present in different forms in our waterways. Nitrate-nitrogen is easily dissolved in water, transported through groundwater and taken up by plants. It is toxic to aquatic animals and humans at very high concentrations. Ammonia is another toxic form of nitrogen. In most rivers it is present in much lower concentrations than nitrate and is typically found in human and animal waste. Dissolved inorganic nitrogen (DIN) is the sum of nitrate, nitrite and ammonia. In most New Zealand waterways DIN is approximated by the nitrate value (ie, nitrite and ammonia concentrations are very low). Measures of total nitrogen incorporate both dissolved nitrogen and undissolved nitrogen, such as the fraction that is contained within microscopic plant cells.

Phosphorus is typically measured as total phosphorus and dissolved reactive phosphorus (DRP). Most phosphorus in waterways is bound to sediment and not available for plant growth. The dissolved fraction is readily taken up by plants. Unlike some forms of nitrogen, phosphorus does not cause toxic effects to humans or animals in freshwater.

Human activities have increased the nutrient concentrations in New Zealand's freshwater systems, and continue to do so. The most widespread instances of elevated nitrogen concentrations are in Waikato, Canterbury and Southland (Figure 1). Between 1998 and 2017[49], concentrations of nitrate-nitrogen increased at 54.7% of river monitoring sites. During the same period, concentrations of dissolved reactive phosphorus increased at 30.2% of sites (Figure 2 and 3).[50] In Canterbury (the region with the largest increases) nitrogen leaching from livestock increased 117 percent between 1990 and 2017 (from 15,000 to 33,000 tonnes).[2]

Many studies at the national, catchment and river scale in New Zealand show that catchments with significant urban or agricultural land use have higher concentrations of nitrogen and phosphorus than catchments that more closely resemble environments that have not been disturbed by human activity.[51]

[49] Here, we use 20-year trends because interpreting trend information is complex, and natural drivers such as climate can influence trend information at shorter time scales.

[50] Ministry for the Environment & Stats NZ (2019). New Zealand's Environmental Reporting Series: Environment Aotearoa 2019. Available from www.mfe.govt.nz and www.stats.govt.nz.

[51] Larned, S., Booker, D., Dudley, B., Moores, J., Monaghan, R., Baillie, B., Short, K. (2018a). Land-use impacts on freshwater and marine environments in New Zealand. NIWA Client Report No. 2018127CH. Christchurch, New Zealand. Retrieved from https://www.mfe.govt.nz/publications/

Figure 1. Concentrations of dissolved inorganic nitrogen, 2013-2017, showing concentrations between 1 and 1.5 mg/L, and concentrations higher than 1.5 mg/L. Source: Environment Aotearoa 2019.

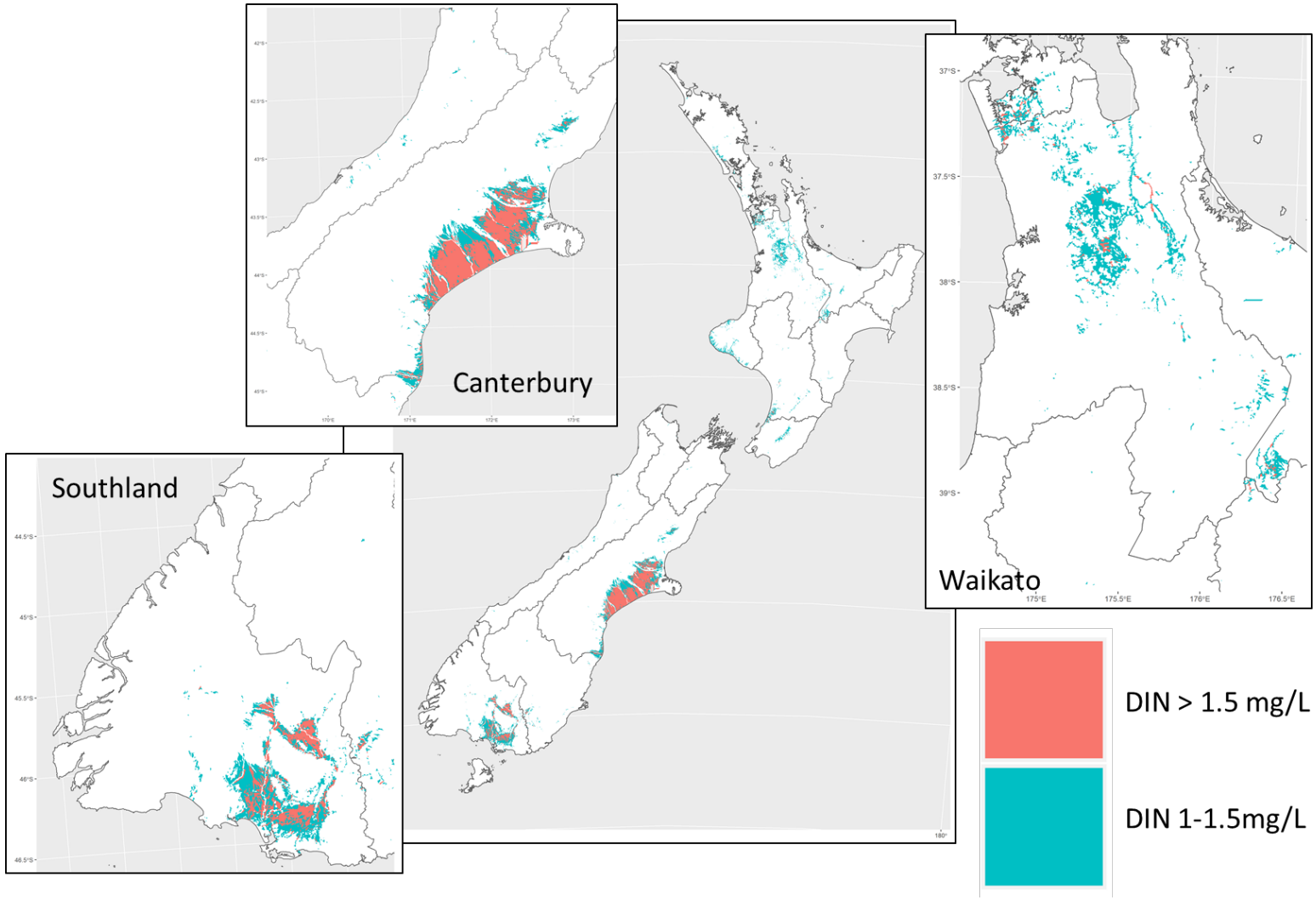


Figure 2. River nitrogen concentration trends, 1998-2017. Source: Environment Aotearoa 2019.

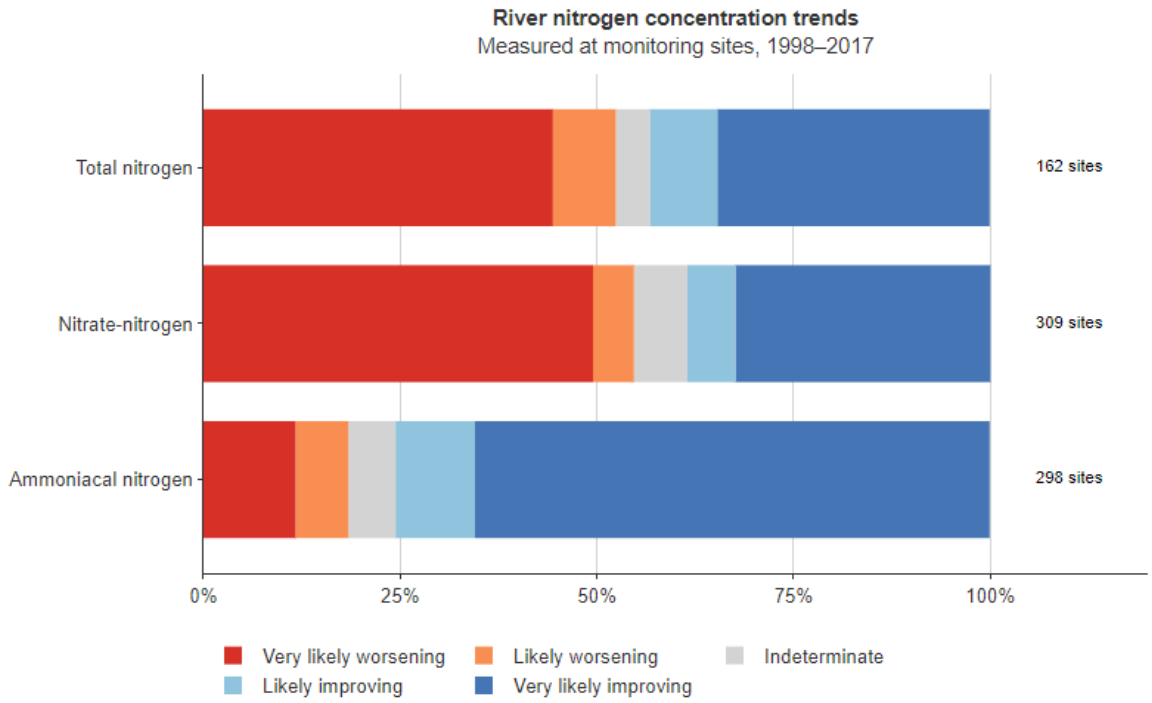
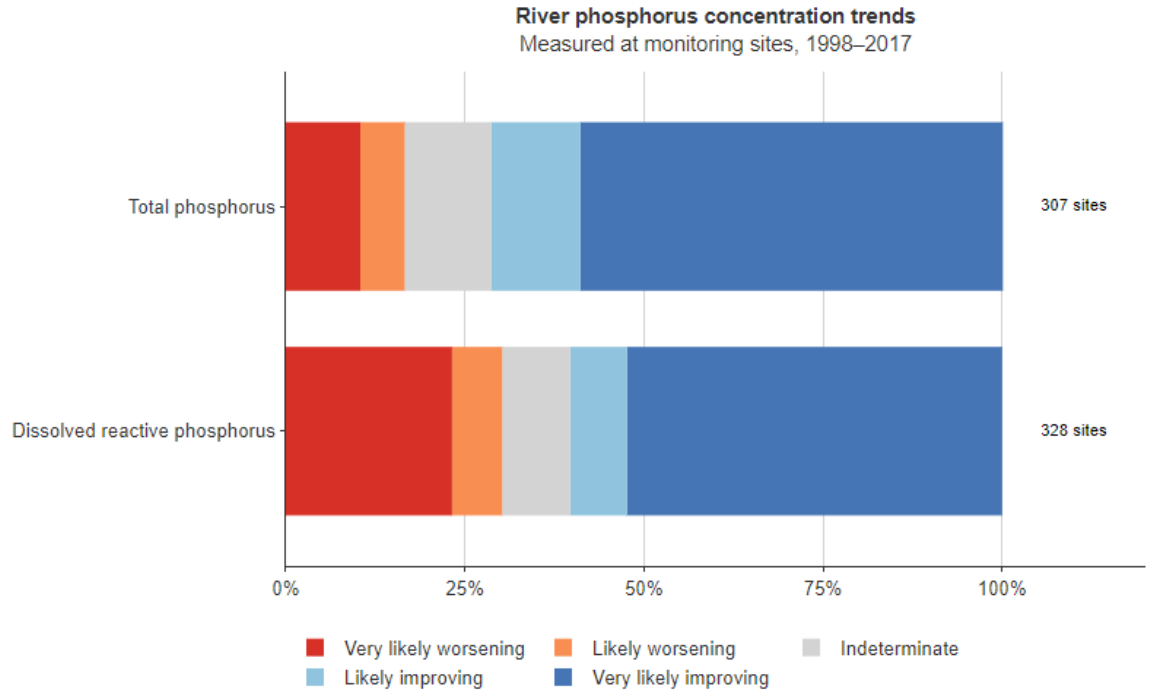


Figure 3. River phosphorus concentration trends, 1998-2017. Source: Environment Aotearoa 2019.



Status quo: management of nutrients in fresh water

What does the current NPS-FM direct councils to do?

Under the Resource Management Act (RMA), local governments are responsible for implementing national requirements through their planning processes. Relevant content in regional plans is directed through the National Policy Statement for Freshwater Management (NPS-FM).

The NPS-FM framework requires councils to follow a particular process to provide for values:[52]

1. Identify the values the community holds for freshwater management units (FMUs)
2. Identify the attributes that need to be managed to provide for those values
3. Formulate freshwater objectives using the attributes in Appendix 2 of the NPS-FM
4. Establish limits on resource use and implement other methods to ensure the freshwater objectives are met.

The NPS-FM directs councils to manage nutrients in rivers by setting objectives for ammonia and nitrate (in terms of their toxic effects, not their nutrient effects on plant growth) and for periphyton. Councils are required to determine the levels of in-stream dissolved inorganic nitrogen (DIN) and dissolved reactive phosphorus (DRP) that will deliver their periphyton objective.[53] The NPS-FM makes it clear that toxicity bottom-lines are insufficient to provide for ecosystem health.[54] However, it does not directly specify the nutrient levels that will provide for ecosystem health.

The periphyton attribute was intended to give councils flexibility in managing the negative effects of nutrients, because different nutrient concentrations cause different amounts of periphyton in different locations. This is due to flow regimes, temperature and stream shading (amongst other factors). Periphyton is more likely to grow in stony or gravelly rivers and is less likely to grow in muddy or sandy rivers.

The existing periphyton attribute has two columns: one for all rivers, and one for productive rivers. Productive rivers are defined as those that, under natural conditions, would be more likely to contain conspicuous periphyton, due to underlying geology and other landscape scale factors. The requirements for managing periphyton in those naturally productive rivers are less stringent.

Councils also need to work out target attribute states for each part of the catchment, and manage the catchment to protect the most sensitive areas. That will mean the levels of nitrogen and phosphorus in rivers need to provide for the desired outcomes in nutrient-sensitive downstream environments (such as a lake or estuary). In rivers that neither grow periphyton nor have a sensitive receiving environment downstream, the nitrate and ammonia toxicity attributes are the minimum specified requirement.

How have councils implemented the current NPS-FM?

Councils have not yet completed the objective and limit setting process that the current NPS-FM requires. Most councils are focused on understanding and setting catchment limits for nitrogen, and understanding nutrient pathways and processes. Eight regional councils have set nitrogen limits for some parts of their regions and others have draft plans in progress.

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[52] MfE 2017

[53] Dissolved inorganic nitrogen is the sum of nitrate, nitrite and ammonia. In most New Zealand waterways DIN is approximated by the nitrate value (ie, nitrite and ammonia concentrations are very low).

[54] A footnote to the nitrate toxicity table reads: "This attribute measures the toxic effects of nitrate, not the trophic state. Where other attributes measure trophic state, for example periphyton, freshwater objectives, limits and/or methods for those attributes will be more stringent."

Councils have invested substantial resources implementing the periphyton attribute. New Zealand now has around 170 sites where periphyton is monitored on a monthly basis. This has increased substantially since 2014. Councils are using this new data to produce high-quality catchment-specific analysis on the drivers of periphyton.

Below is a summary of the status quo for excessive nitrogen and phosphorus concentrations in freshwater.

Table 1. Summary of the status quo for excessive nitrogen concentrations in freshwater

Effect on freshwater ecosystems	Current policy that addresses the effect	Impacts on land use
Direct toxic effects on fish and other aquatic animals.	The nitrate toxicity bottom line of 6.9 mg nitrate-N per litre.	Applies everywhere. Some small areas of Canterbury and Southland have nitrogen concentrations above bottom-line levels. In the Hinds catchment in Canterbury it will cost 10 percent of aggregate farm profit or $32 million per annum to achieve this bottom line.[55]
Excessive growth of periphyton (algae attached to rocks), the periphyton in turn damages freshwater ecosystems by smothering habitat and changing dissolved oxygen levels.	The periphyton bottom line of 200 mg chlorophyll *a* per square metre. The nitrogen concentrations required to achieve 200 mg chlorophyll *a* vary depending on the river type, flows, phosphorus concentrations, and water temperature.	Applies to stony rivers. Councils can choose how to meet bottom-lines and the time frames for achieving them. If councils were to meet bottom-lines only through nutrient reductions, extensive mitigations and land use change would be required in some catchments (see Impacts section).
Excessive growth of algae floating in lakes.	The lakes total nitrogen bottom-lines of 0.8 and 0.75 mg N per litre (value depends on lake type).	Whether lakes, estuaries or rivers in the catchment impose the most stringent requirements will vary depending on the catchment characteristics. Meeting bottom-lines for lakes can require significant investment and time due to groundwater lag times and storage of nutrients in lake sediment. In Te Waihora/Lake Ellesmere, one of our most impacted lakes, restoring lake water quality to a minimum acceptable state will require substantial land use change.
Excessive growth of all kinds of algae in receiving environments (eg, lakes and estuaries).	The periphyton attribute note that requires councils to set nitrogen and phosphorus objectives that provide for desired outcomes in downstream lakes and estuaries.	As above.
Degradation of ecosystem health through other mechanisms (eg, altering the ways that plant matter is recycled by microbes and invertebrates and how it is incorporated into food chains).	**Not currently addressed in the NPS-FM**. The Science and Technical Advisory Group (STAG) proposal would impose a bottom line of 1 mg of dissolved inorganic nitrogen (DIN) per litre to address this effect. The bottom line and other thresholds for the DIN attribute would be set out in an "attribute table" in the NPS-FM.	Relevant where there are no rocks for periphyton to attach to (eg, muddy bottom rivers like the Waikato), and there is no lake or estuary downstream. See Impacts section.

[55] Daigneault, A., Samarasinghe, O., Lilburne L. 2013. Modelling Economic Impacts of Nutrient Allocation Policies in Canterbury: Hinds Catchment. Prepared by Landcare Research for Ministry for the Environment.

Table 2. Summary of the status quo for excessive phosphorus concentrations in freshwater

Effect on freshwater ecosystems	Current policy that addresses the effect	Impacts on land use
Excessive growth of periphyton (algae attached to rocks), the periphyton in turn damages freshwater ecosystems by smothering habitat and changing dissolved oxygen levels.	The periphyton bottom line of 200 mg chlorophyll *a* per square metre. The phosphorus concentrations required to achieve 200 mg chlorophyll *a* vary depending on the river type, flows, nitrogen concentrations, and water temperature.	Applies to stony rivers. Councils can choose how to meet bottom-lines and the timeframes for achieving them. If councils were to meet bottom-lines only through nutrient reductions, extensive mitigations and land use change would be required in some catchments (see Impacts section).
Excessive growth of algae floating in lakes.	The lakes total phosphorus bottom-lines of 0.05 mg P per litre.	Whether lakes, estuaries or rivers in the catchment impose the most stringent requirements will vary depending on the catchment characteristics. Meeting bottom-lines for lakes can require significant investment and time due to groundwater lag times and storage of nutrients in lake sediment. In Te Waihora/Lake Ellesmere, one of our most impacted lakes, restoring lake water quality to a minimum acceptable state will require substantial land use change.
Excessive growth of all kinds of algae in receiving environments (eg, lakes and estuaries).	The periphyton attribute note that requires councils to set nitrogen and phosphorus objectives that provide for desired outcomes in downstream lakes and estuaries.	As above.
Degradation of ecosystem health through other mechanisms (eg, altering the ways that plant matter is recycled by microbes and invertebrates and how it is incorporated into food chains).	**Not currently addressed in the NPS-FM.** The Science and Technical Advisory Group (STAG) proposal would impose a bottom line of 0.018 mg of dissolved reactive phosphorus (DRP) per litre to address this effect. The bottom line and other thresholds for the DRP attribute would be set out in an "attribute table" in the NPS-FM.	Relevant where there are no rocks for periphyton to attach to (eg, muddy bottom rivers like the Waikato), where there is no lake or estuary downstream. See Impacts section.

Vegetable production

Commercial vegetable growing is a highly intensive land-use which leaches significantly more nitrogen on a per-hectare basis than other forms of primary production. The total amount of land in commercial vegetable growing in New Zealand is very small. However, as vegetable growing is concentrated in a small number of catchments, principally Pukekohe and Horowhenua, there are high localised impacts on freshwater quality. In the absence of further government intervention, these localised impacts will most likely continue.

Costs of bottom-lines on vegetable growing

The proposed nitrate toxicity and DIN bottom-lines would be onerous to meet in catchments where vegetable production is concentrated, and assuming current methods continue, would essentially require wholesale conversion from vegetable production as a land use. This would have a number of negative implications, including:

- *Consumer effects*: Reduced supply of domestically produced vegetables is likely to result in higher prices for vegetables, particularly for fresh, highly perishable vegetables which are more difficult to be import
- *Impact on regional economies*: Vegetable production is a significant economic contributor in areas such as Pukekohe and Horowhenua, where vegetable growing is concentrated. A reduction in vegetable production will have strong direct and indirect employment implications for these areas
- *Other impacts*: Reduced access to fresh, locally-grown vegetables will have negative public health implications if consumption decreases. Increasing reliance on imported vegetables increases risk to national food security.

Nutrient leaching associated with commercial vegetable production has a highly localised impact. The trade-off to be considered is whether the implications of severely constraining commercial vegetable production, as outlined above, outweigh the potential freshwater improvements that might be seen in a small number of catchments, namely in Pukekohe and Horowhenua.

Benefits of bottom-lines on vegetable growing

Sustainable vegetable growing practices are a positive consequence of bottom-lines. The environmental and economic analysis conducted in the Pukekohe catchment, however, indicates those practices alone won't be enough to meet proposed bottom-lines in this catchment, as there is limited opportunity for more sustainable growing practices in these catchments given the scale of land use change implied. There are other mechanisms to move growers to more sustainable growing practices, such as requirements in Farm Environment Plans.

One consequence of applying the proposed bottom line in the Pukekohe catchment would be to move vegetable growing to another region. This may degrade water quality in the catchments moved to, dependent on whether there is simultaneously a reduction in other higher leaching production, such as dairying. This would probably mean that catchments like Pukekohe and Horowhenua might improve, but at the cost of other catchments. Commercial vegetable growing is also reliant on a number of factors such as soil quality, climate and access to suitable labour markets. This means the mobility of vegetable production in response to economic or regulatory pressures is limited by those factors.

The problem/opportunity

The Action for healthy waterways Package contains a range of proposals designed to deliver on the Government's objectives of halting further declines in freshwater and ecosystem health, making material improvements in five years, and restoring past damage over a generation.

Nutrients are key drivers of ecosystem health and the Ministry for the Environment (the Ministry) has identified gaps in the current NPS-FM policies that could lead to unintended decline of ecosystem health.

The effect of nutrients on ecosystem health is not adequately managed in the NPS-FM. The NPS-FM addresses the effects of nitrogen and phosphorus on periphyton growth, sensitive downstream environments and some toxicity measures (for nitrogen). It does not explicitly address other effects that nutrients can have on ecosystem health (eg, altering the ways plant matter is recycled by microbes and invertebrates and how it is incorporated into food chains).

These effects will continue to occur because the NPS-FM effectively requires councils to manage nutrients to low levels only in some places:

- It has much more permissive requirements for soft-bottomed rivers (around 28 per cent of New Zealand's river length). Soft-bottomed rivers do not generally support algal growth, so nutrients do not need to be managed to achieve periphyton objectives in these rivers. There is potential for these rivers to decline in ecological health because they are not receiving adequate attention in council limit-setting processes.
- The national bottom-lines for nitrate and ammonia toxicity (which apply everywhere) protect only 80 per cent of species. Adverse effects on ecosystem health (other than toxicity) will occur at much lower concentrations of nitrogen. If councils choose to set objectives based on toxicity bottom-lines, they will not be protecting ecosystem health adequately.

Even in hard-bottomed rivers where the existing periphyton attribute applies, it could be inappropriately applied by setting inadequate in-stream nutrient concentrations.

The desired outcome of the policy intervention is that regional councils require in-stream nutrients to be maintained below thresholds throughout the country to provide for ecosystem health.

There is an opportunity to provide clearer direction on nutrient requirements for managing ecosystem health in all rivers. If we do not comprehensively manage nutrients across all ecosystems, it could lead to damage that is difficult and expensive to remedy.

A report by NIWA[56] found that delaying reductions in nutrient inputs will make recovery of many rivers, lakes and estuaries slower and more difficult. This happens because nutrients can build up in the sediments of poorly flushed estuaries, lakes and to a lesser extent, rivers. These nutrients can be released from the sediments long after the other inputs have ceased. Delaying nutrient reductions can also set up feedback mechanisms that lock in degraded ecological states (eg, encourage excessive plant growth in rivers, which traps sediment) and make it harder to restore an ecosystem back to a healthy state. The natural characteristics of rivers, estuaries and lakes will affect the severity of consequences of inaction and the time it will take to recover.

[56] Graham, E., Woodward, B., Dudley, B., Stevens, L., Verburg, P., Zeldis, J., Hofstra, D., Matheson, F., Elliott, S. 2020. Consequences of Inaction: Potential ramifications of delaying proposed nutrient limitations on New Zealand lakes, rivers, and estuaries. Prepared for Ministry for the Environment by NIWA.

Constraints on the analysis

Impact analysis was based on national-scale modelled predictions of nutrient concentrations.[57] This study did not take into account the 'load to come' from groundwater, or stricter limits that may be required to manage estuaries. Focusing on smaller scales will introduce greater uncertainty and it is not recommended that this information is used at the scale of an individual freshwater management unit.

Linkages

The options considered for nutrient attributes in this analysis will be relevant for ongoing work on nutrient allocation, as adopting the attributes would affect the way that councils set objectives and limits on resource use in catchments.

The Parliamentary Commissioner for the Environment has recommended that the ownership, use and development of catchment models should be reviewed, to ensure that water quality managers have access to the best possible understanding of nutrient transport and transformation. Such a review would assist council processes to set nutrient limits under the NPS-FM.

Reducing nitrogen runoff from the land has benefits not only for water quality, but also for reducing emissions of nitrous oxide, a greenhouse gas produced by bacteria in the soil. Actions that will reduce both nitrous oxide emissions and nitrate leaching to waterways include:

- better management of fertiliser, stock and effluent
- afforestation
- protection of soil and capture of animal excreta during periods of high risk of runoff
- stock exclusion from streams and wetlands.[58]

What was consulted on?

The Science and Technical Advisory Group (STAG) proposed new attributes in Appendix 2A of the NPS-FM for Dissolved Inorganic Nitrogen (DIN) and Dissolved Reactive Phosphorus (DRP).

The Ministry recommended stricter provisions for managing nitrates than exist in the NPS-FM currently. We also recommended a programme of work to further address the issues, including to:

- establish certainty about the best approach for setting new nutrient thresholds
- assess at a catchment and farm scale the benefits and impacts of the current NPS-FM provisions and new thresholds
- increase the transparency and rigour of the implementation of the current periphyton bottom line and publish guidance on the process for councils
- progress research to further our understanding of the influences on ecosystem health in soft-bottomed rivers
- publish guidance for councils with nutrient criteria to achieve periphyton biomass objectives in different types of rivers.

The Ministry noted that introducing the attributes is a major decision with far-reaching consequences and Ministers will not take final decisions until this analysis is available.

[57] Whitehead, A., 2018. Spatial Modelling of River Water-Quality State. Incorporating Monitoring Data from 2013 to 2017. NIWA Client Report, NIWA, Christchurch, New Zealand.

[58] Shepherd, M., Daigneault, A., Clothier, B., et al. 2017. New Zealand's Freshwater Reforms: What are the Potential Impacts on Greenhouse Gas Emissions? Motu Economic and Public Policy Research.

STAG's proposal to amend the periphyton attribute to remove the productive class was also presented for consultation. The existing periphyton attribute has two columns: one for all rivers, and one for productive rivers. Productive rivers are defined as those that under natural conditions, would be more likely to contain conspicuous periphyton, due to underlying geology and other landscape scale factors. The requirements for managing periphyton in those naturally productive rivers are less stringent because they can exceed the attribute state 17 per cent of the time, while other rivers may only exceed the attribute state 8 per cent of the time.

Justification for this approach

The Ministry considers that there is justification for introducing a more stringent bottom line or threshold for nitrate compared to the current nitrate toxicity bottom line to provide for ecosystem health, especially based on the new definition of ecosystem health and Te Mana o te Wai. STAG has indicated that achieving the suggested bottom-lines for DIN and DRP will contribute to improvements in ecosystem health through direct and indirect mechanisms. The periphyton attribute, lake nutrient attributes, and requirement to manage for the most sensitive waterway in the catchment will remain.

The Ministry received finalised advice from the STAG on 24 June 2019. Until that point there had been considerable discussion on the evidence base for the attributes. The Ministry therefore presented the STAG's attributes in the Action for Healthy Waterways discussion document, noting that further work was required to quantify the benefits and costs of the proposed options. More work was then done to understand the impacts of the proposals during and after consultation.

What do stakeholders think?

IAP

The Independent Advisory Panel (the IAP) recommended that DIN and DRP should be action plan attributes.[59] The IAP finds compelling the suggestion from NIWA that target DIN and DRP limits should only apply if target ecosystem health attribute states are not being met, and suggests this as an alternative if DIN and DRP are to remain in Appendix 2A (Attributes requiring limits).

The IAP has recommended keeping the periphyton attribute largely as it is, with greater provision to use percentage cover as a metric.

Science and Technical Advisory Group

STAG has recommended[60][61] (though not unanimously) amending the national framework for freshwater management to introduce numeric biophysical tables for:

- dissolved inorganic nitrogen (DIN) with a national bottom line of 1 mg/L DIN as an annual median (and 2.05 mg/L as a 95th percentile)
- dissolved reactive phosphorus (DRP) with a national bottom line of 0.018 mg/L DRP as an annual median (and 0.054 mg/L as a 95th percentile) (Additional Information 1).

STAG reviewed the current provisions for nutrient management attributes in the NPS-FM. It considered a number of options:

[59] Essential Freshwater: Report of the Freshwater Independent Advisory Panel. February 2020.

[60] Essential Freshwater Science and Technical Advisory Group Report to the Minister for the Environment, September 2019.

[61] Essential Freshwater Science and Technical Advisory Group Second Report to the Minister for the Environment, March 2020.

- Non-regulatory methods (eg, guidance) to inform objective-setting for the periphyton attribute
- New nutrient attribute tables for DIN and DRP – applicable nationally[62]
- Amending the nitrate toxicity attribute.

STAG recommended attribute tables in its first report. These are attached (Additional Information 1), and in summary STAG's position is:

- A majority of members support the DIN and DRP attributes, and consider the methodologies and datasets used to derive the proposed criteria, bottom-lines and thresholds for DIN and DRP for rivers are scientifically rigorous, well explained and well justified. Those methodologies have been discussed at length by the STAG and peer reviewed independently by Professor David Hamilton who generally supported the approach adopted.
- Members recommend that a note should be added to Recommendation 13 acknowledging that, while some rivers in acid-volcanic geological soils may have naturally high levels of DRP, these rivers are readily identifiable, equate to 17 per cent of national stream length (70,899 km) and, where identified, can reasonably be dealt with by exception – although it would also be technically feasible for the management framework to treat these rivers as a separate class.

A minority of members consider:

- The methodology used to derive the nutrient criteria set out in the primary report is not sufficiently robust to support the inclusion of a management category, thresholds and bottom-lines for DIN and DRP for rivers in national regulatory tools.
- The recommendation to include the attributes should be deleted and replaced with the following:

  Nitrogen and phosphorus can both impact the structure and functioning of healthy river ecosystems. For those rivers that do not support or could not support conspicuous periphyton:
  - further work is necessary before contemplating the development of nationally-applicable thresholds for DIN and DRP for rivers, for evaluation and potential inclusion in the NPS-FM, and
  - if ecosystem health does not meet community aspirations or national bottom-lines, then managers should undertake targeted investigations to determine the cause(s). Guidance should be developed as to the conditions under which elevated nutrients may be influential on such ecosystems, and managers should then derive DIN and DRP reduction targets that are likely to achieve the desired states. Where nutrients are not influential, or where ecosystem health metrics already meet community aspirations, then managers should ensure that DIN and DRP are maintained at the current state or reduced to concentrations consistent with protecting downstream ecosystems, whichever is the most stringent.

[62] Combining national relationships between nitrate and fish, macroinvertebrates, ecosystem metabolism and periphyton and averaging these to produce nitrate thresholds for management of ecosystem health.

STAG also recommend that:

- the existing periphyton attribute should remain. It noted that nutrient attributes on their own are not sufficient to provide for ecosystem health, and we must still account for downstream receiving environments (eg, lakes, estuaries)
- where there is more than one attribute for managing nutrients the more stringent one should apply.

On periphyton, STAG recommends amending national direction on freshwater management by changing the table specifying numeric biophysical values for periphyton (trophic state) to:

- remove the exclusion allowing rivers in the 'productive class' to exceed bottom-lines 17 per cent of the time
- require councils use the default nutrient criteria provided in the absence of robust, locally suitable, independently peer reviewed criteria.

Independent peer reviewer

Prof. David Hamilton, deputy director of the Australian Rivers Institute, conducted a review of the management of nutrients in rivers in the NPS-FM and the interim recommendations of the STAG. Prof. Hamilton made several recommendations to improve the analysis which were acted upon by STAG to formulate its final recommendations.

The main points raised in the review, and STAG's responses, are included in STAG's first report. Prof. Hamilton concluded that the numerical values for the attribute states for DIN and DRP proposed by STAG "*match reasonably well with my own interpretation of whereabouts the concentrations would 'fall out.' There is strong evidence for additional attributes besides periphyton and nutrient toxicity to manage stream ecosystem health."*

Freshwater Leaders Group

In its first report[63] the FLG expressed support for DIN and DRP to be defined as attributes, based on STAG's initial recommendation to incorporate ecosystem health DIN and DRP as limit-setting attributes into the NPS-FM, with further work to answer outstanding questions. Since that first report, FLG has recommended the following exceptions[64]:

1. Where DRP exceeds the bottom line because the catchment is in acid-volcanic soil, these water systems are readily identifiable and quantifiable (according to STAG) and could readily be managed by exception.
2. Where DIN of greater than 1mg/L[65] when all other attributes, ecosystem health measures and their bottom-lines, are met, and there is compelling, peer-reviewed scientific evidence that acting to reduce the DIN to 1mg/L will not result in further improvement in ecosystem health of the freshwater body or the downstream receiving environments (including estuaries and lakes).

[63] Freshwater Leaders Group report to the Minister for the Environment. September 2019. https://www.mfe.govt.nz/publications/freshwater/freshwater-leaders-group-report-minister-environment

[64] FLG letter to Hon David Parker, 6 March 2020

[65] 1 part per million (ppm) is the same as 1 mg/L.

3. Where DIN is much higher than 1 mg/L Regional Councils must target at least a 30% reduction over a ten year period as part of a long-term plan long term plan to reduce DIN towards the national bottom line, consistent with ecosystem health.

Kahui Wai Māori

Kahui Wai Māori[66] has not been able to consider the proposals in detail as a group. The three KWM members on the STAG are supportive of ecosystem health DIN and DRP attributes in the NPS-FM.

Regional Sector Water Subgroup

The Regional Sector Water Subgroup[67] (the RSWG) raised strong concerns regarding the details of STAG's suggested new attributes for DIN and DRP. It does not support the proposals. It considers there is a considerable risk that they will not result in better ecological health, while incurring significant cost to communities through land-use change.

The RSWG notes that environmental drivers of ecological health are complex. Predictive models have been developed in several regions (eg, Waikato, Horizons) and tend to identify flow, habitat and sediment as the key drivers. In most cases, nutrients are of secondary importance for macroinvertebrate measures of ecosystem health (but are more important for periphyton).

Previous advisory groups

The National Objectives Framework (NOF) Reference Group and the NOF Science Review panels had several discussions between 2015 and 2017 on the applicability of setting nutrient levels as attributes for Ecosystem Health in the NOF, given the confusion over the nitrate and ammonium attribute tables that related to toxicity. These discussions were reported to the Land and Water Forum (LAWF), which made the decision to recommend the periphyton attribute.

Feedback from public consultation

Submissions show mixed responses to the proposed DIN and DRP attributes. Of the unique submissions:

- nearly 700 express an opinion on the DIN attribute. About 30 per cent support it, and 70 per cent oppose it
- over 570 express an opinion on the DRP attribute. About 33 per cent support it, and 67 per cent oppose it.

We also received over 11,300 form submissions.

- In support: about 10,700 form submissions from Greenpeace New Zealand, Fish & Game New Zealand, Wellington Fish & Game and Forest & Bird. They support the STAG's attributes as they are. Fish & Game New Zealand (1414 submissions) also supports incorporating default nutrient criteria for periphyton in the NPS-FM.
- Opposed: about 600 form submissions from DairyNZ, Horticulture New Zealand, and Beef + Lamb New Zealand. They advocate for a more catchment-specific approach to setting nutrient objectives.

[66] Te Mana o Te Wai: The health of our wai, the health of our nation: Kāhui Wai Māori report to Hon Minister David Parker. September 2019. https://www.mfe.govt.nz/fresh-water/kahui-wai-m%C4%81ori-freshwater-forum

[67] Regional Sector Commentary on Essential Freshwater Proposals He Pito Kōrero e pa ana ki Ngā Tūtohu Mō te Waimāori. September 2019. https://www.mfe.govt.nz/publications/fresh-water/regional-sector-commentary-essential-freshwater-proposals-he-pito-k%C5%8Drero-e

Table 3 summarises the issues.

Table 3. Summary of responses to the proposed dissolved inorganic nitrogen (DIN) and dissolved reactive phosphorus (DRP) attributes

	Generally support	Generally oppose
Submitters	Environmental non-governmental organisations Academics Some councils (eg, Christchurch City Council) Fish & Game New Zealand Some health providers Some iwi organisations Some individuals, including farmers Many science organisations (Cawthron Institute, Scion, New Zealand Freshwater Sciences Society, Institute of Environmental Science and Research)	Most councils Local Government New Zealand Agricultural sector individuals and organisations National Institute of Water and Atmospheric Research
Based on	The toxicity attributes in the National Policy Statement for Freshwater Management are not sufficient for ecosystem health and the new attributes would address that The risk of nitrate in drinking water, and the benefits of a stricter DIN bottom line for managing drinking water at a safe level	Most who oppose the DIN and DRP attributes support a catchment-based approach with tailored objectives. Many question the validity of the evidence used to develop the attributes, pointing out variation in the correlations between DIN, DRP and ecosystem health components. Many think the economic and social costs of meeting bottom-lines would be substantial and outweigh the environmental benefit. Some think the attributes do not adequately account for natural variability in nutrient concentrations (eg, because of catchment geology).

Benefits of setting nutrient bottom-lines

Many submissions support the DIN and DRP attributes[68] and express the view that they would have positive impacts on water quality across the country. Submissions from environmental groups and Māori organisations note that attributes will improve the protection of waterways, as they establish clear and consistent objective-setting processes for councils. A standardised approach enables communities to better understand the effects of excess nutrients on water quality and is consistent with the concept of Te Mana o te Wai. Submissions from public health organisations and others note that bottom-lines will also help protect human health from excess nitrates in drinking water. They refer to new research on the link between nitrates and colorectal cancer at substantially lower concentrations of nitrate than the current Maximum Allowable Value for drinking water.

[68] Approximately 10,700 form submissions and one-third of individual submissions were in support of the attributes

Economic impacts

DIN

Several farming businesses submitted that achieving the bottom line for DIN would require substantial land use change in some areas, either by moving from more intensive to less intensive practices (eg, from dairy to sheep and beef), or by retiring land to forestry. Several businesses gave estimates of potential income loss from reducing on-farm nitrogen application and many expressed the view that this could make their business unviable (or at least require staff reduction).

Farming businesses often relied on economic analysis from primary sector organisations and LGNZ to estimate on-farm cost impacts. Submitters also engaged with the map on Page 47 of the *Action for Healthy Waterways* discussion document[69] which shows indicative nitrogen reduction needed across New Zealand to reach bottom-lines. Many assume these numbers will direct how much nitrogen loading needs to be reduced at the farm scale to be compliant – however, attributes apply at the Freshwater Management Unit scale.

Commercial Vegetable Growing

Vegetables NZ Inc./Process Vegetables NZ submit that changes to minimum bottom-lines for nitrogen, phosphorus and sediment should only be done once (amongst other things) research has been completed on the social and economic impacts, including the impact on domestic food supply, of achieving the minimum bottom-lines.

Horticulture NZ submit that for some nationally significant infrastructure, exceptions to bottom-lines are appropriate. They also seek a nationally-consistent planning framework for commercial vegetable growing.

The Pukekohe Vegetable Growers' Association submit that imposing nitrogen restrictions could result in many of their growers becoming unviable. The Association submit that the proposed provisions will have a major impact on the availability and cost of produce to the consumer and as a result, on access to fresh vegetables. They support the development of a National Environmental Standard for commercial vegetable production.

DRP

While farming businesses comment more on the impacts of meeting DIN bottom-lines, submitters are also concerned that meeting DRP bottom-lines would have substantial economic impacts and render some businesses unviable (or at least reduce income substantially). Northland Regional Council submitted that DRP at 37 per cent of its monitored regional water quality sites would be below bottom-lines and substantial economic costs would be borne by people and communities to meet them. Several farming businesses submitted that proposed DRP bottom-lines were more stringent than those set in the UK and Europe, which would affect New Zealand farmers' ability to be competitive in international export markets.

Many farming businesses also thought that nationally-applicable bottom-lines would have disproportionate cost impacts for farmers in regions where phosphorus levels in water are naturally high. This concern was reflected in the LGNZ submission, where case studies from Auckland, Waikato, and Taranaki showed DRP levels in large sections of waterways would be worse than proposed bottom-lines. In these areas, LGNZ also predict that the cost impacts of meeting bottom-lines for DRP would likely be more severe than meeting DIN bottom-lines.

[69] See https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/action-for-healthy-waterways.pdf

Social and mental health impacts

Many farming businesses that discuss economic impacts also comment on the negative social and mental health impacts that would result from a loss of income and/or jobs. Submitters refer to worsening mental health trends in rural communities and predict that meeting bottom-lines in some catchments will exacerbate mental health issues, diminish rural communities and cause overall wellbeing declines.

Alternatives to attributes

Submitters suggested alternatives to limit-setting attributes. NIWA recommended that the DIN and DRP attributes should be default attributes that apply unless objectives for ecosystem health were being met, or ecosystem health attributes were better than the bottom line. LGNZ suggested that councils should be able to choose catchment scale bottom-lines for DIN and DRP that provide for ecosystem health, and that the nitrate and ammonia toxicity bottom-lines should be strengthened.

Periphyton

A few submitters commented on STAG's proposal to remove the productive class in the existing periphyton attribute table. Most, including NGOs, science organisations and DairyNZ, are supportive of the proposal. Some submitters are of the view that the status quo was appropriate and that councils should be able to justify higher exceedance where justifiable on account of natural conditions (eg, climate, hydrology, nutrients). Councils currently making use of the productive class (eg, Greater Wellington Regional Council) recommend that it be retained.

What changes are being made to the recommendations?

Nitrogen

The Ministry's recommendations following consultation are to:

- Introduce a DIN bottom line of 1 mg/L with an exception where other ecosystem health bottom-lines are all being met
- Set the nitrate and ammonia toxicity bottom-lines to provide for 95 per cent species protection.

Justification for a limit-setting attribute

The majority of STAG, KWM, FLG, IAP, many submitters and eNGOs recommend adding DIN set at 1 mg/litre. A minority of STAG, councils, the dairy sector, and many other farmers do not support DIN as a single number that applies everywhere. They argue that ecosystem health can be good with DIN above 1, and that therefore the cost of adding DIN everywhere is not necessarily justified.

The Ministry recommends that if DIN is adopted as a limit-setting attribute, there are exemptions to the national bottom line where other ecosystem health attributes are shown to be better than their national bottom-lines. Specifically, the national bottom line would not apply if a regional council can demonstrate other relevant ecosystem health attributes (ie, those that may respond to nutrients, such as macroinvertebrates and dissolved oxygen) are at or better than their national bottom-lines. This will account for those situations where ecosystem health is already at an acceptable level despite DIN being worse than the bottom line, and so avoid unnecessary costs associated with DIN reductions.

This will mean that if freshwater is currently not providing for ecosystem health (as indicated by those other attributes), regional councils will have to manage DIN as part of their response. The Ministry considers that where freshwater is in a poor state, DIN should be included in the management response to ensure we are not putting freshwater ecosystem health at further risk.

Justification for strengthening the existing nitrate and ammonia toxicity national bottom-lines

Officials recommend strengthening the national bottom-lines for nitrate and ammonia toxicity to protect 95 per cent of species (Option 4). For nitrate this is a national bottom line of 2.4 mg/L. At this point, 5 per cent of river sites we monitor are worse than this bottom line. We consider this bottom line will offer a greater, and more credible, level of protection for ecosystem health if the DIN attribute is not adopted.

If the DIN attribute is not adopted as a limit-setting attribute, strengthening the existing nitrate and ammonia toxicity national bottom-lines will be the main way to improve the protection of soft-bottomed rivers (which will not otherwise be managed via the periphyton attribute).

This Ministry notes there is widespread agreement that the existing nitrate and ammonia toxicity attributes do not provide adequate protection for ecosystem health, and support for strengthening the national bottom-lines. Submitters and officials agree that 80 per cent species protection is not enough.

The IAP and LGNZ recommend strengthening the national bottom-lines to provide protection of 90 per cent of species (up from 80 per cent). However, concerns about the bottom-lines would be likely to persist at this level. Currently the national bottom line for nitrate toxicity is 6.9 mg/L, and 0.7 per cent of river sites we monitor are worse than this.[70] For 90 per cent species protection (a national bottom line of 3.8 mg/L), 2.3 per cent of river sites we monitor are worse.

Phosphorus

The Ministry's recommendation following consultation is to introduce an action plan attribute for DRP without a bottom line.

Justification

We consider that this option will improve environmental outcomes compared with the status quo, because as an action plan attribute DRP would be subject to the requirement to "maintain or improve". This requirement does not currently apply to DRP.

The Ministry's recommendation is that DRP needs to be an attribute. However, due to the complex behaviour in water and less direct links to land-use and management interventions (as discussed above), we believe it is more suited to introduction as an action-plan attribute than a limit-setting attribute.

We also prefer not to introduce DRP with a national bottom line, as one bottom line that applies nationally risks being ineffective and inequitable because DRP shows significant natural variation in different river types (similar to sediment). Several river types are predicted, under natural conditions, to have DRP concentrations that are worse than the proposed A band (the water quality under natural conditions is referred to as the 'reference state'. See Figure 4). One river type would have natural concentrations in the C band.[71] It would be much harder to improve DRP to meet the bottom line in these rivers. If an attribute with a single bottom line was progressed, it is likely that councils would make use of the existing exemption for naturally-occurring processes in the NPS-FM. This would mean that the attribute would not drive improvement in DRP in a consistent way.

[70] Based on monitoring data collected between 2013 and 2017 and reported in *Environment Aotearoa 2019*.

[71] Ministry for the Environment. Technical material – proposed DIN and DRP bottom-lines in relation to modelled minimally disturbed condition. Prepared for the Science and Technical Advisory Group (STAG) meeting, 27 November 2019.

To better account for natural variation in DRP, we propose to conduct further research on developing attribute classes in a similar manner to the proposed sediment attributes.

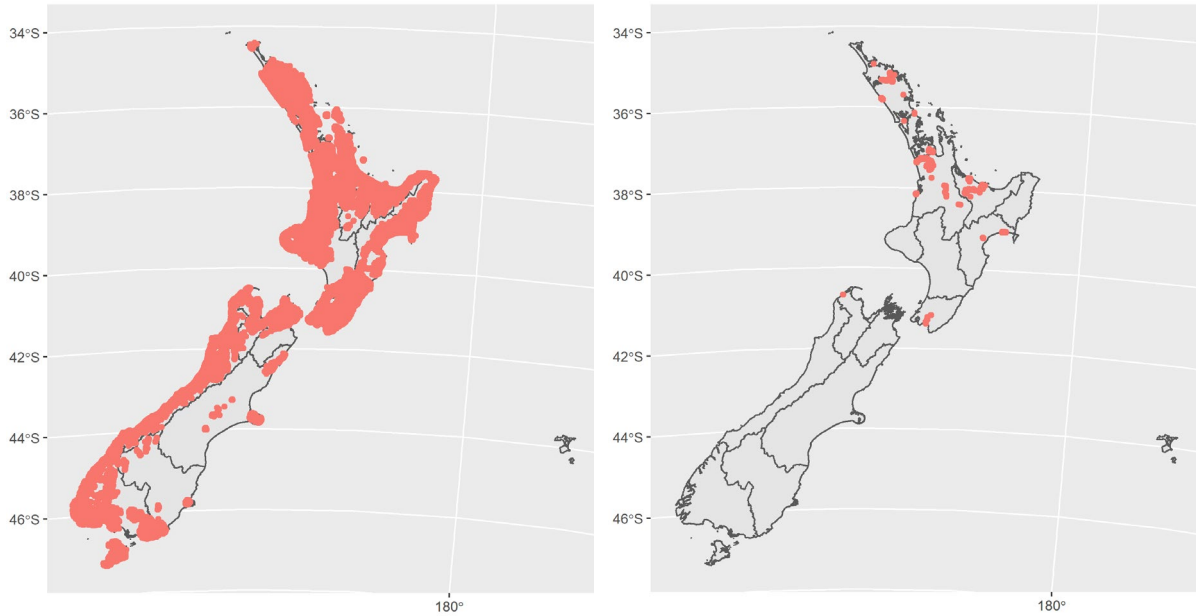

Figure 4 a) River segments where the predicted reference state is worse than the proposed DRP "A" band

b) River segments where median reference state is worse than the proposed DRP "B" band

Periphyton

The Ministry recommends that the two column approach in the existing periphyton attribute table in Appendix 2A of the NPS-FM should not change (ie, that the periphyton table should retain the productive class).

The effect of this recommendation will be that the requirement to reduce nutrient loads to manage for periphyton will not change relative to the existing NPS-FM.

Following the recommendation of the IAP, the Ministry also recommends that minor amendments are made to the table to allow the use of percentage cover as a metric at sites that are not at risk of being worse than their target attribute state. This is consistent with existing Ministry guidance[72] but is not yet explicitly allowed for in the attribute table. The effect of allowing greater use of percentage cover will be that councils will have lower monitoring costs at low-risk sites.

Options

Option 1: Enhanced status quo, with additional non-regulatory interventions

Amend the NPS-FM to require councils to set DIN and DRP attributes to provide for ecosystem health at the Freshwater Management Unit (FMU) scale. Provide greater assistance for councils to set objectives and limits to manage periphyton and sensitive receiving environments.

The status quo requires councils to understand their catchments, and set site-specific objectives and criteria, taking local conditions into account. This option would build upon the status quo by expanding upon the existing Periphyton Attribute Note, and elevate it into a policy requiring councils to set DIN and DRP attribute states to provide for other ecosystem health attributes (ie, the

[72] Ministry for the Environment. 2018. A draft technical guide to the Periphyton Attribute Note.

attributes relating to macroinvertebrates, fish, periphyton, dissolved oxygen and ecosystem metabolism). They would have discretion on where to set the DIN and DRP bottom-lines, but the upper limit for DIN would be constrained by the nitrate toxicity bottom line. The requirement to maintain or improve water quality and ecosystem health would remain.

Under this option, recommended non-regulatory measures include:

a) continue to improve the underlying science and modelling issues to provide confidence in the ecosystem health improvements that will be achieved
b) increase the transparency and rigour of the implementation of the current periphyton bottom line and improve guidance on the process that councils need to follow
c) progress research into the drivers of ecosystem health of soft-bottomed rivers
d) publish guidance on nutrient criteria required to meet periphyton biomass objectives in different river types.

Analysis

This option takes into account the variation in water quality in different areas of the country, and gives councils flexibility to manage nutrients at levels that will provide for values specific to their catchments.

As the process of setting nutrient criteria is technically difficult, there is a risk that it will not be carried out or implemented properly. However, the knowledge base of councils is rapidly growing, and there is already guidance available detailing a step-by-step process[73], which can be expanded upon.

This option does not provide a national level assurance regarding the issue that in soft-bottomed streams and rivers, the current nitrate toxicity bottom line does not adequately protect ecosystem health – that is addressed by Option 4.

Publishing guidance would help councils to derive their own nutrient criteria, or provide a sense check for those councils that choose to derive their own criteria. Publishing the nutrient criteria as guidance, rather than compulsory attribute tables, would preserve the incentive for councils to derive their own values for their ecosystems.

Option 2: Limit-setting attributes for nitrogen and phosphorus

Introduce the STAG's proposed DIN and DRP attributes in the National Objectives Framework of the NPS-FM (Table 4, see also Additional Information 1).

Regional councils would have to set desired outcomes for DIN and DRP as mandatory measures of ecosystem health and monitor them.

At a minimum, regional councils would have to maintain DIN and DRP, or improve DIN and DRP where they are currently below a defined national bottom line. Regional councils and communities would work towards these outcomes by limiting resource use (eg, ability to discharge nitrogen) over timeframes of their choosing.

Attribute tables would set quantitative thresholds for the state of each attribute (DIN and DRP). Each has four "bands" that describe different states for the attribute, the threshold between the "C" and "D" bands is the national bottom line. The suggested attribute tables have been developed based on relationships between nutrients and macroinvertebrates, fish, periphyton and ecosystem

[73] Ministry for the Environment. 2018. A draft technical guide to the Periphyton Attribute Note.

metabolism, in an approach that combines multiple lines of evidence. STAG's rationale for this approach is outlined in its September 2019[74] and March 2020[75] reports.

The effect of incorporating these tables would be a more stringent bottom line for DIN (compared to the nitrate toxicity attribute) and a new nationally-applicable attribute for DRP, where there is none currently. DIN and DRP are proposed to be progressed as a package, because both impact the structure and function of freshwater ecosystems. STAG proposed that both the median and 95th percentile measurements would need to be met for a waterbody to fall within the specified attribute state.[76] If the DIN attribute is adopted, STAG has recommended that the nitrate and ammonia toxicity attributes in the NPS-FM would no longer be required.

Where there are multiple attributes for the same metric, the most stringent would apply.

Table 4. Proposed attributes for dissolved inorganic nitrogen and dissolved reactive phosphorus. See Additional Information 1 for full attribute tables

	Dissolved Inorganic Nitrogen (mg/L)		Dissolved Reactive Phosphorus (mg/L)	
Attribute state	**Annual Median**	**95th percentile**	**Annual Median**	**95th percentile**
A	≤ 0.24	≤ 0.56	≤ 0.006	≤ 0.021
B	> 0.24 and ≤0.50	> 0.56 and ≤1.10	> 0.006 and ≤0.010	> 0.021 and ≤0.030
C	> 0.50 and ≤ 1.0	> 1.10 and ≤ 2.05	> 0.010 and ≤ 0.018	> 0.030 and ≤ 0.054
D	> 1.0	> 2.05	> 0.018	> 0.054

The proposed bottom line for DIN is the same as the current "A" band for 99 percent species protection from nitrate toxicity. It is consistent with a global literature review of effects of inorganic nitrogen pollution in rivers, which concluded that levels should be less than 0.5-1 mg/L to prevent eutrophication and protect against toxicity.[77]

Analysis

Reducing DIN and DRP will contribute to improvements in ecosystem health. It will do so by:

- potentially reducing the prevalence of macrophytes and periphyton
- changing the ways in which organic matter is processed and recycled by microbes and invertebrates, the way energy is transferred through the food chain, and the types of fish and invertebrate communities that are present.

The STAG attributes would have the most effect in soft-bottomed rivers that do not have a receiving environment downstream such as a lake or estuary. These are the types of rivers where the nitrate toxicity attribute would currently be the minimum requirement. The proposed attribute tables

[74] Essential Freshwater Science and Technical Advisory Group Report to the Minister for the Environment, September 2019.

[75] Essential Freshwater Science and Technical Advisory Group Second Report to the Minister for the Environment, March 2020.

[76] Based on monthly measurements. These give a long-term average indication of conditions and may not take into account larger nutrient loads delivered during high flow events.

[77] Camargo, J. A., & Alonso, Á. (2006). Ecological and toxicological effects of inorganic nitrogen pollution in aquatic ecosystems: A global assessment. Environment International, 32(6), 831–849.

would also apply where the nutrient concentrations to meet periphyton objectives are less stringent than the proposed bottom-lines.

STAG's proposed national nutrient concentration thresholds are not low enough to achieve the periphyton bottom line in many parts of New Zealand (the existing requirement is more stringent in those places). There is a risk of confusion that the DIN and DRP values are of themselves sufficient to achieve ecosystem health. On the other hand, this option would prevent councils from specifying concentrations more permissive than the national DIN and DRP bottom-lines.

Implementation

Guidance and assistance will need to be provided to help councils implement any new nutrient management mechanisms. A proposed flow chart showing the process is provided in STAG's September 2019 report.

Option 3: Action plan attributes for nitrogen and phosphorus

Introduce the bottom line thresholds as attributes with action plan requirements (for details see Appendix 1: Recognising all components of ecosystem health). Introduce a requirement to investigate causes and put in place management actions if DIN or DRP concentrations worsen over time or are worse than the bottom-lines.

This option was presented in the interim RIS that was released for public consultation.

Analysis

Under option 2, councils would have to set limits on resource use to achieve objectives for DIN and DRP. Under option 3, they would have to implement an action plan to address a declining or unacceptable state.

Adopting DIN as an action-planning attribute in this way is likely to add complexity. It is important to note that regional councils will set limits to manage nitrogen regardless. This is because they are already required to set limits on resource use to achieve target attribute states for the existing nitrate and ammonia toxicity attributes.

Councils are likely to need a variety of approaches for achieving desired outcomes for DIN (eg, making improvements through farm plan with a freshwater module (FW-FP), engineered nutrient removal, managed aquifer recharge, new technologies, and improved waste water management).

The Ministry considers that any approach to manage DIN should be underpinned by limits, because:

- otherwise there is a risk that reductions made through non-regulatory action plans to reduce DIN will be overwhelmed by ongoing intensification and increased discharges
- limits defining the maximum amount of nitrogen that can be discharged are fundamental to a future allocation system.

There is stronger justification for introducing an action-plan attribute for DRP, as there is no existing attribute for managing DRP directly. Phosphorus is more complex to manage than nitrogen because of the way it binds to sediment, and may be better suited to an action plan approach.

Option 4: Strengthen nitrate and ammonia toxicity bottom-lines

Adjust the nitrate and ammonia toxicity national bottom-lines to provide a higher level of species protection.

Three options were considered for the nitrate and ammonia toxicity bottom line, shown in Table 5 below.

Table 5. Species protection from nitrate and ammonia toxicity

% Species protection	Nitrate concentration (% of monitored sites that exceed this)	Ammonia concentration (% of monitored sites that exceed this)
80% (status quo)	6.9 mg/L (0.7%)	1.3 mg/L (0.3%)
90%	3.8 mg/L (2.3%)	0.54 mg/L (0.4%)
95%	2.4 mg/L (5%)	0.24 mg/L (0.9%)

Analysis

The key benefit of this option is the evidence for, and clarity of, the ecological response to increased nitrate concentrations. The nitrate toxicity bottom line was identified following the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (formerly ANZECC 2000) derivation procedures, which combine information about the effects on multiple species from laboratory trials.

A criticism of this option is that by relying on toxicity, it avoids setting objectives for all nutrient effects on ecosystem health and therefore does not directly address the problem.

Option 5: Exemption for FMUs where ecosystem health attributes are at or better than bottom-lines

Provide an exemption to national bottom-lines where all other ecosystem health attribute bottom-lines, are met, and there is compelling, peer-reviewed scientific evidence that acting to reduce the DIN to 1mg/L will not result in further improvement in ecosystem health of the freshwater body or the downstream receiving environments (including estuaries and lakes).

Analysis

The Ministry recommends that if DIN is adopted as a limit-setting attribute (Option 2), there are exemptions to the national bottom line where other ecosystem health attributes are shown to be better than their national bottom-lines. This recognizes that although nitrogen causes significant degradation to ecosystem health, some ecosystems are capable of existing in a healthy state despite high nitrogen levels. This proposal would reduce the nitrogen load reductions required in some catchments.

Macroinvertebrate monitoring data was analysed to indicate where this exemption might apply. Based on monitoring data:

- 34 monitored sites would be exempt, which amounts to 8 per cent of monitored sites (there are 445 sites where MCI is monitored)
- Of the 34, the Hawkes Bay has by far the most at 9, followed by Canterbury (5) and Southland (4)
- The remainder are scattered between Northland, Waikato, Manawatū, Taranaki, Wellington, Otago, and the West Coast.

It should be noted that for the exemption to apply all relevant measures of ecosystem health would need to be better than the national bottom line, not only macroinvertebrate monitoring data. The actual number of monitored sites where an exemption might apply is therefore likely to be lower than the number indicated above which is based solely of MCI data.

All these measures of ecosystem health are included as attributes which councils monitor regardless of decisions on this option. Officials do not, therefore, expect any cost impact on councils in establishing eligibility for an exemption.

The economic consequences cannot be modelled with certainty because it is not clear what the presence of an exempt site means in terms of the whole FMU – one site could suggest there should be an exemption, while other sites in the FMU do not. Councils will ensure that their ecosystem health monitoring sites are representative for the FMU. Further guidance will be developed to provide to councils, should this option proceed, to direct how exceptions should be identified and applied.

Option 6: Exemption for commercial vegetable production

Provide an exemption to national bottom-lines driving nitrogen reductions for a small area of key catchments in Pukekohe and Horowhenua, where the majority of vegetable growing for the domestic market is taking place, and the catchment is over-allocated for nutrients.

There are three elements to the proposed amendments to the NPS-FM:

a) allow regional councils to maintain freshwater below national bottom-lines for nitrogen attributes in specific parts of these catchments that are affected predominantly by fresh vegetable production, and only to the extent that bottom-lines would require nutrient reductions that significantly constrain fresh vegetable production
b) regional councils will be directed to improve wherever possible, without making fresh vegetable growing un-viable, to ensure the exemption is only applied where the most significant reductions in nutrients would be required
c) spatially define these areas in a way that ensures the exception does not apply to other areas that are not impacted by fresh vegetable growing.

Analysis

If either the existing nitrate toxicity bottom line is strengthened, or DIN is adopted as a limit-setting attribute, then an exemption for some catchments in significant vegetable growing areas should be considered. This exemption would be spatially bound to areas of the catchments which are dominated by vegetable production.

Pukekohe and Horowhenua include specific catchments where the concentration of nitrate per hectare is very high, the proportion of vegetable cropping within the catchment is very high and domestically-consumed vegetables are grown. In these catchments it is infeasible in the near term to meet either the proposed strengthened nitrate toxicity or DIN bottom line without extensive land use change (good practice improvements on vegetable cropping or from good management practice and land-use change from other land uses will not be sufficient to avoid breaching either a strengthened nitrate toxicity bottom line or a DIN bottom line of 1.0). In other words, there are some catchments in these parts of New Zealand that will not be able to reduce nitrate levels sufficiently without reducing their vegetable production significantly.

Exempting these catchments, or particular activities within parts of these catchments, from a strengthened toxicity attribute or a DIN bottom line of 1.0 is a possible policy response to address concerns about food security in the near-to-medium term. Exemptions such as this would have impacts other than ensuring the supply of food from historically important food producing catchments (for example, the exemptions may slow the development of sustainable vegetable production in other regions and/or the adoption of new technologies). However, this risk could be managed through the use of FW-FPs to ensure that producers continue to make on-farm improvements which seek to limit nitrate discharge.

The exemption for the Pukekohe and Horowhenua areas could be achieved in a number of ways:

- through the existing provisions in the NPS-FM allowing for transitional exemptions;

- a specific, new exemption for significant vegetable growing areas similar to that of the exception for large hydroelectricity schemes; or
- by encouraging relevant regional councils to adopt long timeframes through which to achieve their target attribute states.

In effect, the difference between these options is relatively minor, although we note the proposed provision for a transitional exemption to national limits applies to all attributes rather than only those impacting nitrogen, or only specific listed attributes. This is consistent with the transitional exemption in the existing NPS-FM.

Pukekohe and Horowhenua are areas where intensive winter crops, such as leafy greens, are primarily grown. The regional climate, soil class, and proximity to supply hubs means they are well suited as growing regions, especially during colder winter months. Conversely, vegetable production in the Hawkes Bay, Gisborne, and Canterbury Plains regions are dominated by crop systems that discharge lower levels of nitrate and vegetable production to be processed (eg, canning and drying). Land-use designated for vegetable cropping in these regions has significantly lower nitrate levels in the adjacent surface water bodies. In areas of Hawkes Bay such as the Ruataniwha Plains, nitrate discharge is predominately from farming intensification. The Canterbury Plains have a greater area of land dedicated to vegetable cropping but the predominant source of nitrate discharge is from other land uses such as dairy farming.

This makes nitrate reductions a significantly greater challenge in the Pukekohe and Horowhenua growing areas compared with other regions.

This option would allow for an exemption to vegetable growers in some catchments within the Pukekohe and Horowhenua growing areas specifically to comply with the nitrogen bottom line rules. Exclusion of these vegetable growing areas recognises the importance of fresh vegetables for the New Zealand domestic market.

As proposed in the Action for healthy waterways Package, all farms will be required to have a FW-FP by 2022. The FW-FP will still require operators to identify actions that seek to avoid, remedy and mitigate activity that will have an adverse impact on surface freshwater bodies. There is a risk that by allowing an exemption to the nitrogen national bottom line that some growers in the Pukekohe and Horowhenua areas will expand into higher-risk production, this will protect food production and the availability of fresh vegetables in winter, but will have a further detrimental impact on water quality in these catchments. We think that this can be managed through FW-FPs and requirements for good management practice.

We note that this option has impacts specifically on Māori, and recommend further consultation with local Iwi be undertaken before Ministers make final decisions on this option. We will also undertake a mapping exercise to define the exact catchments/sub-catchments within Pukekohe and Horowhenua where this exemption would apply.

Choosing a policy instrument

We consider the NPS-FM to be the most appropriate instrument to set these thresholds.

The Regulatory Impact Statement accompanying the 2014 amendments to the National Policy Statement for Freshwater Management evaluated different policy instruments in relation to

measurable characteristics of water quality (nitrogen).[78] It concluded that the NPS-FM was the preferable policy tool for that purpose, and we consider that the same applies in this instance.

Choosing a mechanism for implementation

The proposed NPS-FM provides two mechanisms through which thresholds may be defined and implemented:

- limit-setting attributes (Appendix 2A)
- action-plan attributes (Appendix 2B).

Both may set minimum standards ("national bottom-lines") and water quality thresholds ("bands").

Appendix 2A attributes are implemented through planning processes that include limits on resource use, whereas Appendix 2B attributes are to be implemented through more flexible adaptive management regimes (interventions could include a broader range of actions, such as restoration activities).

There are also monitoring requirements for other aspects of ecosystem health, but these do not have thresholds.

Criteria to evaluate attributes for limit-setting were established for analyses in 2014 and 2017.[79] Accordingly, we assessed DIN and DRP in relation to their:

1) link to ecosystem health
2) measurement and threshold characteristics
3) link to land use and management interventions
4) ability to be evaluated nationally.

DIN meets all the relevant criteria and would suit being progressed as a limit-setting attribute (as per Option 2).

DRP, however, displays complex behaviour in water[80] and has a less direct link to land-use and management interventions (criterion 3), and should be progressed as an action-plan attribute (as per Option 3).

Options ruled out of scope, or not considered

Specify maximum nutrient reductions that must be achieved in a specific timeframe

While it is possible to specify the maximum nutrient reductions that regional councils can require in the short term (eg, 10 years), we do not recommend doing so. Regional councils are able to set achievable limits on resource use to work towards a target attribute state over any time period they consider appropriate – this is intended to factor in community expectations and capacity to make change and is not regulated nationally. We consider that regional councils are best placed to make these decisions.

Apply attributes only to hard-bottomed rivers

Limiting DIN to apply only in hard-bottomed rivers would address concerns that reducing DIN in soft-bottomed streams will not yield an environmental benefit. This option would have little impact and we do not recommend it. Existing attributes for periphyton, nitrate and ammonia toxicity, and total

[78] 2014 RIS for the National Policy Statement for Freshwater Management

[79] See Section 11.3 of the 2014 RIS

[80] Parliamentary Commissioner for the Environment. 2013. Water quality in New Zealand: Land use and nutrient pollution.

nitrogen and phosphorus in lakes, are expected to be more stringent in the vast majority of hard-bottomed rivers. In addition, the rationale for including a DIN attribute is primarily to ensure soft-bottomed rivers are adequately managed.

Options Analysis Criteria and Summary

Standard evaluation criteria were used to analyse the six options presented above. Specifically, these are:

- Effectiveness (the extent to which the option solves the problem/achieves the opportunity of better addressing N and P levels in freshwater ecosystems, ultimately delivering improved ecosystem health);
- Timeliness (the speed with which the option is effective. It is important to note there is inherent uncertainty in the timeliness of options due to the delegated nature of freshwater management through National Policy Statements);
- Fairness (the extent to which the option treats all stakeholders equitably, including over time, and that costs to the environment are borne by those who incur them);
- Efficiency (the extent to which the option is cost-effective, achieving outcomes for a minimum of social or economic costs);
- Principles of the Treaty of Waitangi (the extent to which the option provides for, and upholds, the Treaty Principles of Partnership, Reciprocity, Mutual Benefit, Active Protection, and Redress, where these are applicable); and,
- Te Mana o te Wai (the extent to which the option puts the wellbeing of the water first, promotes holistic management to sustain communities' wellbeing according to their values, and acknowledges mātauranga Māori).

Analysis of the options against these criteria in comparison to the status quo reveals that while each has particular areas of benefit (and some have areas of deficit), there is overall only moderate difference between options. The Ministry's preference is a combination which utilises the strengths of several options. These are implementing:

- Option 2, adding a DIN (nitrogen) limit setting attribute with a nationally set bottom line
- Option 3, adding a DRP (phosphorus) action plan attribute, without a nationally set bottom line
- Option 4, strengthening nitrate and toxicity attributes to 95 per cent species protection
- Option 5, exempting FMUS from the DIN attribute bottom line where ecosystem health measures are demonstrably above bottom-lines

Table 6 below summarises the options analysis.

Table 6. Summary of options analysis. 0 indicates no change, - indicates negative change, and + indicates positive change.

Criterion	Option 1 (Enhanced status quo – councils develop and implement their own DIN and DRP thresholds)	Option 2 (Central government develops limit-setting attributes and requires councils to implement them)	Option 3 (Central government develops action plan attributes and requires councils to implement them)	Option 4 Strengthen nitrate and ammonia toxicity attributes	Option 5: Exemption for FMUs where ecosystem health attributes at or better than bottom-lines (assessed as applying to option 2)	Option 6: Exemption for commercial vegetable growing in Pukekohe and Horowhenua (could apply to Options 2-4)
Effectiveness	+ Where N and P levels are causing damage to ecosystem health, this option would provide an additional requirement on councils. However, variability in evaluation of N or P impact on ecosystem health and appropriate reactions to that mean the positive impact is likely to be minor compared against the status quo. There is also the potential for councils to utilise the N-tox bottom-lines instead of deriving their own bottom-lines to protect ecosystem health.	+++ Central government is well-placed to develop thresholds for reasons of data availability, coordination role, and ecosystem health evaluation capacity, and a clear, consistent national bottom line gives strong assurance that a high level of water quality will be achieved at some point in the future. Regional councils can then use existing freshwater policy planning mechanisms to implement the thresholds as appropriate for local conditions. This is an improvement on the status quo as there are currently no attributes that directly regulate N and P in rivers to protect ecosystem health. The DRP attribute however has a complex relationship to land usage, so although this is overall a very effective option, its effectiveness for the DRP attribute will be lower.	+ Adopting this option would reduce the risk of increased degradation by requiring local government to develop action plans in response to any degradation with variable levels of resourcing. This is an improvement on the status quo as there are currently no attributes that directly regulate N and P in rivers to protect ecosystem health. The DRP attribute has a complex relationship to land usage, so although this is overall not a very effective option, its effectiveness for the DRP attribute will be higher. There is a risk that if resource use limits are not set, reductions made through non-regulatory action plans to reduce nutrients will be overwhelmed by ongoing intensification and increased discharges.	++ As with option 2 a clear, consistent national bottom line gives strong assurance that a high level of water quality will be achieved and central government can develop this easily. However, strengthened nitrate and ammonia toxicity attributes would not be as stringent a requirement as the proposed DIN bottom line, so cannot provide the same level of assured protection for ecosystem health.	**0** This exemption does not per se have a positive impact on ecosystem health or reduce N or P levels. However, neither does it permit degradation in the FMUs to which it applies. Prevention of further degradation could be seen as a net positive, however as it only applies to catchments already in a healthy state it should have no impact on the status quo.	**0** As an exception to bottom-lines for DIN or Nitrate, this option does not specifically contribute to achieving better management of N or P levels in freshwater bodies. There will still be a focus on water quality improvement where possible in these through farm plans, and further degradation will not be permitted.
Timeliness	– Development of thresholds can be a time-consuming and technically demanding endeavour. While a few councils have developed, or signalled they are considering developing	+ Regional councils will implement limits according to timeframes they develop in consultation with communities as part of the regional planning process. No additional time is required to establish attribute	++ Councils would develop action plans initially according to timeframes they develop in consultation with communities as part of the regional planning process, and thereafter can develop action plans outside that	++ Regional councils will implement limits according to timeframes they develop in consultation with communities as part of the regional planning process. As this is not the introduction of a new attribute,	+ As some regional councils may have fewer FMUs where they will have to set limits for nutrient attributes, this helps to speed the regional planning process.	– Water quality impacts from vegetable growing could be partially addressed through farm plans. However, without the requirement to achieve national bottom-lines there is potential

	these thresholds some of those will have delayed action by the time it takes to develop the thresholds, and ultimately not all councils will undertake that development.	measures or thresholds, however any changes to those limits will require an amendment to regional plans, which may be time-intensive.	process in response to changes. This avoids the needs for often time-intensive amendments to regional plans.	some limits will already be in place. This enables new limits to be implemented and met relatively quickly.		for reductions in nitrogen levels to take place over a longer time period, which may also make the objective state for nitrogen more difficult to achieve in those catchments.
Fairness	++ This option is highly equitable between communities by allowing regions to tailor their targets to local conditions, and not requiring changes to N or P levels where ecosystem health is not effected. The negative timeliness score above creates a negative impact in inter-temporal equity, however this is minor.	+ A national bottom line treats all resource users and N and/or P emitters equally. Although, as there is not an exact and clear correlation between DIN or DRP levels and ecosystem health, there may be some distortions in equity. In some catchments national bottom-lines may represent the minimum nutrient quantities to ensure ecosystem health, and in others be more stringent than necessary to ensure ecosystem health. There are equity concerns between catchments for DRP particularly, due to highly variable natural levels of DRP which will make a single national bottom line easier for some catchments to meet than others. However, clear and stringent action in the near future required by this option makes this option a significant improvement on the status quo in terms of inter-temporal equity.	++ This option has an improved fairness score to the status quo, as action plans give flexibility and time for councils to more accurately inspect and identify the causes of degradation in their specific catchments, prior to, or if appropriate instead of, taking action to set limits. This allows resource users to adapt, and take mitigation measures where they may otherwise be required to cease or change land use. It also increases the accuracy with which costs fall on those who contribute to degradation. The same particular equity concerns between catchments for DRP also apply to this option, as it also sets a national bottom line for DRP.	+ Nitrate and ammonia levels are managed via the same instrument under the NPS-FM, so changes to distributional equity are minor. A small improvement on the status quo to inter-temporal equity is derived from overall lower levels of nitrate and ammonia, which prevents more difficult remediation in future.	+++ This exemption ensures that the costs of complying with this package fall accurately onto those emitters who are having a negative impact on ecosystem health. Although the exemption means limit stringency is not strictly equal between catchments, it is highly compliant with principles of equity by ensuring those having like impact are treated alike, while achieving improved ecosystem health.	**?** Complex and uncertain equity issues do arise from this option. Its application to a narrowly defined geographic area is not, strictly, equitable treatment of all commercial vegetable growers. However, commercial vegetable growers elsewhere in the country are much more able to meet national bottom-lines without land use change where growers in these catchments are not. This can be taken as justification for differentiated treatment.
Efficiency	−− Multiple councils duplicating efforts to develop N and P metrics, and uncertain positive outcomes from possible inconsistencies, mean this option has poor cost-effectiveness.	+ A single bottom line improves consistency nationally, and is likely to achieve the greatest positive impact for ecosystem health. It is also the simplest for councils to implement. This option also comes with the greatest costs; it is likely to result	+/− The efficiency of this option varies significantly depending on the attribute assessed. The causal link between DIN and ecosystem health is well-understood, so management of DIN via action plans would add unnecessary complexity.	**0** As a strengthening of a mechanism already in place, this option does not represent a significant improvement or loss of efficiency relative to the status quo.	**0** Regional councils will have to assess on a case-by-case basis whether or not the exemption will apply to each particular FMU. However, because the component measures of this assessment consist of attributes which councils will be required to undertake regardless it is	+ Cost effective in that a significant share of the vegetable production system will be able to continue. Although this is not a marked improvement on the status quo, it does prevent a significant negative impact of Options 2, 3, and 4 which require

		in the greatest extent of land-use change, and have the greatest negative economic impact in the short run. It is, however, more cost effective to prevent damage now, than to remediate damage at a later date. A more stringent bottom line implemented now will provide the highest protection against future declines in ecosystem health.	However, DRP is complex and requires more delicate adaptive management approach, meaning management via action plans would avoid unnecessary costs to resource users that a limit-setting approach may incur.		unlikely to create a significant additional cost to the status quo.	national bottom-lines for nitrogen.
Principles of the Treaty of Waitangi	**0** In the case of this option the improvement in upholding of Treaty Principles, particularly in relation to the principle of active protection relating to taonga waterbodies, is very minor. The score given is related to the options' effectiveness.	++ Improved upholding of Treaty Principles, particularly in relation to the principle of active protection relating to taonga waterbodies. The score given is related to the options' effectiveness.	+ Improved upholding of Treaty Principles, particularly in relation to the principle of active protection relating to taonga waterbodies. The score given is related to the options' effectiveness.	+ Improved upholding of Treaty Principles, particularly in relation to the principle of active protection relating to taonga waterbodies. The score given is related to the options' effectiveness.	**0** As this exemption is contingent upon positive measures of ecosystem health, it does not significantly interact with Treaty Principles.	−− Decreased upholding of Treaty Principles, particularly in relation to the principle of active protection relating to taonga waterbodies. The reliance of this option on farm plans for continued improvement in the exempted catchments may also compromise the principle of Partnership, as there is likely to be limited opportunity for tangata whenua involvement in freshwater modules of farm plans (discussed below).
Te Mana o te Wai	**0** Although it is not inconsistent with its principles, this option does not independently represent a significant improvement to the status quo in enacting or upholding Te Mana o te Wai.	+++ This option upholds Te Mana o te Wai by creating a clear threshold to ensure high water quality standards predicated on principles that support Te Mana o te Wai.	+ Local government action plans, as with all plans prepared under the proposed NPS-FM, must be predicated on principles that support Te Mana o te Wai via resource management engagement with tangata whenua. This will be regionally variable.	++ This option upholds Te Mana o te Wai by creating a clear threshold to ensure high water quality standards predicated on principles that support Te Mana o te Wai. As a less stringent bottom line that Option 2, it has been scored slightly less highly.	++ Being contingent upon a holistic assessment of ecosystem health, this exemption prioritises the wellbeing of water, reflective of, and compliant with, the principles of Te Mana o te Wai.	− Option does not put water interests first, but acknowledges that water quality must improve through farm plans. Option takes a values-based approach to acknowledge interests of vegetable producers and consumers, as ensuring ongoing availability of fresh vegetables important for providing for the health of people.
Overall Assessment	**0** This option is not a significant enhancement of the status quo.	++ This option is overall a significant improvement on the	+ This option is overall a moderate improvement on the status quo, with greater benefits	++ This option is overall a significant improvement on the status quo.	+ This option is overall a moderate improvement on the status quo, most significantly by improving the equity of other	+ Option does not directly address water degradation and has several disadvantages. It derives value from the

		status quo, with very high scores in some criteria.	for the DRP attribute than the DIN attribute.		options without having any significant negative impact.	mitigation of highly localised negative impacts of other options outlined here, rather than the criteria themselves. There will still be a requirement to improve water quality where possible, most likely actioned through farm plans, and does not exempt councils from the requirement to maintain water quality, so does not allow further degradation.

Impacts

Summary

Nutrient enrichment of fresh and marine waters can impose economic costs by impacting ecosystems, recreational and amenity benefits, spiritual values, and recreational and commercial fisheries. Drinking water contaminated with nitrogen is more costly to treat to a drinkable standard, and untreated water can have health impacts.[81]

It is more cost-effective to prevent degradation of waterways than to restore them after degradation has occurred, particularly in systems that have passed ecological 'tipping points' due to ongoing degradation.[82] A recent NIWA report found that delays in reducing nutrient inputs will increase the time for recovery and make remediation more difficult in rivers, lakes and estuaries.[83]

The Ministry has undertaken an impact assessment to better understand the impact of the proposed regulations on freshwater quality, and how rivers are used and enjoyed. This includes environmental impact, industry, economic impact, regional and national economic impact, cultural impact, social impact, and impact on regional councils.

Impact on land use and management practices

Load reductions are a proxy for required changes in land use and management practices, as this is how they will be achieved.

The cost of achieving load reductions is expected to change over time as efforts are made toward achieving the bottom-lines, reaching the per annum costs below at 2050.

The following results are compared with a baseline including periphyton, lake and nitrate toxicity bottom-lines in the 2017 NPS-FM (Figure 5a and 6a). See Additional Information 3.

- To achieve the requirements of the NPS with a national bottom line for DIN of 1 mg/L nitrogen loads would have to reduce by 10.2% across New Zealand (Figures 5b and c). Of that 10.2%, the new bottom line contributes 3.0% relative to the baseload. Regionally, the new bottom line has the most noticeable impact in Canterbury (contributing 9.2% to an overall 32.0% reduction in nitrogen) and Waikato (contributing 76.7% to an overall reduction of 109.9%).
- To achieve the requirements of the NPS with a strengthened national bottom line for nitrate toxicity of 2.4 mg/L nitrogen loads would have to reduce by 7.7% across New Zealand (Figures 5d and e). Of that 7.7%, the change to the bottom line contributes 0.5% relative to the baseload. The change is most noticeable in Canterbury and Waikato.
- To achieve the requirements of the NPS with a national bottom line for DRP of 0.018 mg/L phosphorus loads would have to reduce by 32.5% across New Zealand (Figures 6 b and c). Of that 32.5%, the new bottom line contributes 1.7% relative to the baseload. The new bottom line makes a noticeable difference in Waikato, Manawatū-Whanganui and Northland, but not elsewhere.

[81] OECD. Publishing, & Organisation for Economic Co-operation and Development Staff. (2012). Water Quality and Agriculture: Meeting the Policy Challenge. OECD publishing.

[82] Rohr, J. R., E. Bernhardt, M. W. Cadotte, and W. Clements. (2018). The ecology and economics of restoration: when, what, where, and how to restore ecosystems. Ecology and Society 23(2):15.

[83] Graham, E., Woodward, B., Dudley, B., Stevens, L., Verburg, P., Zeldis, J., Hofstra, D., Matheson, F., Elliott, S. 2020. Consequences of Inaction: Potential ramifications of delaying proposed nutrient limitations on New Zealand lakes, rivers, and estuaries. Prepared for Ministry for the Environment by NIWA.

Table 7. Summary table of impacts on land use and management practices. See Additional Information 3 for detailed estimates of the N and P loads required[84]

	Option 1 (Enhanced status quo – councils develop and implement their own DIN and DRP thresholds)	Option 2/3 (Central government develops limit-setting/action plan attributes and requires councils to implement them)	Option 4 Strengthen nitrate and ammonia toxicity attributes
Description	The existing NPS-FM controls nitrogen through nitrate and ammonia toxicity, total nitrogen in lakes, and indirectly through the periphyton attribute.	A DIN bottom line of 1 mg/L would ensure environmental protection from damage caused by N in all waterways, costs can be locally significant. The impacts of an action plan attribute would be similar to a limit setting attribute, because where a waterbody was worse than the bottom line, councils would still need to set an objective better than the bottom line, and put plans in place to address it.	A bottom line of 2.4 mg/L nitrate-N (and 0.24 mg/L ammoniacal-N) would provide 95% species protection.
Load reduction impact	If councils choose to manage periphyton solely by limiting nutrients, the status quo requires significant mitigation and/or land-use change to achieve the existing national bottom-lines (Figures 5a and 6a). Similarly, the lake attributes will require significant mitigation in catchments of degraded lakes.	In most parts of the country, the DIN attribute would have a marginal impact over and above existing attributes in the NPS-FM (Figure 5b), but still require substantial reductions in some catchments (Figure 5c).[85][86] Objectives would be stricter in some lowland agriculturally-dominated areas. The most affected areas would be Pukekohe as well as Canterbury, Waikato, and to a lesser extent Southland. The proposed DRP bottom line would require phosphorus load reductions that are largely concentrated in Waikato and Northland regions (Figure 6b), although the extent would be reduced if rivers that would be naturally high in DRP are excluded.	A nitrate toxicity bottom line of 2.4 mg/L (without a DIN bottom line) would also require nitrogen load reductions beyond the status quo, but these would be largely confined to Canterbury (Figure 5d)
Cost of mitigation	Achieving nitrogen load reductions driven by the lake nitrogen and periphyton attributes in the existing NPS-FM is estimated to cost $394 million per annum at 2050.[87]	Achieving the DIN bottom line of 1 mg/L is estimated to cost $294 million per year at 2050.[88] This is less than the cost of nitrogen load reductions in the existing NPS because: • not much of New Zealand's river-length exceeds a DIN of 1 (mostly soft bottomed streams, 4.3 per cent of the area of non-conservation land) • where concentrations of DIN are likely to exceed 1 mg/L, they are not likely to be much higher • many mitigation options do not have a large impact on profit.	Achieving the raised nitrate toxicity bottom line of 2.4 mg/L is estimated to cost $30 million per year at 2050.

[84] Options 5 and 6 are exemptions which could apply to either options 2, 3, or 4 and have not been modelled but are likely to reduce the load reduction impact and cost of mitigation.

[85] Ministry for the Environment. 2019. Essential Freshwater: Impact of existing periphyton and proposed dissolved inorganic nitrogen bottom-lines. https://www.mfe.govt.nz/publications/fresh-water/essential-freshwater-impact-of-existing-periphyton-and-proposed-dissolved

[86] Ministry for the Environment. 2020. Essential Freshwater: CLUES modelling to inform environmental impact assessment.

[87] Ministry for the Environment. Essential Freshwater: Regional and National Impact Report. March 2020.

[88] Ministry for the Environment. Essential Freshwater: Regional and National Impact Report. March 2020.

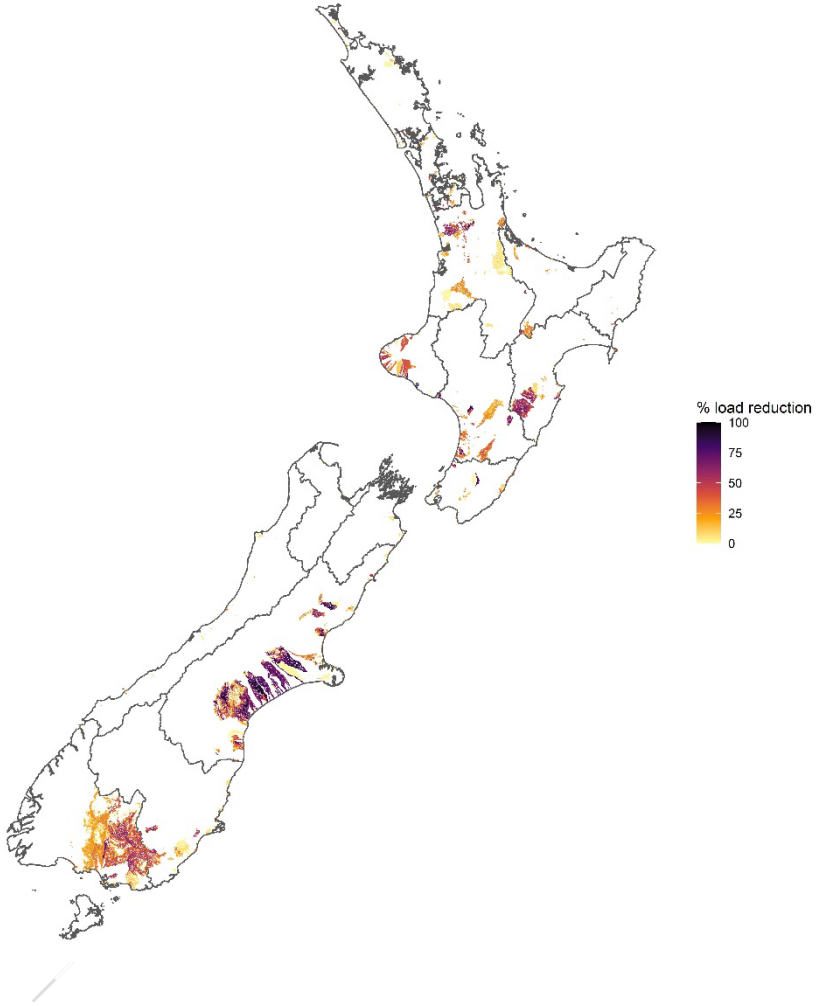

Figure 5a. Nitrogen load reductions required to achieve relevant bottom-lines in the existing NPS (baseline)

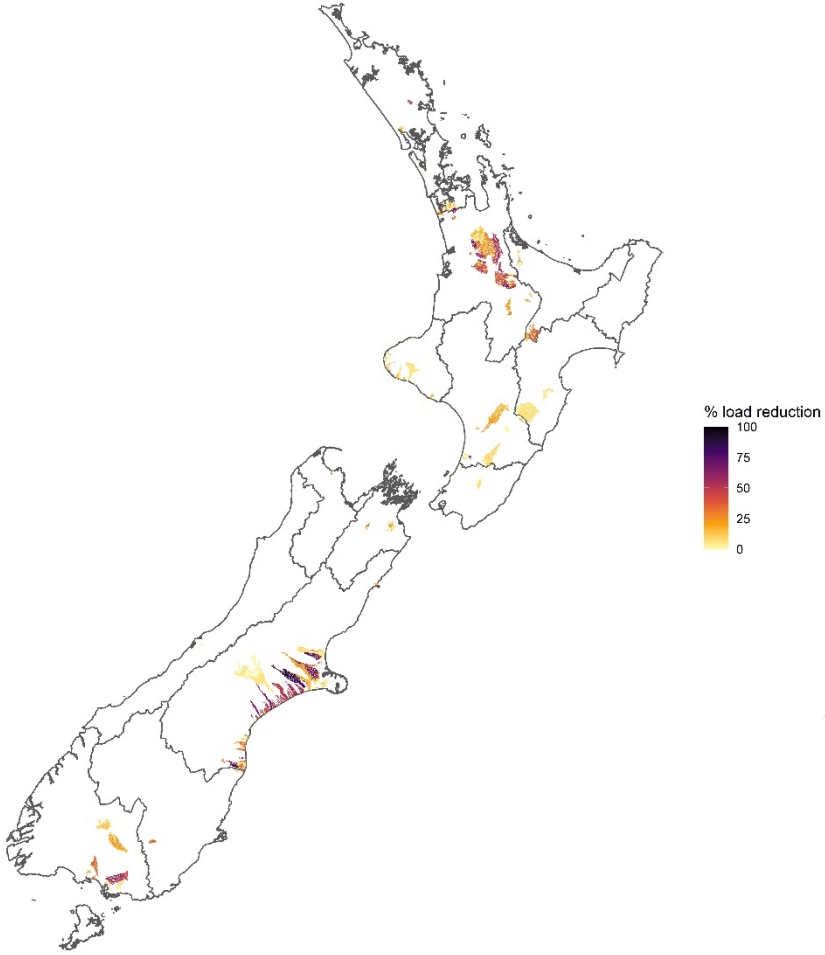

Figure 5b. Additional nitrogen load reductions (above the baseline) required to achieve a new bottom line for DIN of 1 mg/L

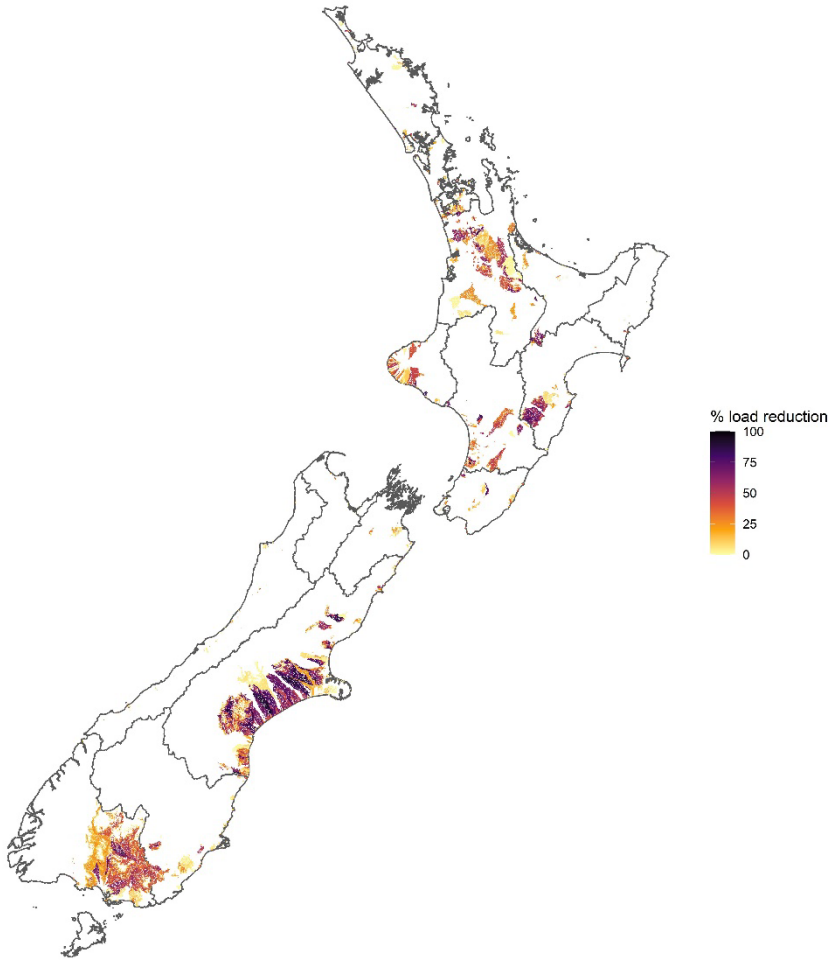

Figure 5c. Total nitrogen load reductions required to achieve the baseline and a new bottom line for DIN of 1 mg/L

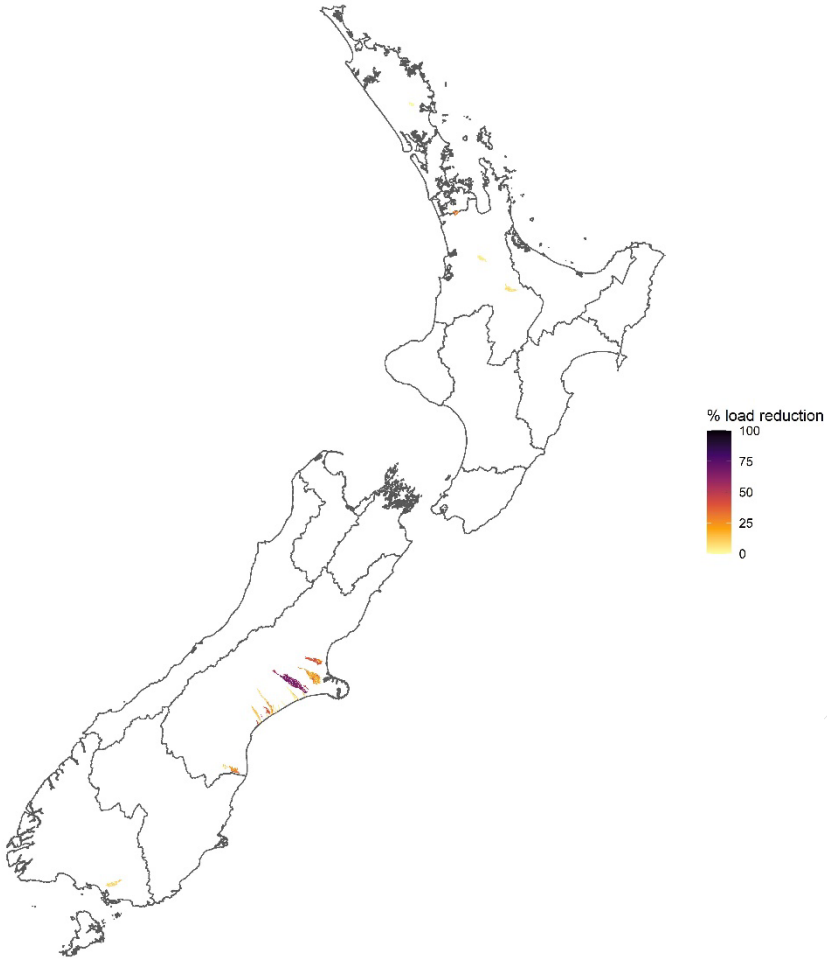

Figure 5d. Additional nitrogen load reductions (above the baseline) required to achieve an amended bottom line for nitrate of 2.4 mg/L

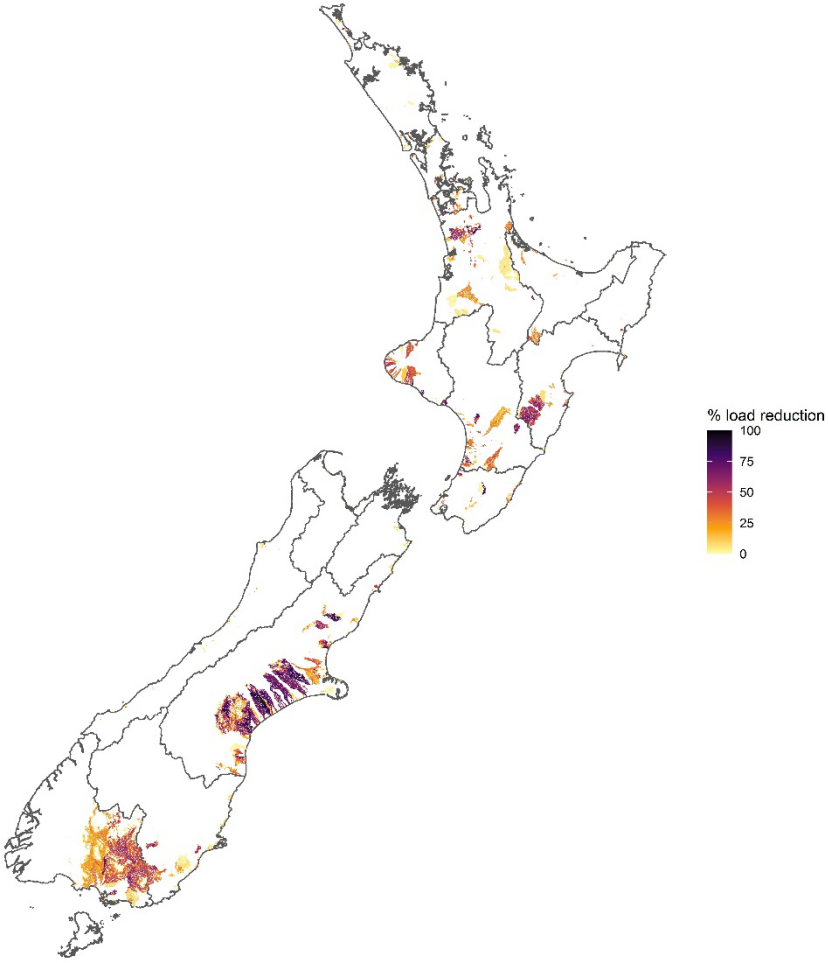

Figure 5e. Total nitrogen load reductions required to achieve the baseline and an amended bottom line for nitrate of 2.4 mg/L

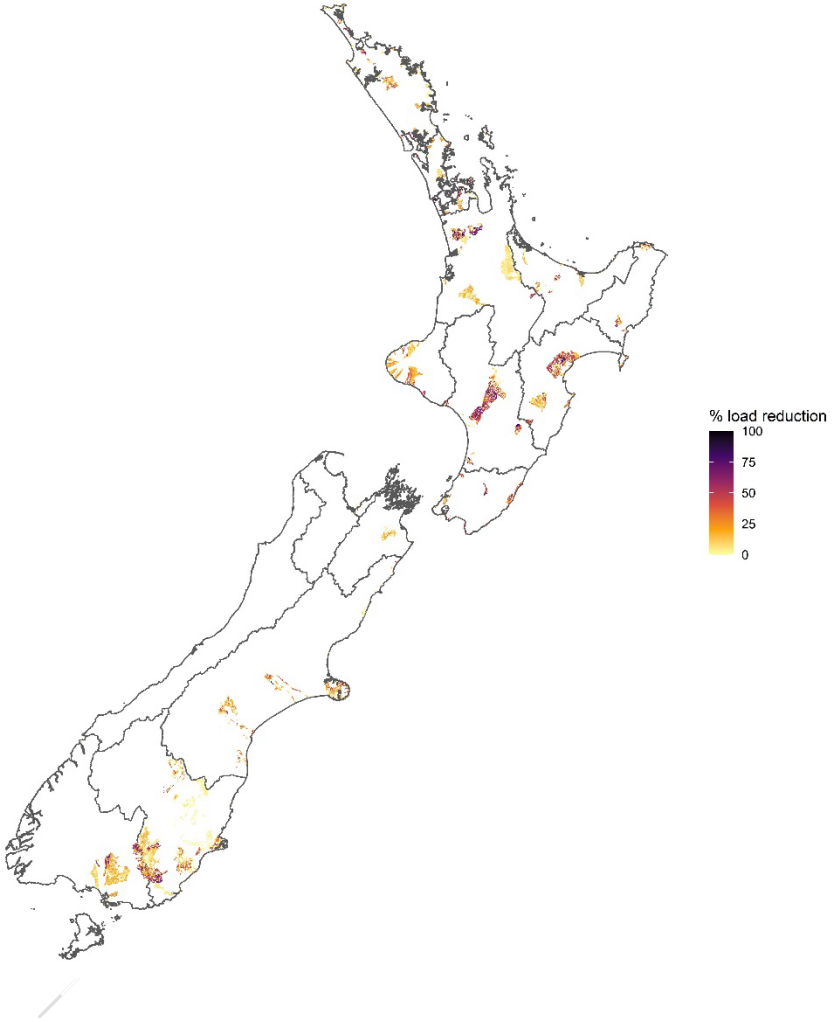

Figure 6a. Phosphorus load reductions needed to achieve relevant bottom-lines in the existing NPS (baseline)

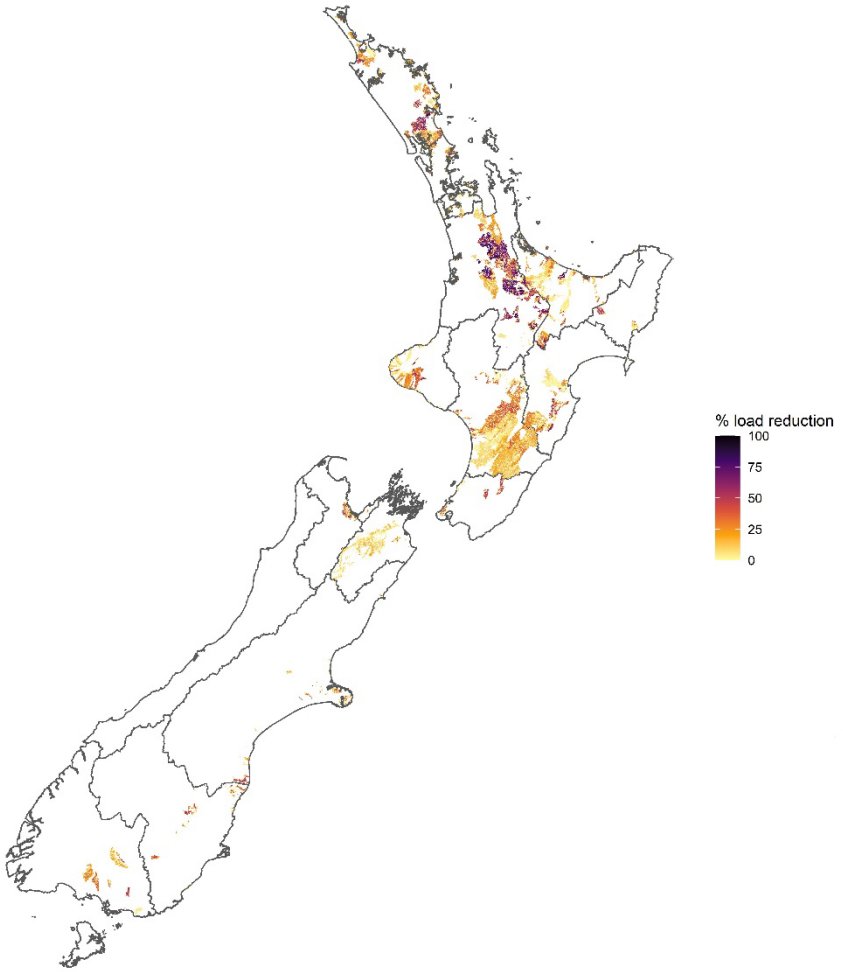

Figure 6b. Additional phosphorus load reductions (above the baseline) required to achieve a new bottom line for DRP of 0.018 mg/L

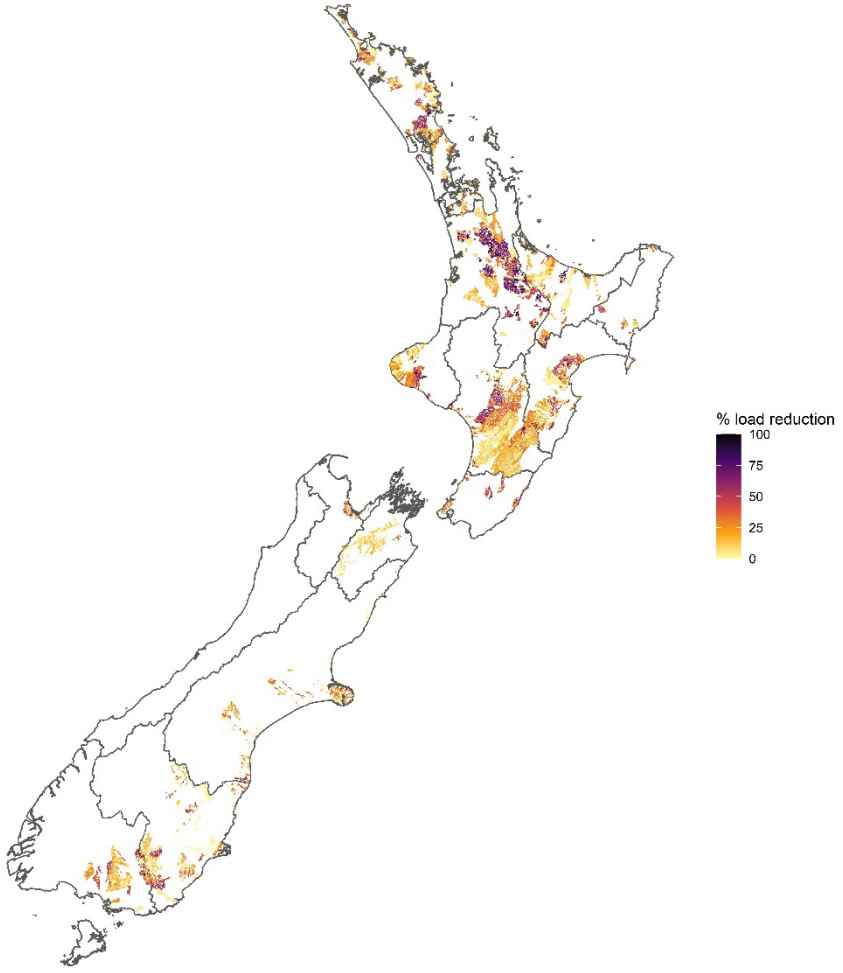

Figure 6c. Total phosphorus load reductions required to achieve the baseline and a new bottom line for DRP of 0.018 mg/L

Assumptions and limitations

This analysis was based on national-scale modelled predictions of nutrient concentrations.[89] Focusing on smaller scales will introduce greater uncertainty. This study did not take into account the 'load to come' from groundwater, or stricter limits that may be required to manage estuaries.

This analysis also assumes that the effects of periphyton are managed solely by nutrient management and not by shading, flow manipulation, or other methods. This is a conservative assumption (ie, it maximises the impact of the current NPS-FM requirements) because measures other than nutrient concentration management could contribute to achieving periphyton objectives. The implications of this assumption will vary depending on the catchment in question.

Managing to the existing periphyton attribute is more uncertain than managing to the proposed DIN attribute. If we expect councils to be less precautionary in response to this uncertainty and set relatively loose nutrient limits to manage periphyton, the relative cost of DIN goes up significantly. This could change the cost of the 2020 package relative to the NPS-FM by +30 per cent. On the other hand, if we assume councils are more precautionary and set relatively tight nutrient limits to manage periphyton then the relative cost of this package goes down significantly. See Additional Information 3 for more detail.

The costs associated with this package and with climate change initiatives are not additive. While it is difficult to separate these, much of the cost discussed above will also deliver on climate change objectives.

Economic impacts

Impact on profits for dairy and sheep & beef farms

Dairying is the industry that would be most impacted by a DIN bottom line. Profitability impacts on dairy are likely to be 5.3 per cent reduction nationally (this is additional to a 5.1 per cent reduction in dairy profits annually being caused by existing NPS). The option is estimated to result in 7.1 per cent less land area in dairy nationally (in addition to 6.8 per cent less land area in dairy nationally being caused by the existing NPS).

Impacts are concentrated in a few regions. Dairy land area will be most impacted in Waikato, and Canterbury.

Table 8. Options considered for the DIN attribute and nitrate and ammonia toxicity bottom-lines, with the national nitrogen load reductions and corresponding impact on profits for the dairy and sheep & beef industries (based on a spatial exceedance of 20% for periphyton)

	DIN at 1 – Option 2 for nitrogen, excluding options 5 and 6		**No DIN –Option 4 for nitrogen, excluding options 5 and 6**	
National nitrogen load reduction required	3%		0.9%	
Profit impacts	5.3% Dairy	0.1% S&B	0.2% Dairy	0.0% S&B

[89] Whitehead, A., 2018. Spatial Modelling of River Water-Quality State. Incorporating Monitoring Data from 2013 to 2017. NIWA Client Report, NIWA, Christchurch, New Zealand.

Economic impact from constraints on vegetable growers

The 'New Zealand's food story: The Pukekohe Hub'[13] report prepared by Deloitte in 2018, modelled the potential impact of constrained horticultural production in Pukekohe on the regional economy. The report presented both a status quo, and 'rigid' scenario, where land scarcity is further constrained by land uses restrictions including environmental regulation. Under the rigid scenario, the report estimated that between 2018 and 2043 there will be:

- A projected loss of $1.1 billion (2018 dollars) to regional GDP
- Loss of up to 4,500 FTEs
- A 55 per cent decrease in the volume of vegetables and fruit produced
- Price increases of up to 58 per cent.

The analysis is restricted to Pukekohe alone, which produces 26 percent on New Zealand's total vegetable production. At the same time, the level of restriction imagined in the rigid scenario is likely to be less restrictive than if growers were to have to meet proposed bottom-lines for nitrate toxicity or DIN. Impacts at the national level are therefore expected to be much higher than those detailed above.

It is also important to note that the modelling above does not make the distinction between fruit and vegetable supply and therefore may be inflated to a degree. However, the vast majority of land in Pukekohe is used for commercial vegetable production, with 40 per cent of land use associated with vegetable growing versus less than 1 per cent for fruit growing.[14]

Pukekohe encompasses 3.8 per cent of New Zealand's total horticultural land (8.9 percent of vegetable growing land) and is responsible for around 26 per cent of New Zealand's vegetable production.[10] Approximately 40 per cent of land in Pukekohe is used for vegetable growing, with the area in fruit being under 1 per cent.[11]

As of 2017, the vegetable growing industry in Pukekohe directly employed around 1,458 FTEs (22 percent of workers employed in the industry nationally), and provides for a further 1,500 FTEs in indirect employment through industries which support the vegetable growing hub. Total employment attributable to the industry in Pukekohe is 3,090 FTEs.

The total economic contribution of the Pukekohe growing hub was estimated by Deloitte in 2018 to be $261 million per annum. This included direct contribution of $86 million in value-added terms to the region economy, as well as $175 million in indirect economic contribution, including expenditure on intermediate inputs such as agriculture support services, irrigation, machinery and fertiliser and seed.[12]

Timeframes for implementation

Timeframes will vary depending on the physical characteristics of catchments, the ambitions of communities, and the kind of changes that can actually be achieved. In some cases, significant improvements may take generations. For example, we know parts of the Waikato catchment experience significant lags between changes in groundwater quality (eg, from historic land use) and seeing a response in surface water quality – up to 75 years at some sites.[90]

In this context, the Healthy Rivers Wai Ora plan change process has proposed an 80 year timeframe for achieving target attribute states in the Waikato and Waipa catchments. Interim plan changes between now and then will make stepped improvements, with the next plan change aiming to

[90] Estimated Age in Surface Water and Changes in Nitrogen Concentration in Groundwater in the Upper Waikato Catchment, Prepared for Ministry of Environment, September 2013: https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/aqualinc-surface-water-nitrogen-upper-waikato.pdf

achieve a further 10 per cent improvement in water quality by 2026.[91] Although driven by local settlement legislation, this approach and timeframe is consistent with the NPS-FM.

Understanding the connections between the target attribute state and the changes needed to make improvements will help communities make the right decisions in the interim (eg, targeting funding and interventions, and informing plan development or the application of rules).

Impacts on councils

The options to change the nutrient attributes would all have a moderate impact on councils. If any of these options were implemented, councils would need to incorporate amended nutrient objectives in the next iterations of their plans. The monitoring and modelling would not be substantially different from that required for existing NPS-FM processes. Due to the increased spatial coverage of nitrogen reduction required, greater effort would be required to plan and implement mitigation options and support communities through the transition to land uses with lower nitrogen leaching.

A recent report found that the DIN and DRP attributes would impose additional planning and monitoring costs on regional councils.[92] The total annual cost for all councils was estimated at $4,457,320, and costs were predicted to be higher in areas with greater stock units per hectare of agricultural land.

Although regional councils will have to make or amend regional plans to include target attributes states by 2025, they are able to determine the appropriate timeframes for achieving them. This means regional councils have the ability to mitigate cost impacts by spreading costs over time.

Impact on tangata whenua

The approach that was presented for consultation (DIN and DRP limit setting attributes) will have a net benefit on Māori values compared to the status quo.[93] The proposals will:

- Diminish mana motuhake, because there is likely to be limited opportunity for tangata whenua involvement in freshwater modules of farm plans (relates to the vegetable production exemption). Proposed changes to the NPS attributes do not change decision making power and tino rangatiratanga of tangata whenua is not supported
- Neither enhance nor diminish mātauranga Māori, because the proposed approach is not informed by mātauranga Māori
- Enhance mauri because measures to improve water quality will help to support mauri
- Enhance whānau ora through improved water quality, except in catchments with exemptions, which is not aligned with the concept of Te Mana o Te Wai.
- Restrict options for the further development of some Māori-owned land, although this is likely more heavily impacted by other components of the Action for healthy waterways Package related to limiting intensification and conversion to high-risk land uses.

Impacts on Māori vary between options; these are described in Table 6 above.

[91] Proposed Waikato Regional Plan Change 1 – Waikato and Waipā River Catchments, Section 32 Evaluation Report: https://www.waikatoregion.govt.nz/assets/WRC/Council/Policy-and-Plans/HR/Dip-your-toes/Section32.pdf

[92] Administrative Costs of Proposed Essential Freshwater Package on Regional Councils. Draft Report to Ministry for the Environment. February 2020

[93] Essential Freshwater - Action on Healthy Waterways: Impacts on Māori Values. Final Report for the Ministry for the Environment. February 2020

Mitigations

To meet the current periphyton limits set under the NPS-FM, councils may choose to employ any combination of mitigation methods. Examples might include managed aquifer recharge, constructed wetlands, shading, and limits on water takes. The combination of methods chosen would influence the reduction in nutrient loading required. The effect of the Action for healthy waterways proposal would be to constrain the council's choice in how they meet the periphyton bottom line as the DIN bottom line would also have to be met.

There is potential to achieve periphyton objectives by stream shading small waterways. The advantage of using shading to achieve periphyton objectives is sometimes only local because nutrients flow downstream to receiving environments such as wide lowland rivers that cannot be shaded. In these circumstances, reduction of in-stream nutrient concentrations is necessary to achieve periphyton objectives in the downstream receiving environments.

One mitigation option proposed has been to enable the continuation of vegetable production through the contraction of the dairy industry in Pukekohe. However, dairy production only occurs within 12 percent of the area in the catchment, with a nitrogen proportional loss of 11 per cent of the total discharge. Changing all dairy hectares to kiwifruit (from an estimated 30 kg N/ha to 11 kg N/ha) would result in a 7 per cent reduction in nitrogen load within the catchment, holding everything else constant. This would provide a marginal reduction of the total nitrogen discharge from vegetable production with minimal overall benefit. The land use conversion from dairy to kiwifruit production would have a large socio-economic impact for little environmental benefit. Subsequently, the national nitrogen toxicity bottom line would still not be met.

It is clear that even with significant land use change and the application of advanced mitigation strategies, the reductions in nitrogen load needed to meet the proposed DIN bottom line of 1 mg/L and more stringent nitrate toxicity bottom line (95 per cent species protection) are still relatively unachievable in Pukekohe because of intensive vegetable growing. Meeting the current nitrate toxicity bottom line (80 per cent species protection) is achievable, but will likely require a mix of land use change and advanced mitigation strategies.

Commercial vegetable growing has historically been a low-margin industry, with many smaller growers. It is therefore likely that the costs associated with undertaking advanced mitigation will force some producers from the market, which will negatively impact domestic vegetable supply alongside land-use change.

Case studies

Some regional processes have already planned for nitrogen reductions. None has yet planned for reductions of the scale that would be needed to meet the bottom line for DIN in Option 2 in the most-affected areas.

Two plans that require large nutrient load reductions are the Hinds catchment in Canterbury which requires a 45 per cent reduction (and managed aquifer recharge), and Rotorua Lakes catchment which requires a 42 per cent reduction to meet in-stream or lake water quality objectives. Economic modelling in Hinds and Rotorua Lakes for these reductions show a degree of land-use change (dairy converting to lower intensity use) is required to meet these targets (more in Rotorua Lakes than Hinds).

Limits have not yet been set for the Whangamarie catchment in Pukekohe, however modelling shows that substantial nitrogen load reductions would be required to meet the nitrate toxicity bottom line and even larger reductions would be required to meet the proposed DIN bottom line.

The case studies below have been included to illustrate how different catchment nutrient objectives have been set, and show the mitigation and land use changes that are required to meet them.

Tukituki River, Hawkes Bay

This case study gives an example of a catchment where relatively stringent targets have been set. This catchment would not be affected by the proposed DIN and DRP attributes because the targets that have been set are stricter than the proposed bottom-lines.

Targets were set in the Tukituki River catchment in Hawke's Bay to meet the existing requirements in the NPS-FM. To provide for maintenance or enhancement of the habitat and health of aquatic ecosystems, macroinvertebrates, native fish and trout, there is a DIN target of 0.8 mg/L in all zones, except the Upper Tukituki and Waipara rivers which have a target of 0.150 mg/L.[94] To meet objectives for periphyton biomass and cover, the DRP target is 0.010 mg/L in main stems and 0.015 mg/L in tributaries, except the Upper Tukituki and Waipara rivers where it is 0.004 mg/L.

To meet the DIN target, an estimated 60 per cent reduction in the nitrogen load from land use within the Tukituki catchment is required, involving extensive change in land practice and land use.[95] Two scenarios were tested: where a zone target reduction in the amount of nitrogen leached was not achieved through mitigation, land use was changed, with the final land-use change modelled as either forestry or conservation land. The forestry and conservation land scenarios resulted in reductions of operating profit (after capital costs of transition) of $90 and $80 million per annum respectively.

Te Waihora/Lake Ellesmere, Canterbury

In some catchments, the existing requirement to manage rivers to meet nutrient objectives in lakes has already resulted in stringent nutrient reduction targets being set. Te Waihora/Lake Ellesmere is an intermittently open and closed lake. This has implications for its management and vulnerability to human-induced stressors. An estimated 76 per cent reduction in N and 50 per cent reduction in P loads would be required to meet NPS-FM bottom line objectives for Te Waihora.[96]

A business case commissioned by Environment Canterbury estimated that substantial land-use change would be required to meet the nutrient load targets, with the catchment needing to be dominated by dryland sheep and beef grazing or forestry. Substantial costs were estimated for constructed wetlands as a mitigation method. The business case authors concluded that there would be widespread loss of operating surplus returns and equity, with resulting change in land ownership and loss of services and depopulation in rural areas. The authors noted that the scale of the changes required is outside the parameters of any modelled or real assessments of nutrient reductions in New Zealand.[97]

Lake Rotorua

The Lake Rotorua catchment is another example where stringent nutrient load reductions would be required to meet objectives for lakes. To achieve long-term sustainable water quality at Lake Rotorua, analyses have been conducted to inform development of a nitrogen trading scheme to

[94] Hawke's Bay Regional Council. 2015. Plan Change 6 to Hawke's Bay Regional Resource Management Plan: Tukituki River catchment. HBRC Report No. SD 15-08 – 4767

[95] Harris Consulting Ltd (2012). Economic Impacts of Future Scenarios for the Tukituki River. Report prepared for Hawkes Bay Regional Council.

[96] Harris, S., and Davie, T. 2017. Selwyn Te Waihora zone: Memorandum on the implications of meeting the National Policy Statement for Freshwater Management objectives for lake environments in Te Waihora. Prepared by Land & Water People for Environment Canterbury.

[97] Land and Water People Ltd (2017). Selwyn Waihora zone: Memorandum on the implications of meeting the National Policy Statement for Freshwater Management objectives for lake environments in Te Waihora. Report prepared for Environment Canterbury

meet nitrogen load reduction targets.[98] Reducing leaching rates will require a combination of land-use change and on-farm mitigation in this catchment. Under a trading scheme, drystock farm profits benefit from the ability to sell N (to higher profit-per-kilogram-of-N businesses and the incentives fund). Dairy farm profits fall due to the need to acquire N in order to continue operating.

In some cases, a reduction in nitrogen loss will result in farm profit increases through elimination of unprofitable inputs. This can occur in a number of different farm types. However, because the reduction in nutrients is so large, the mitigations required to meet the required nitrogen load reduction result in a net cost for most individual farms. De-intensification has some costs, but also has some benefits in that it lowers ongoing costs (eg, for additional feed) and frees up capital invested in fixed assets such as livestock or supplier shares. A reduction in capital land value was predicted across all land uses.

Waikato-Waipa, Waikato

The Regional Sector Water Subgroup has conducted an analysis of the economic impacts of the STAG's proposed attributes (Option 2) based on an existing economic model set up to test the impacts of policy decisions relating to the Healthy Rivers/Wai Ora (Plan Change 1) process.[99] The model covers the Waikato-Waipa catchment, which is largely soft-bottomed, and was developed to estimate the change in land use profitability that would be expected in order to meet proposed environmental objectives.

The modelling analysis involved comparing a baseline scenario assuming "business as usual", that is, continuing linear increases in nitrogen leaching from dairy and drystock of 1.3 and 0.4 per cent annually.[100] The status quo for comparison is therefore different to the baseline of compliance with existing NPS-FM provisions that is assumed elsewhere in this document.

The modelling results showed that land-use change would likely be required to bring water quality up to the proposed DIN and DRP bottom-lines, and the combination of changes arrived at by the model involved a decrease in drystock farming and dairy farming, with an increase in forestry.

The costs of land use transition and profitability were estimated to be around $100 million per year in the Waikato/Waipa catchment (or around 11 per cent of profits derived from land use in the catchment). As a comparison, the annual costs of the Healthy Rivers/Wai Ora plan change (based on current NPS-FM requirements) were estimated as four per cent of profits derived from land use in the catchment.

It is noted that the economic impacts will depend on the time that councils and communities allow for achieving the bottom-lines, and the management actions taken.

Whangamarie Stream, Pukekohe

In some catchments, even meeting nitrogen toxicity bottom-lines will require substantial reduction of nutrient loads. A recent analysis estimated the nitrogen reductions that would be required to meet the nitrate toxicity bottom line of 6.9 mg/L and the DIN bottom line of 1 mg/L in the Whangamarie catchment in Pukekohe.[101] This is one of New Zealand's densest vegetable growing

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[98] Parsons, O. J., Doole, G. J., Romera, A. J. 2015. On-farm effects of diverse allocation mechanisms in the Lake Rotorua catchment. Report for the Rotorua Stakeholder Advisory Group, August 2015.

[99] Moran, E. and Keenan, B. 2019. Initial Economic Advisory Report on the Essential Freshwater Package. Prepared for the Local Government New Zealand Regional Sector Water Subgroup.

[100] Doole, G. J. 2016. Evaluation of scenarios for water quality improvement in the Waikato and Waipa River catchments: Business-as-usual assessment. Waikato Regional Council Technical Report 2018/49.

[101] Ministry for Primary Industries. 2020. Environmental-economic modelling to reduce nitrogen in the Whangamarie stream (Pukekohe)

areas. To meet a bottom line of 6.9 mg/L, a nitrogen load reduction of between 41 and 53 per cent would be required. To meet a bottom line of 1 mg/L, a reduction of between 91 and 93 per cent would be required. Good management practices and advanced mitigation are not enough to achieve these reductions.

Water quality in the Whangamarie Stream is highly impacted by land use, with a total oxidised nitrogen concentration of 14 g/m^3 (median for the last 5 years.[102] Total oxidised nitrogen is nitrate plus nitrite, usually mainly nitrate). The Whangamarie catchment is mainly fed from groundwater from the Upper Pukekohe aquifer, which is also highly impacted, with nitrate concentrations well in excess of what is measured in the stream. (Note: g/m^3 and mg/L units are roughly equivalent)

The Upper Pukekohe aquifer catchment area is predominately market gardening (39 per cent), followed by lifestyle properties, urban settlement area and roads (38 per cent), with some dairy (12 per cent), sheep and beef (7 per cent) and orchard/vineyard (2 per cent) land uses.

Horowhenua

The Horowhenua district produces between 10-15 per cent of New Zealand's fresh vegetable supply. Commercial vegetable growing is a highly intensive land-use, and generally leaches significantly more nitrogen on a per-hectare basis than other agricultural land-uses such as dairy, and sheep and beef farming. The average commercial vegetable farm in the Horowhenua area, for example, can leach anywhere between 65-150 kg/ha of nitrogen while pastoral farming typically leaches between 30-60 kg/ha.

Horticulture New Zealand (HortNZ) estimates that the vegetable industry in Horowhenua generates approximately 80 million in annual revenue, and employs around 360 FTEs.8 Estimates from one large grower in the district suggest that the industry provides $50 million in direct local spend, and greater than $60 million nationally. For the greater Horizons region, this translated to $100 million in direct local spend and more than $120 million.[103]

Hawkes Bay, Gisborne and Canterbury Plains

As previously noted, the instream nitrogen levels in the Whangamarie Stream are well above either the strengthened nitrate toxicity level or DIN. Vegetable production in the Hawkes Bay, Gisborne, and Canterbury Plains regions are dominated by crop systems that discharge lower levels of nitrate. In comparison, land use designated for vegetable cropping has significantly lower nitrate levels in the adjacent surface water bodies. This makes nitrate reductions a significantly greater challenge in the Pukekohe and Horowhenua growing areas. Elevated instream nitrogen levels in Hawkes Bay are substantially lower than those in Pukekohe.

Nitrate discharge is predominately from farming intensification throughout Hawkes Bay such as the Ruataniwha Plains. The Canterbury Plains have a greater area of land dedicated to vegetable cropping but the source of nitrate discharge is from other land uses such as dairy farming.

Indicative social impact

The options are likely to bring variable improvements to waterbodies depending on their degree of stringency, and with it, variable improvements to human health, wellbeing and cultural identity. This section outlines potential negative social impacts, and then potential positive social impacts.

[102] Land Air Water Aotearoa. Whangamarie Stream. https://www.lawa.org.nz/explore-data/auckland-region/river-quality/whangamarie-stream/whangamarie-stream/ accessed 20/04/2020

[103] Woodhaven Gardens presentation to the Ministry of Primary Industries, 2019

Negative social impacts

All of the options are likely to contribute, in the short term, to higher levels of stress and related mental health issues among affected farmers:

- from the uncertainty about what action will be required and the pace of change
- if financial costs of implementing nutrient-reducing measures will, or are perceived to affect farm viability, especially if those measures require significant land-use change
- from financial and emotional costs if they choose to participate in the regional plan-making process to establish rules (submissions, hearings, appeals).[104]

This may lead to an increase in demand for mental health support services in more affected rural communities.

Moderate reductions of nutrient leaching could be achieved at relatively low cost for farmers, and in some cases be associated with increasing profit.[105] On the other hand, models suggest that reductions above 50 per cent would require land-use change.

Any of the options will add to existing legislation that promotes change in farm practices and land use, as well as some initial capital investment. Options 2 and 4 may have a flow-on negative effect for available income and employment for rural communities in a few catchments.[106] Environmental and economic modelling of Option 2 shows this may be the case in Canterbury, Southland, Taranaki and Waikato, in catchments where dairy farming and related industry are more important. Economic modelling for Option 4 with no exemptions suggests that these impacts will only be significant in Canterbury and Waikato. In any policy scenario, this effect is likely to be mitigated by alternative sources of income and employment (eg, some high value crops, forestry, tourism, rural services).

Effects flowing on from the impact on employment in these communities are likely to include a reduction in population numbers in areas with fewer employment alternatives. This may affect the viability of social services (eg, schools and health services) that rely on population-related counts to maintain their viability, the social character of communities, as well as cultural identity and sense of place. A reduction in population numbers is also likely to affect the wider local economy and services available.

Any of the options that increase the stringency of nutrient attributes are likely to add to councils' workload, especially around compliance, monitoring and enforcement. Regional councils in Canterbury, Waikato and Otago are likely to be more affected than others. Councils may increase rates in order to resource the extra workload, with potential negative impacts for wider communities.

A risk for all options is that a lack of fast improvement of freshwater quality, due for instance to time lag or compliance and enforcement challenges,[107] may impact on the New Zealand public's trust in

[104] Farmers' mental health: A review of the literature (2014) Report prepared for the Farmers' Mental Wellbeing Stakeholder Group by the Accident Compensation Corporation.

[105] See Appendix 16: Reducing excessively high nitrogen leaching (nitrogen cap).

[106] NZ Institute of Economic Research (2020) Draft Report: The economic effects of water quality proposals: Modelling scenarios. Report to Resource Economics Ltd.

[107] *Independent Analysis of the 2017/2018 Compliance Monitoring and Enforcement Metrics for the Regional Sector*. 2018. Report prepared by The Catalyst Group for Local Government NZ

government to 'do the right thing'.[108] It is unlikely to contribute to perceptions that the farming community are acting as stewards of the land/environment (social licence to operate),[109] which will likely be associated with low levels of wellbeing and sense of self within the farming community.[110] Slow improvements may also affect farmers' morale and willingness or enthusiasm to persevere in improving on-farm practices.[111]

A policy scenario with Option 2 or Option 4 with no exemptions for vegetable growing areas may restrict access to affordable, fresh vegetables, which are an essential aspect of human health. The vast majority of vegetable crops grown in New Zealand are produced for the domestic market – approximately 70-80 per cent. Lower levels of commercial vegetable production domestically will result in a greater reliance on imported vegetables, as well as negative price effects for more perishable vegetables which cannot be easily substituted. This is firstly a consumer choice issue, in that many of our highly perishable fresh vegetables will either no longer be available to New Zealanders or will come with significant price premiums which may price out large segments of New Zealanders.

According to a 2016/17 survey by the Ministry for Health, only 62 per cent of adults over the age of 15 met the minimum vegetable intake requirement, with only 39 per cent of people meeting the recommended vegetable intake. Asian, Pasifika and those from more deprived areas were even less likely to meet the recommended intake of fruit and vegetables.[112] Increases in the price of vegetables in New Zealand is therefore likely to have a disproportionate impact on our most deprived communities.

Domestic vegetable production is important from a resilience and food security perspective. Unlike other primary products (sheep, beef, dairy), our ability to import highly perishable fresh vegetables is impeded by our geographic location. While the majority of vegetables produced in New Zealand are likely to be able to be imported, highly perishable vegetables will be unable to be imported. A greater reliance on some imported vegetables also constitutes a food security risk, particularly in cases where the free flow of goods and services across countries is restricted, as most recently seen through governments' response to COVID-19.

Positive social impacts

The positive social impacts associated with improved water quality and providing for Te Mana o te Wai are likely to include reduced risk to human health (through improved drinking water quality), improved environmental amenity, and increased access to valued natural resources, including for cultural purposes and recreational activities. This will likely contribute to improved physical and mental wellbeing, particularly at the local scale, and contribute to New Zealanders' cultural identity associated with high quality natural environment. These positive impacts are likely to most felt by

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[108] The majority of surveyed New Zealanders in 2018 feel that it is very or extremely important to improve the quality of our water, and see government and farmers are responsible to make this change. Colmar Brunton. 2018. Environmental Attitudes Baseline. Commissioned by the Ministry for the Environment.

[109] P Clark-Hall, 2018, *How to Earn a Social Licence to Operate.* Report prepared for Ravensdown Ltd.

[110] Farmers' mental health: A review of the literature (ACC Policy Team, 2014) https://www.mentalhealth.org.nz/assets/ResourceFinder/wpc134609.pdf; Botha N, Roth H and Brown M 2013. '*The Adaptation of Pastoral Farmers to Environmental Policy Changes: A New Zealand Case Study*.' South African Journal of Agricultural Extension, Vol. 41: 16-25; Kennedy A, Maple MJ, McKay K, Brumby SA. 2014. Suicide and accidental death in Australia's rural farming communities: a review of the literature Rural and Remote Health 14: 2517. http://dro.deakin.edu.au/eserv/DU:30062460/kennedy-suicideandaccidental-2014.pdf

[111] For example, Botha N, Roth H and Brown M 2013. '*The Adaptation of Pastoral Farmers to Environmental Policy Changes: A New Zealand Case Study*.' South African Journal of Agricultural Extension, Vol. 41: 16-25

[112] Ministry of Health. 2019. Annual Data Explorer 2018/19: New Zealand Health Survey [Data File]. URL: https://minhealthnz.shinyapps.io/nz-health-survey-2018-19-annual-data-explorer/

tangata whenua, farming communities and visitors in the areas with greater improvement in water quality and ecosystem health.

Any of the options that increase the stringency of nutrient attributes may have a positive impact on the social cohesion of local communities, farmers' mental health (and as a result physical health), and overall satisfaction of life.[113] This requires the policy to be seen by the New Zealand public and ENGOs as a robust tool to ensure change in farming practices that result in better environmental outcomes, and for enough farmers and growers to be able to comply with the proposed regulations and "do things right". Adopting policy option 4 with no exceptions could result in a general perception of fairness by all or most parties as all agri-sectors are being targeted by the proposed policy.[114]

There may be economic benefits for farmers able to leverage from "doing the right thing" (eg, sustainable branding).

Improvement in freshwater quality is likely to have a positive impact on the incomes of those employed the tourism operators and on the wider set of businesses supplying products and services associated with the tourism sector. Any increase in fish populations is likely to enhance this effect.

The scale of these positive impacts will depend on the scale of freshwater quality improvement across the country.

The proposed policy is also likely to increase demand for a higher-skilled and larger rural professional workforce to help farmers and growers meeting the new thresholds, thus creating more job opportunities, especially in sectors with currently fewer rural advisors (ie, other than the dairy sector).

Economic analysis carried out for Option 2 shows that in several regions alternative sources of income and employment (eg, high value crops, forestry, tourism, rural services) have the potential to generate a net positive impact for local communities. This is most likely to be the case in the Tasman/Nelson region, in Marlborough and in Otago.[115]

The increased workload for councils also suggests some job growth in that sector, which may help with employment challenges arising from more stringent policies.

How do other countries manage nutrients?

A recent review of global nutrient criteria for rivers found that on average, STAG's recommended nutrient criteria are more stringent than overseas criteria for both nitrogen and phosphorus.[116] However, many Australian and New Zealand states or regions have already set criteria which are more stringent than STAG's recommendations, with several EU countries and US states also having set more stringent criteria.

[113] Farmers' mental health: A review of the literature (2014) Report prepared for the Farmers' Mental Wellbeing Stakeholder Group by the Accident Compensation Corporation

[114] P Clark-Hall, 2018, *How to Earn a Social Licence to Operate.* Report prepared for Ravensdown Ltd

[115] NZ Institute of Economic Research (2020) Draft Report: The economic effects of water quality proposals: Modelling scenarios. Report to Resource Economics Ltd.

[116] Ministry for the Environment. 2020. Nitrogen and Phosphorus Global Criteria Review (working draft).

The main findings of the review are:

- many countries report nutrient criteria that are site-specific (meaning they apply to a particular waterbody or small group), or give different criteria for different classifications (eg, lowland), or standards (eg, good to moderate)
- while there is often regulatory direction requiring countries, states or regions to set nutrient criteria, there is usually an absence of regulation to ensure the relevant authority is meeting these
- criteria are derived using several methods where it is often unclear how the values are intended to support good ecological quality (despite this generally being the purpose of criteria)
- Australia and New Zealand's criteria are often more stringent compared to STAG's recommendations. Criteria set by regional councils in New Zealand often have regulatory implications for limit-setting in catchments. For Australian states meanwhile nutrient criteria generally serve as default guidelines with only limited cases of locally relevant criteria, which could be more readily used for regulation, being established.

Reported criteria for US states and EU countries are usually less stringent than STAG's recommendations, however there are several states and countries which report more stringent criteria. The frameworks in the US and EU countries require criteria to be set which represent a perceived measure of good ecological quality, but with limited means to enforce these. They therefore have different legislative requirements than Australian/New Zealand criteria.

Implementation covered in chapter one of this document

For analysis of the proposed implementation of the recommended options presented in this chapter, please see the first chapter of this document for a discussion of the currently proposed implementation of the NPS-FM.

Summary table of costs and benefits of the preferred approach

It is important to note that these proposals, as with the rest of the Action for healthy waterways Package, largely provide non-market or qualitative benefits, for which any form of quantification, and in particular monetisation, is unlikely to be accurate. Costs associated with implementing the proposals are, conversely, explicitly financial costs, and therefore easily monetised. For completeness monetised values of impacts are provided in this section, but it is important to note many important benefits are not included here because they cannot be monetised.

The impacts reported in this section relate to a set of decisions for nutrients, and not the full suite of options considered by officials and discussed earlier in this paper. This reflects a pragmatic decision to focus on generating monetised cost estimates for options that were assessed as having a high probability of proceeding as preferred options. Note, due to the inability to monetise significant benefits, the decision on what options to progress for final consideration was not, and nor could reasonably be, dependent on estimates of monetised impacts (because of the inevitable inability to monetise key benefits). The monetised values reported here are included for completeness.

Table 9 presents impact information about a set of nutrient-related options Ministers have indicated they wish to progress at this time. These options can be summarised as follows:

- For nitrogen: combining Options 1, 4, and 6, which means respectively requiring councils to set DIN and DRP attribute states to provide for other ecosystem health attributes, adopting a more stringent toxicity bottom line to provide 95 per cent species protection, and exempting selected commercial vegetable growing areas.
- For phosphorus: adopting Option 3, which means introducing an action plan attribute for DRP without a national bottom line.

Table 9. Summary assessment of proposals' costs and benefits

Affected parties	Comment	Impact	Evidence certainty
Additional costs of preferred approach, compared to taking no action			
Agricultural farmers (resource users)	Costs vary depending on current level of degradation. Costs will be higher in more degraded catchments. Some of these costs will be avoided by exemptions for vegetable growing areas (not modelled). Costs vary by year as farmers transition to full compliance.	Low. NPV of mitigation costs to 2050 estimated at $217 million (additional to costs of implementing existing current requirements)	Medium
Regional Councils	Costs vary depending on levels of intensive agriculture/horticulture, and river extent within regions. Costs will be higher in areas with higher stocking rates, or where more monitoring sites must be maintained. Assume an average annual cost of $4.4 million per year.	Low. PV of additional council costs to 2050 estimated at $86 million (additional to costs of implementing existing current requirements)	Medium
Total Monetised Cost		PV $303 million	Medium
Horticultural farmers (resource users)	Costs vary depending on location. The majority of vegetable growers are captured by exemption, however vegetable farmers outside those catchments in degraded catchments may face higher costs.	Low	High
Māori	Costs relate primarily to the exception for vegetable growing areas, which impacts Mana Motuhake through the increased use of Farm Plans to manage nitrogen in those areas. Tāngata whenua are likely to perceive this as a high level of impact.	High	Medium
The environment	Although all catchments are covered by the requirement to maintain or improve water quality, exemptions from a nitrogen bottom line may result in worse ecosystem health outcomes where exemptions apply.	Low overall, with medium costs for localised areas where exemption to nitrogen bottom-lines apply	High
Wider Public, rural and urban communities	Costs vary depending on current level of degradation. Costs will be higher in more degraded catchments.	Low on average, but medium in some catchments	High
Non-monetised costs		Medium	High

Expected benefits of preferred approach, compared to taking no action			
Total Monetised Benefit	Not available	Not available	
Resource users (Horticultural and Agricultural Farmers)	Improved perception of the farming community as stewards of the land (social license).	Medium	Low
Councils	Improved clarity for objective-setting.	Medium	Medium
Wider government	Reduced infrastructure operation costs (eg, water treatment). Avoided costs of restoring degraded ecosystems in the future.	High	Medium
Māori	Benefits associated with enhanced mauri and whānau ora increase proportionally to improvements to the environment.	High	Medium
The Environment	Reduced strain on freshwater ecosystem health, lower levels of periphyton	High	High
Wider public, rural and urban communities	Improved water quality for drinking and recreation (eg swimming and fishing), improved mauri of waterbodies, and more opportunities for food gathering/mahinga kai. Increase in skilled labour market via demand for farm advisors	High	Medium
Non-monetised benefits		High	Medium

Additional Information 1: STAG recommended attribute tables

Value	Ecosystem health		
Freshwater Body Type	Rivers [1]		
Attribute	Dissolved inorganic nitrogen		
Attribute Unit	DIN mg/L		
Attribute State	Numeric Attribute State[2]		Narrative Attribute State
	Median	95th percentile	Description
A	≤ 0.24	≤ 0.56	Ecological communities and ecosystem processes are similar to those of natural reference conditions. No adverse effects attributable to DIN enrichment are expected.
B	> 0.24 and ≤0.50	> 0.56 and ≤01.10	Ecological communities are slightly impacted by minor DIN elevation above natural reference conditions. If other conditions also favour eutrophication, sensitive ecosystems may experience additional algal and plant growth, loss of sensitive macroinvertebrate taxa, and higher respiration and decay rates.
C	> 0.5 and ≤ 1.0	> 1.10 and ≤ 2.05	Ecological communities are impacted by moderate DIN elevation above natural reference conditions, but sensitive species are not experiencing nitrate toxicity. If other conditions also favour eutrophication, DIN enrichment may cause increased algal and plant growth, loss of sensitive macroinvertebrate & fish taxa, and high rates of respiration and decay.
National Bottom Line	1.0	2.05	
D	>1.0	>2.05	Ecological communities impacted by substantial DIN elevation above natural reference conditions. In combination with other conditions favouring eutrophication, DIN enrichment drives excessive primary production and significant changes in macroinvertebrate and fish communities, as taxa sensitive to hypoxia and nitrate toxicity are lost.

1. Groundwater concentrations also need to be managed to ensure resurgence via springs and seepage does not degrade rivers through DIN enrichment.
2. Must be derived from the rolling median of monthly monitoring over five years.

Value	Ecosystem health
Freshwater Body Type	Rivers
Attribute	Dissolved reactive phosphorus

Attribute Unit	DRP mg/L		
Attribute State	Numeric Attribute State[1]		Narrative Attribute State
	Median	95th percentile	Description
A	≤ 0.006	≤ 0.021	Ecological communities and ecosystem processes are similar to those of natural reference conditions. No adverse effects attributable to DRP enrichment are expected.
B	> 0.006 and ≤0.010	> 0.021 and ≤0.030	Ecological communities are slightly impacted by minor DRP elevation above natural reference conditions. If other conditions also favour eutrophication, sensitive ecosystems may experience additional algal and plant growth, loss of sensitive macroinvertebrate taxa, and higher respiration and decay rates.
C	> 0.010 and ≤ 0.018	> 0.030 and ≤ 0.054	Ecological communities are impacted by moderate DRP elevation above natural reference conditions. If other conditions also favour eutrophication, DRP enrichment may cause increased algal and plant growth, loss of sensitive macro-invertebrate & fish taxa, and high rates of respiration and decay.
National Bottom Line	0.018	0.054	
D	>0.018	>0.054	Ecological communities impacted by substantial DRP elevation above natural reference conditions. In combination with other conditions favouring eutrophication, DRP enrichment drives excessive primary production and significant changes in macroinvertebrate and fish communities, as taxa sensitive to hypoxia are lost.

1. Must be derived from the rolling median of monthly monitoring over five years.

Additional Information 2: Existing nitrate toxicity attribute

Value	Ecosystem health		
Freshwater Body Type	Rivers		
Attribute	Nitrate (Toxicity)		
Attribute Unit	mg NO_3-N/L (milligrams nitrate-nitrogen per litre)		
Attribute State	**Numeric Attribute State**		**Narrative Attribute State**
	Annual Median	**Annual 95th Percentile**	
A	≤1.0	≤1.5	High conservation value system. Unlikely to be effects even on sensitive species.
B	>1.0 and ≤2.4	>1.5 and ≤3.5	Some growth effect on up to 5% of species.
C	>2.4 and ≤6.9	>3.5 and ≤9.8	Growth effects on up to 20% of species (mainly sensitive species such as fish). No acute effects.
National Bottom Line	6.9	9.8	
D	>6.9	>9.8	Impacts on growth of multiple species, and starts approaching acute impact level (ie risk of death) for sensitive species at higher concentrations (>20 mg/L).

Note: This attribute measures the toxic effects of nitrate, not the trophic state. Where other attributes measure trophic state, for example periphyton, freshwater objectives, limits and/or methods for those attributes will be more stringent.

Additional Information 3: DIN and DRP load reductions

Purpose

This section describes NIWA's environmental modelling of N and P pollution loads.

Findings

The environmental modelling provides estimates of how much nutrient loads have to reduce by. The results presume change is one-off and instantaneous (they say nothing about the annual change required in the event land users are given time to reach the nutrient bottom-lines).

The modeling results inform two issues:

- What are the cumulative impacts of the NPS-2017 and the Action for healthy waterways (AHW) reforms?
- What is the marginal impact of the AHW reforms?

If we interpret the NPS-2017 to mean 20% exceedance risk for periphyton, with implementation of **both the NPS-2017 and the AHW reforms**:

- **To achieve the requirements of the NPS with a national bottom line for DIN of 1 mg/L** nitrogen loads would have to reduce by 10.2% across New Zealand. Of that 10.2%, the new bottom line contributes 3.0% relative to the baseload. Regionally, the new bottom line has the most noticeable impact in Canterbury (contributing 9.2% to an overall 32.0% reduction in nitrogen) and Waikato (contributing 6.7% to an overall reduction of 9.9%).
- **To achieve the requirements of the NPS with a strengthened national bottom line for nitrate toxicity of 2.4 mg/L** nitrogen loads would have to reduce by 7.7% across New Zealand. Of that 7.7%, the change to the bottom line contributes 0.5% relative to the baseload. The change is most noticeable in Canterbury and Waikato.
- **To achieve the requirements of the NPS with a national bottom line for DRP of 0.018 mg/L** phosphorus loads would have to reduce by 2.5% across New Zealand. Of that 2.5%, the new bottom line contributes 1.7% relative to the baseload. The new bottom line makes a noticeable difference in Waikato, Manawatū-Whanganui and Northland, but not elsewhere.

Nationwide nutrient reductions based on 10%, 20%, and 30% spatial exceedances for periphyton.

Spatial exceedance is important because it affects the size of the nutrient load reduction required to meet the periphyton bottom-line contained in the existing NPS-FM.

NIWA tested three periphyton "spatial exceedance" criteria of 10 per cent, 20 per cent and 30 per cent. The tests were done on a scenario in which a national bottom line for DIN was set at nitrogen toxicity bottom line 6.9 (2017 NPS-FM), a proposed nitrogen toxicity bottom line 2.4 mg/L, and proposed ecosystem national bottom line of 1 mg/L. The same periphyton spatial exceedance criteria were tested with a national bottom line for DRP was set at 0.018 mg/L.

The "spatial exceedance" criteria essentially describe the probability of a randomly chosen river reach in the River Environment Classification (REC) failing to meet the bottom line. In this way the spatial exceedance criteria represent the level of precaution regional councils are willing to take, it represents the risk that a reach in the REC (with more than 500,000 reaches nationally) fails the bottom line even where periphyton monitoring sites (around 200 nationally) pass the bottom line.

A choice between the 10 per cent and 20 per cent spatial exceedance criteria has very little impact on the additional nutrient load reduction in the proposed NPS (numbers bolded in Table 1 below). It does affect the size of the nutrient load reduction required to meet the periphyton bottom-line

contained in the existing NPS-FM (marked by *).

The 30 per cent spatial exceedance criterion makes a larger difference. Under this assumption, nutrient thresholds consistent with meeting the periphyton attribute in the existing NPS-FM are higher than the DIN and DRP bottom-lines in many REC classes.

Therefore the level of spatial exceedance chosen makes a significant difference to the estimated impact of the existing NPS-FM.

Table 1: Sensitivity to choice of spatial exceedance criterion.

Periphyton spatial exceedance	Description	N (tonnes per annum)	P (tonnes per annum)
N/A	*Current nutrient discharge rate*	*235,698*	*54,964*
10%	Reduction under existing NPS	*44,106	*5,779
	Reduction under NPS with new bottom-lines (DIN 1 mg/L)	*50,488	*6,228
	Difference between existing NPS and NPS with new bottom-lines (DIN 1 mg/L)	**6,382**	**448**
	Reduction under NPS with new bottom-lines (DIN 2.4 mg/L)	***45,272**	
	Difference between existing NPS and NPS with new bottom-lines (DIN 2.4 mg/L)	**1,166**	
20%	Reduction under existing NPS	*16,951	*488
	Reduction under NPS with new bottom-lines (DIN 1 mg/L)	*24,131	*1,414
	Difference between existing NPS and NPS with new bottom-lines (DIN 1 mg/L)	**7,180**	**926**
	Reduction under NPS with new bottom-lines (DIN 2.4 mg/L)	***18,138**	
	Difference between existing NPS and NPS with new bottom-lines (DIN 2.4 mg/L)	**1,187**	
30%	Reduction under existing NPS	* 8,171	*101
	Reduction under NPS with new bottom-lines (DIN 1 mg/L)	*18,961	*1,254
	Difference between existing NPS and NPS with new bottom-lines (DIN 1 mg/L)	**10,790**	**1,153**
	Reduction under NPS with new bottom-lines (DIN 2.4 mg/L)	***9,500**	
	Difference between existing NPS and NPS with new bottom-lines (DIN 2.4 mg/L)	**1,328**	

The level of risk (represented in the modelling by spatial exceedance) is something that would be chosen by regional councils based on their level of comfort with the risk of waterways having excessive levels of periphyton.

Chapter 5: Reporting on ecosystem health – Update on Interim Analysis

This section is an update to the corresponding section on pages 102 to 110 of the Interim Regulatory Impact Analysis available here: www.mfe.govt.nz/sites/default/files/media/Fresh%20water/interim-regulatory-impact-analysis-for-consultation-essential-freshwater-part-2.pdf .

Under-reporting of ecosystem health

There is systematic under-reporting of the state of freshwater ecosystem health and its five components[117], but it is not clear to the public what information is missing. The reasons for this under-reporting vary across regional councils, and are likely to include institutional inertia, the increased costs associated with a wider monitoring and reporting programme, and a reluctance to widen the scope of environmental factors that need management (ie, organisations do not tend to manage what they do not measure).

As a result, central and local government have difficulty communicating where improvements or declines in overall ecosystem health, or its components, have occurred. This under-reporting means:

- it is more challenging to identify the management interventions required to achieve desired freshwater ecosystem health outcomes[118]
- members of the public are less able to understand the state of the different components of ecosystem health, and as result they are less able to advocate for optimal management interventions.[119]

Clear direction about reporting on ecosystem health will also ensure reporting is done in a consistent manner – both between and within regional councils – and, importantly, that monitoring gaps are clearly identified. Acknowledgment of data gaps will help address any information asymmetry that informs decision making.

Proposed reporting requirements

We proposed mandatory transparent reporting of the five components of ecosystem health (proposed policy 3.21 of the NPS-FM). All relevant data routinely collected by councils would have to be explicitly categorised as relating to one of the five components of ecosystem health. Councils would also be required to produce a synthesis report at least every five years integrating the five components of ecosystem health into a single ecosystem health score.

The proposed reporting requirements do not require information gaps to be filled, just that they be acknowledged and communicated. We do not anticipate these reporting requirements will significantly add to regional council costs, but acknowledge that monitoring new attributes for managing ecosystem health (as is also recommended in this reform of the freshwater management system) will impose additional costs on councils.

[117] The five components of freshwater ecosystem health are water quality, water quantity, habitat, aquatic life, and ecological processes.

[118] For example, the Macroinverterbrate Community Index (MCI) is often used as a proxy indicator for ecosystem health, but the MCI score alone cannot effectively be used to inform management interventions to improve fish habitat or diversity.

[119] We have no direct evidence of this issue but given the complexity of freshwater ecosystem health and the activities that affect it, it is reasonable to expect that under-reporting is limiting the public's ability to identify desired ecosystem health outcomes and advocate for interventions that would achieve those outcomes.

A draft report commissioned by the Ministry for the Environment to assess the impact of the Government's proposed reforms[120] on Māori cultural values states that these ecosystem health reporting requirements will support Te Mana o Te Wai.

Submitter concerns with 'single score of ecosystem health'

NIWA supported the inclusion of an ecosystem health 'report card'. The New Zealand Freshwater Sciences Society (NZFSS) also supported the recommendation although they raised concerns about integrating the five components of ecosystem health into a single score because a single score alone would not adequately portray the state of ecosystem health and could be misunderstood or misused.

The Independent Advisory Panel (IAP) expressed doubts about the practicality, defensibility and value of a single ecosystem health score. The Panel said it "favour[s] councils having some discretion while making all data publicly available, for example through the LAWA[121] and/or council's own website. There is a risk that the NPS-FM requires unbalanced expenditure on monitoring and reporting, compared to efforts to improve the environment."

Analysis of submitters' concerns

The concern expressed by NIWA and the IAP related to ecosystem health be reported *only* as a single score. If the result is reported only as a single score, concerning issues specific to an individual component might not be clearly identified. It was not intended that the single ecosystem health score should stand on its own, but rather that it should be supported by reporting on the state of the component parts.

Reporting ecosystem health overall (as a single score) is still valuable because relates to managing the value as a whole, but only if it is informed by scores for each of the components of ecosystem health. In regards to the IAP concern regarding expenditure, this policy does not require monitoring to fill the data gaps – although this might be an outcome of public pressure once any gaps are acknowledged.

Change incorporated as a result of public submissions

Change proposed section 3.21(4)(b), which directs councils to provide a single ecosystem health score, to direct councils to provide a single ecosystem health score as well as the scores for each of the five components of ecosystem health:

> *The synthesis report must set out the results of the assessments and also provide a single ecosystem health score and scores for each of the five components of ecosystem health as set out in Appendix 1A ~~(by reference to the 5 components of Ecosystem Health)~~ for each FMU in the region*

[120] As set out in *Action Plan for Healthy Waterways*, Ministry for the Environment 2019

[121] The Land, Air, Water Aotearoa website (www.lawa.org.nz) was established by New Zealand's sixteen regional councils as a public portal to share environmental data and information for all of New Zealand.

Chapter 6: Sediment Attributes

Environmental problem and context

When soil erodes, it can be carried into waterways as sediment. Suspended and deposited fine sediment are among the most significant stressors on freshwater and coastal environments.[122] Sediment is a major driver of biodiversity loss. It is a stressor in its own right, and it exacerbates other stressors.[123]

Sediment is more important as an ecological stressor in some regions than in others. Over the period 2008-2017, turbidity[124] indicators improved in parts of Auckland, western Marlborough and Tasman, and worsened in much of the central North Island, Canterbury Plains, Kaikoura and West Coast.[125]

In-stream sediment levels are high enough to breach tipping points for aquatic animals in some river reaches in every region in New Zealand.[126] [127] [128]

Policy problem and context

Under the Resource Management Act (RMA), local governments are responsible for implementing national requirements through their planning processes. Relevant content in regional plans is directed through the:

- National Policy Statement - Freshwater Management 2017 (NPS-FM)
- New Zealand Coastal Policy Statement 2010 (NZCPS).

Other national instruments manage erosion from specific activities, including the:

- National Environmental Standard for Plantation Forestry
- Building Act
- Local Government Act
- National Policy Statement for Urban Development Capacity.

Modern erosion and sediment challenges reflect historical decisions about primary sector policy and urban development. Until the 1980s, subsidies incentivised land clearance and pasture expansion in highly erosion-prone areas. Rules-based frameworks are still rare for hill country farming activities.[129] [130]

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[122] *Our Freshwater* 2017; *Our Marine Environment* 2016

[123] Davies-Colley et al. 2015

[124] turbidity (cloudiness of water as measured by refraction of light) is an indirect measure of suspended sediment.

[125] Statistics NZ water quality application

[126] Franklin et al 2019

[127] *Environment Aotearoa 2019*

[128] Clapcott J, Casanovas P, Doehring K 2019. Indicators of freshwater quality based on deposited sediment and rapid habitat assessment. Prepared for Ministry for the Environment. Cawthron Report No. 3402. 21 p.

[129] Tyler and Lattimore 1990. Assistance to agriculture. In: Sandrey and Reynolds (eds). Farming without subsidies: New Zealand's recent experience. Wellington: Government Print Books and Ministry of Agriculture and Fisheries.

[130] Ministry for the Environment 2018. *Regional council perspectives on soil erosion management: Current trends and emerging opportunities*. Wellington: Ministry for the Environment.

NPS-FM and NZCPS

The NPS-FM framework requires councils to follow a particular process to provide for values:[131]

5. Identify the values the community holds for freshwater management units (FMUs)
6. Identify the attributes that need to be managed to provide for those values
7. Formulate freshwater objectives using the attributes in Appendix 2 of the NPS-FM
8. Establish limits on resource use and implement other methods to ensure the freshwater objectives are met.

"Sediment levels" and "essential habitat needs of flora and fauna" are matters to take into account for ecosystem health, which is a compulsory national value.

However, there are no "Appendix 2" attributes for sediment. Because of this, regional councils do not prioritise sediment problems, and it can be difficult for them to create sediment-related provisions and defend them in court.[132]

A 2017 review of the NZCPS[133] identified management of sedimentation[134] as a core problem for coastal ecosystems.

It noted a lack of integration between freshwater management (implementing the NPS-FM) and coastal management (implementing the NZCPS). The review also found that regional councils have made implementation of the NPS-FM a priority over the NZCPS.[135] This highlights the importance of the specificity of national direction.

Regional and territorial authorities

Councils use a mix of regulatory and non-regulatory methods to manage erosion and sediment.

For erosion on agricultural land, regional councils primarily rely on non-regulatory methods, such as collaborative efforts with farmers and industry partnerships.

To manage sediment generation in urban areas, councils can use the Local Government Act and local bylaws, regional and district plans, and development and engineering standards.

Together, the methods do not generally provide for thorough consideration of the cumulative effects across a catchment over time, because:

- most councils focus only on specific areas for sediment management, such as fish spawning habitat or areas for drinking water supply
- councils do not refer to in-stream thresholds for sediment when they manage activities that could increase sediment.

Iwi management plans

Many iwi management plans deal with erosion and sediment (69 of 95 plans examined do this). The theme is particularly evident in management plans covering Southland, lowland areas of Canterbury,

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131 MfE 2017

132 MfE 2017a

133 DOC 2017; DOC 2017a

134 the deposition of sediment on the beds of waterbodies.

135 An example of this is the King Salmon case, Environmental Defence Society Incorporated v The New Zealand King Salmon Company Limited [2014] NZSC 38 [17 April 2014] SC 82/2013 [2014] NZSC 38, paragraph 80.

the Marlborough Sounds, the Waikato and its tributaries, Tauranga, the Hauraki Gulf, and Northland's rivers and estuaries.

The fact that sediment is such a prominent theme in iwi management plans indicates that it is a critical aspect of managing the mana of the water (Te Mana o te Wai) for Māori across the country. Sediment issues are discussed in the plans through four main (overlapping) themes:

1. Relationships between people, land, freshwater, and marine environments (both specific to the location and more generally)
2. Relationships between erosion/sediment and the degradation of ecosystem health.
3. Contributing activities and/or controls (this is RMA-specific language)
4. Connections to te ao Māori.

Iwi management plans discuss sediment and erosion with different objectives and purposes. Some are more descriptive and concern the effects of sedimentation on ecosystem health, cultural health, and Te Mana o te Wai; others are very prescriptive, seeking increased controls on specific activities.

Resource user context

For those involved in the activities that contribute to erosion and sediment, there are a number of challenges to changing behaviour:

- The complexity and scale of geological, climatic, land-use and management factors make it difficult to manage erosion
- Sediment modelling at the site and catchment scale is technically demanding and subject to significant uncertainty
- Landowners and those carrying out relevant activities do not bear the external costs associated with excessive sediment in waterways, only the cost of mitigations.

Synthesis and policy objectives

The challenges for resource users, as well as the limitations of the policy framework, mean that high-risk sediment-generating activities and erosion-prone areas are inadequately considered in resource management decisions, and inadequately controlled.

The Ministry has identified a core policy gap in the management of sediment, this is that councils do not require in-stream sediment to be maintained below thresholds throughout the region.

The desired outcome of the policy intervention is that regional councils require in-stream sediment to be maintained below thresholds throughout the region to provide for ecosystem health.

Options analysis

The identification and analysis of options had three phases.

1. We considered a broad range of intervention types. Only planning system interventions were suitable to address the problem and meet the objective.
2. To design a planning system intervention, we considered whether thresholds should be developed and implemented, and if so, by whom. These options were evaluated against standard criteria as listed in Table 1.
3. Following public consultation, we refined the proposed intervention.

Criteria and summary

Standard evaluation criteria were used. Table 1 below summarises the options analysis. Our preferred option is Option B – central government develops thresholds and requires their implementation.

Table 1 - Summary of options analysis

Criterion	Option A (Status quo – councils may develop and implement thresholds but are not required to do so)	Option B (Central government develops thresholds and requires councils to implement them)	Option C (Councils required to develop and implement thresholds)
Effectiveness	**0** A few councils have developed or signalled they are considering developing thresholds.	++ Central government is well-placed to develop thresholds for reasons of data availability, coordination role, and ecosystem health evaluation capacity. Regional councils can use existing freshwater policy planning mechanisms to implement the thresholds as appropriate for local conditions.	+ Local government able to develop thresholds with variable levels of resourcing.
Timeliness	**0** Development of thresholds can be a timely and technically demanding endeavour, and not all councils will undertake it.	++ Central government development of thresholds can happen as a single process and is not reliant on existing planning processes. Regional councils will implement thresholds according to timeframes they develop in consultation with communities.	+ Councils would develop thresholds over varying timeframes depending on where they are in the current planning cycle.
Fairness	**0** Costs for development of thresholds fall on local government; assessment of thresholds' impacts required.	+ Central government bears costs of threshold development and assessment of thresholds' impacts is required. Regional councils bear the cost of policy implementation at the local level. Resource users, local government and central government will bear the costs of primary interventions, with the specific distribution of impacts dependent on future policy and funding choices.	**0** Costs for development of thresholds fall on local government; assessment of thresholds' impacts required.
Efficiency	**0** Multiple councils undertaking comparable developments.	++ Central government development of thresholds and incorporation in policy occurs as a single process. Regional councils will then update their plans through existing NPS-FM planning processes.	-- Most councils undertake comparable research and development of thresholds at the same time using similar methods.
Principles of the Treaty of Waitangi	**0** No change in the Crown's upholding of Treaty Principles.	+ Improved upholding of Treaty Principles, particularly in relation to the protection of taonga.	+ Improved upholding of Treaty Principles, particularly in relation to the protection of taonga.
Te Mana o te Wai	**0** No change in planning processes and so process to support Te Mana o te Wai is not affected.	++ Central government development of thresholds predicated on principles that support Te Mana o te Wai.	+ Local government development of thresholds may be predicated on principles that support Te Mana o te Wai via resource management engagement with tangata whenua. This will be regionally variable.
Overall Assessment	**0** This option is a continuation of the status quo.	++ Central government is best placed to undertake the development of thresholds for reasons presented above.	+ Local government could develop thresholds, but this would entail delays, loss of efficiency, and likely variable thresholds and outcomes.

Options for development of thresholds

Option A: Status quo – Councils may develop and implement thresholds but are not required to do so

Option A is to continue with the status quo. Regional councils have the ability to develop in-stream thresholds for sediment throughout the region, but are not required to do so. Whether councils develop thresholds or not, they are still required to provide for ecosystem health under the NPS-FM.

Option B: Central government develops thresholds and requires councils to implement them

Option B is for central government to develop thresholds for in-stream sediment to provide for ecosystem health, and require their implementation. Threshold values for measures of water quality are commonly used in regulation. They identify safe and dangerous levels of the relevant indicator. These thresholds could be made through a range of policy instruments.

Option C: Local government required to develop and implement thresholds

Option C is for central government to require regional councils to set in-stream sediment thresholds to provide for ecosystem health. Guidance for thresholds exists[136] – so this option would require councils either to conduct new research and develop thresholds or to adopt threshold values from the guidance.

Our preferred option is that central government develops and requires implementation of in-stream sediment thresholds. This analysis is consistent with past evaluations of policy options to strengthen management for water quality characteristics that have definable, quantitative relationships with ecosystem health impacts.[137]

Thresholds should be set for both suspended and deposited fine sediment. Research suggests that these two indicators should be assessed and managed independently, and are both critical and separate facets of ecosystem health.[138]

Choosing a policy instrument

We consider the NPS-FM to be the most appropriate instrument to set these thresholds.

Other potential options for the policy instrument would be through a National Environmental Standard, regulations under section 360 of the RMA, or amendments to Schedule 3 and section 69 of the RMA.

The Regulatory Impact Statement accompanying the 2014 amendments to the National Policy Statement for Freshwater Management evaluated these options in relation to measurable characteristics of water quality (nitrogen).[139] It concluded that the NPS-FM was the preferable policy tool for that purpose, and we consider that the same applies in this instance.

Choosing a mechanism for implementation

The proposed NPS-FM provides two mechanisms through which thresholds may be defined and implemented:

- limit-setting attributes (Appendix 2A)
- action-plan attributes (Appendix 2B).

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[136] ANZECC 2000, ANZG 2018.

[137] 2011 RIS for the National Policy Statement for Freshwater Management

[138] Davies-Colley et al (2015)

[139] 2014 RIS for the National Policy Statement for Freshwater Management

Both may set minimum standards ("national bottom-lines") and water quality thresholds ("bands").

Appendix 2A attributes are implemented through planning processes that include limits on resource use, whereas Appendix 2B attributes are to be implemented through more flexible adaptive management regimes (interventions could include a broader range of actions, such as restoration activities).

There are also monitoring requirements for other aspects of ecosystem health, but these do not have thresholds.

Criteria to evaluate attributes for limit-setting were established for analyses in 2014 and 2017.[140] Accordingly, we assessed "suspended fine sediment" and "deposited fine sediment" in relation to their:

5) link to ecosystem health
6) measurement and threshold characteristics
7) link to land use and management interventions
8) ability to be evaluated nationally.

Suspended sediment meets all the relevant criteria and should be progressed as a limit-setting attribute.

Deposited sediment does not have a direct link to land-use and management interventions (criterion 3), and should be progressed as an action-plan attribute.[141]

Recommendations for consultation

The proposal put forward for consultation was to add:

- a suspended sediment attribute, as included in Table 10 in Appendix 2A of the draft NPS-FM
- a deposited fine sediment attribute, as included in Table 18 in Appendix 2B.[142]

The proposed thresholds are based on the effects that long-term elevated levels of suspended and deposited fine sediment have on freshwater fish and macroinvertebrates.[143]

Because natural levels of in-stream suspended and deposited fine sediment vary significantly around the country, the proposed thresholds use a spatial classification system based on the River Environment Classification. This means that different bottom-lines and bands would apply in different places.

Stakeholder feedback on recommendations prior to consultation

The Ministry's stakeholder advisory groups for the Action for healthy waterways work programme – which include individuals with private sector, scientific community, local government, Māori, and civil society interests – unanimously agree with the described environmental context.

The FLG, STAG, and KWM supported the recommended proposal for a suspended sediment limit-setting attribute and a deposited sediment action-plan attribute.

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[140] See Section 11.3 of the 2014 RIS

[141] Hicks et al 2016; Hicks et al 2019.

[142] Draft NPS-FM 2020

[143] Franklin et al. (2019)

Overall, regional councils want national direction on sediment policy. In a March 2019 letter to the Minister for the Environment, Local Government New Zealand stated that in-stream sediment is "widely accepted as a 'master stressor' in waterways and a recognised gap in the previous NPS-FM."

We convened a working group from the regional council Resource Managers' Group (RMG) and a technical expert group of council staff to contribute to policy development and analysis. Both groups supported the policy intent and objectives but had concerns about the specific proposals (which were reflected in submissions from councils).

The Urban Water Working Group identified sediment as one of the stressors of primary concern in urban freshwater and coastal ecosystems, and the Land and Water Forum called for sediment attributes to be included in the NPS-FM. [144]

Consultation feedback

The large majority of submissions (over 10,000 of approximately 17,500 submissions) were supportive of the proposals.

Substantive comments on both attributes related to the following issues:

A. Using "limit-setting" or "action-plan" attributes
B. The method used to define bottom-lines and bands
C. Precision of bands (compared with monitoring methods)

Substantive comments on the suspended sediment attribute related to the following issues:

D. Choice of indicator for suspended sediment
E. Technical characteristics: time horizon and statistic for assessment

Substantive comments on the deposited sediment attribute related to the following issues:

F. Soft-bottomed streams
G. Leniency in bottom-lines

Comments on the environmental classification systems related to the following themes:

H. Including all river types
I. Complexity.

The Independent Advisory Panel (IAP) described some of these issues in its recommendations on sediment attributes. [145] In particular, it considered suspended sediment would be more appropriate as an action-plan attribute, and deposited sediment as a monitoring requirement.

Submissions analysis

This section describes the analysis of the feedback received during consultation, and recommended changes to the policy as a result. Issues raised which did not change the policy recommended are described in the Appendix to this section. Impacts of the revised attributes are discussed in the next section.

Issue D: Choice of indicator for suspended sediment

[144] LAWF (2015); LAWF (2017); LAWF (2018).

[145] IAP report on Essential Freshwater.

Some regional councils, primary industry (especially forestry) groups, and research organisations (especially NIWA) considered the proposed attribute indicator to be inappropriate for three main reasons:

1) Turbidity is a proxy for suspended sediment rather than a direct measurement
2) The challenges in monitoring turbidity, particularly the variation in turbidity readings from the same or similar instruments at a site[146]
3) The inability of industry, catchment groups, or citizen scientists to engage effectively in policy implementation support given the technical challenges and expense of monitoring turbidity.

These submitters, and the IAP, prefer other measures of suspended sediment, such as:

- visual clarity
- total suspended solids (TSS)
- suspended sediment concentration (SSC).

We have no suitable information on which to base a suspended sediment attribute using TSS or SSC in relation to ecological effects thresholds. The researchers determined TSS and SSC to be unsuitable for defining natural state variation and therefore for development of the attribute.[147]

Franklin et al (2019) provided bottom-lines for turbidity and visual clarity, developed separately.

The Ministry assessed two options to deal with this issue:

1) define the attribute using turbidity but explicitly permit inter-conversion between turbidity and visual clarity
2) define the attribute using visual clarity but explicitly permit inter-conversion between turbidity and visual clarity.

STAG and council technical staff considered that the first option did not adequately address the underlying problems – especially that turbidity measures from the same instrument could vary substantially – and the Ministry concurred with this assessment.

Visual clarity measurements have less error. Potential drawbacks to using visual clarity include:

1. Implications for objective-setting in relation to downstream receiving environments
2. Potential shifts in council monitoring programmes to prioritise monitoring in smaller streams and rivers only, and to take samples during base flow conditions only.

In relation to the first issue, the Ministry considers that no matter the in-stream indicator, councils will be required to establish sediment loads and total reductions needed to achieve in-stream bottom-lines. Therefore, the management framework for either indicator is based on the issue most relevant for receiving environments – total loads. In relation to the second issue, STAG and council staff indicated that councils' monitoring programmes would not likely shift locations if the attribute were changed to visual clarity. However, several councils that do not monitor visual clarity (Auckland, Otago, Marlborough, Gisborne) would need to do so even if only to establish local relationships between visual clarity and turbidity. The Ministry agreed with these assessments.

[146] E.g. Hughes et al (2019). Comparability of ISO 7027 compliant turbidity sensors. Internal report prepared for the Freshwater and Estuaries and Environmental Information National Science Centres. June 2019. NIWA CLIENT REPORT No: 2019125HN.

[147] see page 39 of Depree et al 2019 for a summary of the rationale.

Recommendation D: Minor and technical changes – use visual clarity as the attribute indicator instead of turbidity and explicitly permit councils to convert from turbidity to visual clarity for attribute assessment.

This change would lead to small increases in the costs and benefits of the proposals.

Issue E: Technical characteristics: time horizon and statistic for assessment

Some regional council submitters consider that the attribute assessment timeframes should be five years rather than two, to line up with the timeframes for other proposed attributes, and to take account of climate influences on in-stream sediment.

We compared turbidity attribute states using two- and five-year medians from state of the environment observation data. "Band-switching" – the indicator score at a monitoring site moving from one attribute band to another – was less frequent and smaller using the five-year median.

In relationship to the specific assessment statistic, the intention was to use the median value, and its omission was a drafting mistake.

Recommendation E: Minor and technical changes – amend the suspended attribute timeframe and statistic of assessment to "the median of 5 years of at least monthly monitoring"; amend the deposited sediment attribute timeframe of assessment to "the median of 5 years of monthly monitoring, except at sites that can only be accessed seasonally due to flow conditions, for which assessment will take place using at least 24 observations".

These changes have no implications for impacts of the proposals.

Issue F: Soft-bottomed streams

Some regional council submitters considered the proposed deposited fine sediment attribute to be inappropriate for naturally soft-bottomed streams.

The prescribed monitoring method was developed for use in hard-bottomed streams and ecological relationships to the indicator in soft-bottomed streams have not been empirically established.[148] We agree that it does not make sense to use this measure in streams where it is not a meaningful indicator of freshwater habitat. Other deposited sediment indicators, such as the Rapid Habitat Assessment or sediment depth measures, would be more relevant and appropriate.

Some regional council submitters consider the deposited sediment classification system to have mischaracterised some catchments in their regions.

There are two relevant considerations:

- many streams are soft-bottomed now because of historical vegetation clearance (they would not have been soft-bottomed before human settlement)
- it is possible that a small number of local classifications are inaccurate because of the way the REC applies a national model to the local context, a shortage of deposited sediment data in the area,[149] or inaccurate assumptions or bias in the clustering process used in the REC.

[148] Clapcott et al 2011

[149] See Appendix D in Franklin et al 2019 for more information on the development of the classification systems.

Recommendation F: Change the deposited sediment attribute requirements as follows -

1. **Exclude naturally soft-bottomed streams (as defined by the classification system) from the attribute deposited sediment attribute table.**
2. **In naturally soft-bottomed streams as defined by the classification system, require councils to monitor and report on freshwater habitat.**
3. **For monitoring sites that are currently soft-bottomed but not classified as such per the classification system, councils may, using a risk-based prioritisation, assess whether they would have been soft-bottomed prior to human arrival. If, based on the evidence available, councils conclude they would have been soft-bottomed before human arrival, they should follow the monitoring requirement for soft-bottomed streams. If not, they should follow the deposited sediment attribute requirements as laid out in the table.**

These changes lead to minor decreases in costs of the proposals and no change in the benefits.

Issue G: Leniency in deposited sediment bottom-lines

Some submitters consider the deposited sediment bottom-lines too lenient because new observation data shows significantly less deposited fine sediment than the reference state (as described in Franklin et al, 2019), on which the bottom-lines and bands were based.

Following consultation, we contracted research to examine this issue, and the researchers concluded that new observations were indeed consistently lower, and sometimes significantly so.[150] We contracted further work to revise the bottom-lines and bands using the new and pre-existing data in relevant models. The revised bottom-lines and bands are significantly lower in all classes.

Recommendation G: Change deposited sediment bottom-lines and bands to use those produced by Franklin et al (2020).

These changes will lead to increased environmental benefits and costs over time.

Issue H: Including all river types in the classification system

Submitters noted that some rare groups in the REC were not covered in the proposed attribute classification system.

We have contracted further research to incorporate all REC groups into the classification system.[151]

Recommendation H: Minor and technical changes – revise the classification system (Appendix 2C) to incorporate all classes.

These changes have no implications for impacts of the proposals.

Issue I: Complexity of the classification system

Submissions on this topic generally appreciated the need for classification, but suggested using fewer classes to reduce complexity. Reasons included:

- councils would struggle to implement so many classes (12 for suspended sediment and 12 for deposited sediment) within the freshwater management unit framework of the NPS-FM.

[150] Stoffels et al 2020. Check of deposited fine sediment reference states against all available SoE data. Technical memo for MfE Contract 23184 Task 4.

[151] Booker et al 2020. Mapping CTG classes with few data to sediment classes. Technical memo for MfE Contract 23184 Task 1.

- it would be difficult for catchment groups and the public to engage effectively with the planning process.

Choosing how many classes to use is a balancing act between statistical certainty (determining predicted reference state and ecological outcomes) and attribute management uncertainty (the inherent difference in difficulty of achieving bottom-lines between classes).

When fewer classes are defined, more data are available for each class. Therefore, a more precise estimation of the reference condition for the overall class can be obtained. However, there is also more inherent natural variation within the class and therefore a greater chance of the reference condition being inappropriate for some sites within the class.[152] Franklin et al 2019 recommend using the 12-class system because it provides the most parsimonious data for both deposited and suspended sediment – information theory criteria indicate the model outputs have the most explanatory power.[153]

However, following consultation, we consider that using fewer classes would give a better balance between statistical certainty and management certainty. STAG and the IAP both also recommended that fewer classes should be used.

Recommendation I: Change from 12 class systems as consulted to use the 4-class systems for both suspended sediment and deposited sediment

This change will have implications for the distribution of impacts, but not their overall magnitude. This is because changes in bottom-lines and bands from changing the level of aggregation "average each other out" across the system.

Constraints on the analysis

Different parts of the analysis described in this RIS happened at different times.

The specific options analysis relies on general analysis relating to central government development (and local government implementation) of water quality thresholds. The regulatory impact assessments for the introduction of the NPS-FM in 2011 and the introduction of the National Objectives Framework in the NPS-FM in 2014 assesses these issues in great depth.

Proposed suspended and deposited sediment attributes

Tables 2 and 3 below show the proposed suspended and deposited sediment attributes within their spatial classification systems[154].

Table 2 - Proposed suspended sediment attribute

Value	Ecosystem Health (water quality)			
Freshwater Body Type	Rivers and streams			
Attribute Unit	visual clarity (meters) [1,2]			
Attribute State and narrative description	**Numeric attribute state by Suspended Sediment Class**[3]			
	1	2	3	4

[152] Franklin et al 2020a. Contract 23184: Task 3 - Response to peer reviews of Appendix J of Franklin et al. (2019)

[153] See, for example, Table D-5 in Franklin et al 2019 for information theory criteria

[154] The full table for classification is provided in Booker et al 2020 and will form part of the NPS-FM, but it is not necessary to produce it in full here.

A Minimal impact of suspended sediment on in-stream biota. Ecological communities are similar to those observed in natural reference conditions.	>1.78	>0.93	>2.95	>1.38
B Low to moderate impact of suspended sediment on in-stream biota. Abundance of sensitive fish species may be reduced.	1.78	0.93	2.95	1.38
C Moderate to high impact of suspended sediment on in-stream biota. Sensitive fish species may be lost.	1.55	0.76	2.57	1.17
National Bottom Line	1.34	0.61	2.22	0.98
D High impact of suspended sediment on in-stream biota. Ecological communities are significantly altered and sensitive fish and macroinvertebrate species are lost or at high risk of being lost.	<1.34	<0.61	<2.22	>0.98
[1] The minimum record length for grading a site is the median of five years of at least monthly samples (at least 60 samples). [2] Conversion from turbidity measurements to clarity values may be used for attribute assessment. [3] See Table X for the definition of each suspended sediment class and its River Environment Classification composition.				

Note: the attribute does not apply in the following rivers and streams due to naturally occurring processes:

1. Naturally highly coloured brown-water streams
2. Glacial flour affected streams and rivers
3. Selected lake-fed REC classes (particularly warm climate classes) where high turbidity may reflect autochthonous phytoplankton production (as opposed to organic/inorganic sediment derived from the catchment).

Table 3 - Proposed deposited sediment attribute

Value	Ecosystem Health (physical habitat)			
Freshwater Body Type	Wadeable rivers and streams			
Attribute Unit	% fine sediment cover[1,2]			
Attribute State and narrative description	**Numeric attribute state by Deposited Sediment Class[3]**			
	1	2	3	4
A Minimal impact of suspended sediment on in-stream biota. Ecological communities are similar to those observed in natural reference conditions.	<7	<10	<9	<13
B Low to moderate impact of suspended sediment on in-stream biota. Abundance of sensitive fish species may be reduced.	7	10	9	13
C Moderate to high impact of suspended sediment on in-stream biota. Sensitive fish species may be lost.	14	19	18	19
National Bottom Line	**21**	**29**	**27**	**27**

D High impact of suspended sediment on in-stream biota. Ecological communities are significantly altered and sensitive fish and macroinvertebrate species are lost or at high risk of being lost.	>21	>29	>27	>27
[1] [1]The indicator score is percentage cover of the streambed in a run habitat determined by the in-stream visual method, SAM2, and the monitoring method is defined in p. 17-20 of Clapcott et al. 2011[155] [2] The minimum record length for grading a site is the median of 5 years' sampling, which must be monthly except where flow conditions only permit monthly monitoring to occur seasonally. [3] See Table X for the definition of each deposited sediment class and its River Environment Classification composition.				

Note: the attribute does not apply in naturally soft-bottomed rivers and streams. See Table X for defined naturally soft-bottomed rivers and streams. For monitoring sites that are currently soft-bottomed but not classified as such per Table X, councils may, using a risk-based prioritisation, assess whether they would have been soft-bottomed prior to human arrival. If, based on the evidence available, councils conclude the waterbodies would have been soft-bottomed before human arrival, councils should follow the monitoring requirement for soft-bottomed streams. If not, they should follow the deposited sediment attribute requirements as laid out in Table X above.

Current state of rivers in relation to the recommended thresholds

Suspended sediment attribute bottom-lines

Predictive models estimate that water quality is worse than proposed bottom-lines in about 14% of segments in the New Zealand river network, and observation data from more than 600 sites corroborate this finding. These segments are in about 640 catchments, which cover the majority of the country's land area[156]. Figure 1 shows the estimated reduction of suspended sediment load needed to meet the proposed attribute bottom-lines, at a catchment average level and ignoring attribute exceptions such as the presence of glacial headwaters. This is defined as the average load reduction of all segments in a catchment that has any river segment below the bottom line.[157]

[155] Clapcott et al 2011

[156] Hicks and Shankar 2020. Contract 23184 Task: Sediment load reductions to meet visual clarity bottom-lines.

[157] Hicks et al 2019.

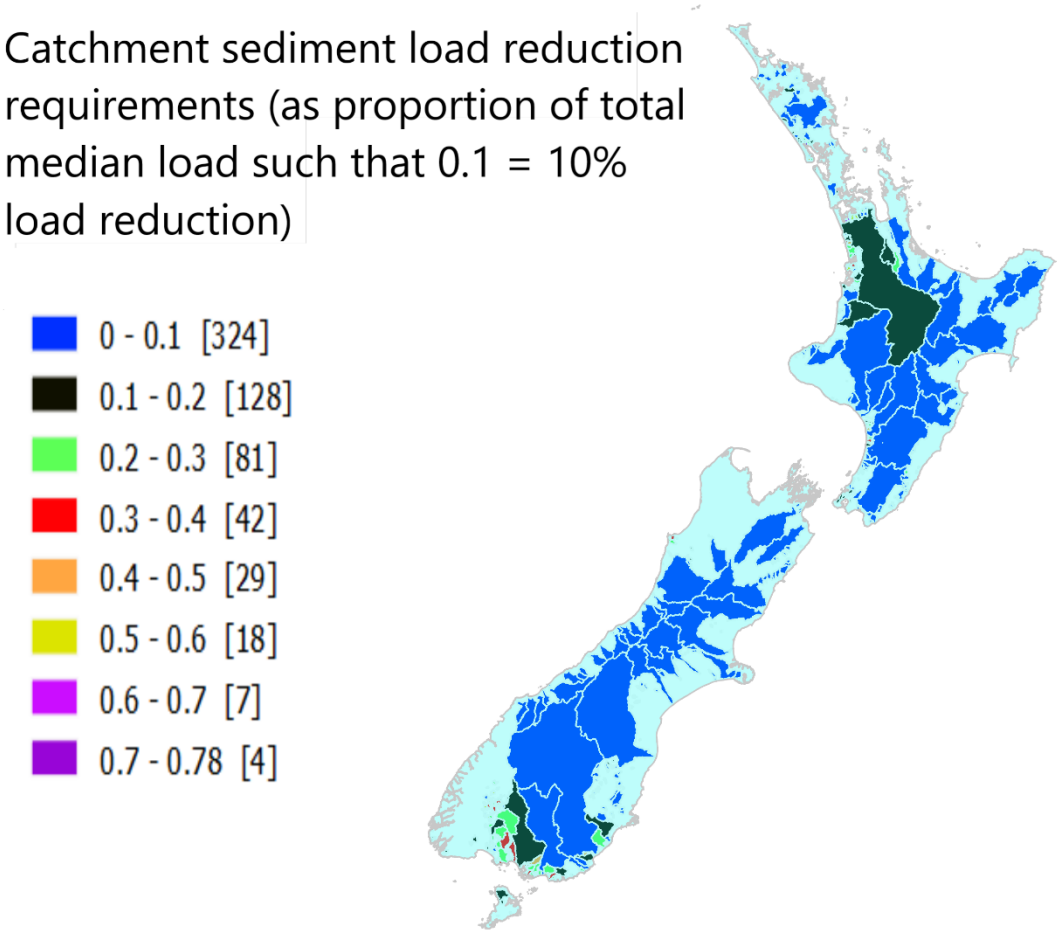


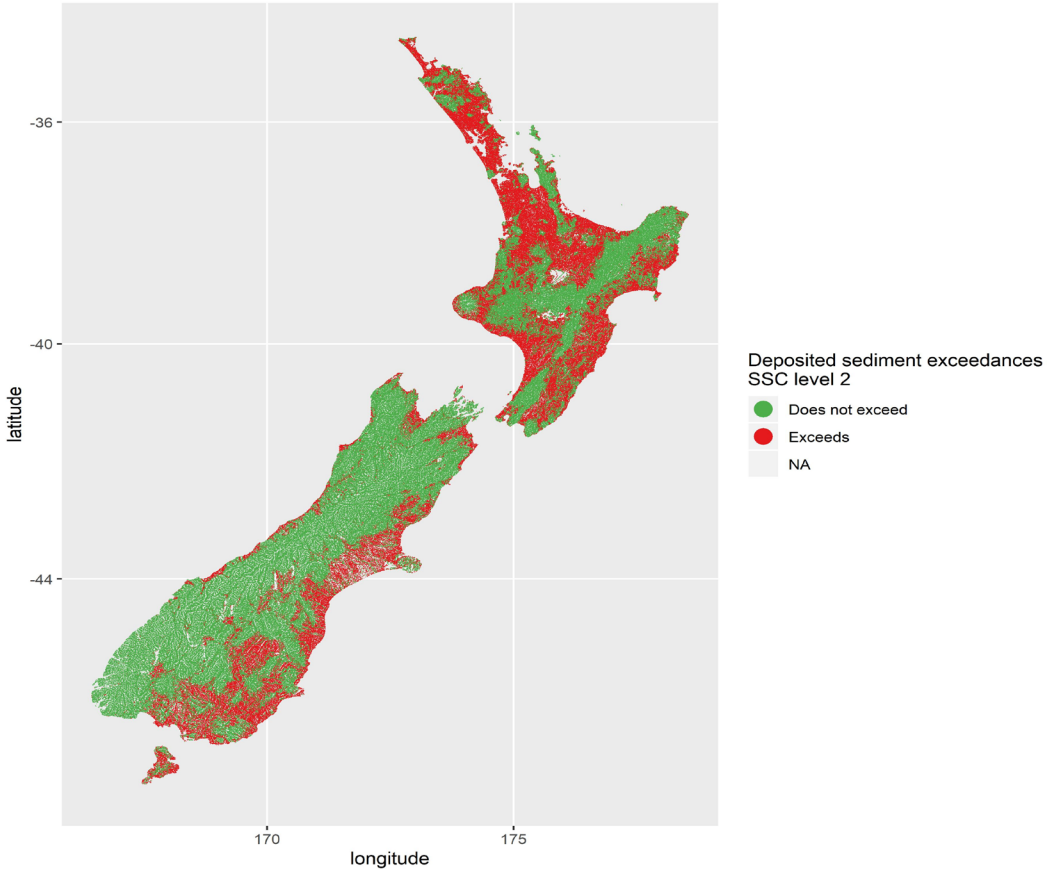
Figure 1 - sediment load reduction requirements per catchment

Deposited sediment monitoring plan thresholds

Predictive models estimate that current deposited sediment levels are worse than the proposed thresholds in river reaches shown in Figure 2 below (approximately 37% of segments). However, the most recent state of the environment data (where they are available) show a more refined and less negative picture of the current state of rivers in relation to the proposed thresholds.

At present, there are 257 monitoring sites with repeat, regular observations using the required indicator, albeit with a shorter data record than the attribute monitoring timeframe. These sites are in Southland, Canterbury, Nelson, Wellington, Horizons, and Hawke's Bay only. They show the median of observed deposited sediment values in all areas (upstream catchment predominantly exotic forest, native vegetation, pasture, and urban) are better than the bottom-lines. Generally, sites in urban areas are the worst (though there are far fewer observation sites), and numerous, though less than half pasture-dominated sites worse than proposed bottom-lines.[158]

[158] See Figure 5 Clapcott et al 2020. Indicators of freshwater quality based on deposited sediment and rapid habitat assessment. Client Report No. 3402. Prepared for the Ministry for the Environment.



Impact analysis

The impact analysis focuses on the suspended sediment attribute because it requires proactive planning measures and will likely result in near-term regulation of resource users as new regional council plans are notified from 2025. Impacts of the deposited sediment attribute beyond 2025 are mostly:

- the development and implementation of monitoring programmes where these do not currently exist
- ongoing research into relationships between resource use (land use and management practices) and deposited sediment.

If more interventions are needed in future to improve deposited sediment above bottom-lines (beyond the interventions to achieve suspended sediment bottom-lines) there would be additional costs and benefits from those actions.

The interim RIS provides detailed information on the actions to implement the proposals, costs of the status quo, and the national CBA (see pages 131-144), and here we present only the overall summary.

Overall summary

The Ministry undertook comprehensive hydrological[159], erosion, and economic modelling[160] to assess baseline conditions and interventions able to meet the suspended sediment attribute bottom-lines

[159] Hicks et al 2019.

[160] Neverman et al 2019.

as proposed for consultation. Impacts of the proposals will be highest where sediment load reduction requirements are highest as per Figure 1.

The post-consultation modifications to the suspended sediment attribute do not invalidate these findings as the difference in sediment load reductions required to achieve bottom-lines does not differ substantially on a national scale. In particular, breakdowns of differences by river network stream order (size of rivers), class within the classification system, region, and land cover show small differences.[161]

Overall, fewer river segments require improvements, and the magnitude of improvement required is slightly lower. Notable increases in reduction requirements only appear for the largest river segments (order 8), catchments with major areas of upstream bare ground (~6% of river segments nationally), and the Auckland and Waikato regions, which have a high proportion of segments shifting into more restrictive bottom-lines (due to using fewer classes). However, these increases are small - the Waikato catchment has a reduction requirement of approximately 17% compared to 15% in the original modelling.

Table 4 presents an overall summary of the proposals' anticipated costs and benefits, and Table 5 presents a summary of the proposals' impacts using the wellbeing framework. The monetised cost and benefit figures in Table 4 come from the national erosion and cost benefit assessment (CBA) and are shown as net present value using a 6% discount rate.[162] The monetised benefits show the entire estimated range using high and low estimates.

Estimated monetary benefits of interventions to meet bottom-lines outweigh costs over a 50-year period in all scenarios. The ratio of monetary benefits to costs is estimated to be between 1.02 and 4.5 to 1, depending on the discount rate and carbon valuation measure used. (Approximately $5.4 billion benefit to $5.3 billion cost in the low-estimate scenario and $31.2 billion benefit to $7.1 billion cost in the high-estimate scenario).

It is likely that overall the CBA underestimates the magnitude of benefits. While it is able to quantify the main types of costs, it is unable accurately to quantify many benefits, some of which may be large. Also, other proposals, such as stock exclusion, will lead to sediment improvements. For example, Hicks et al 2020[163] estimate that approximately 11.6% of river segments that are currently below sediment bottom-lines will improve above bottom-lines as a result of the stock exclusion proposals.

The CBA assesses the suspended sediment attribute as it was proposed for consultation. While the revised attribute is slightly different, as described above, the overall magnitude of costs and benefits is highly similar, though there are small discrepancies in their distribution across regions.

Modelled interventions

The CBA uses modelled interventions to meet bottom-lines: afforestation, whole farm plans for erosion and sediment control, and riparian exclusion. The CBA indicates that the modelled interventions could improve water quality above catchment bottom-lines in most, but not all, of New Zealand.

[161] Hicks and Shankar 2020.

[162] Neverman et al 2019

[163] Hicks et al 2020. Effects of stock exclusion scenario 3b on sediment load reduction and visual clarity

The few large catchments that were unable to meet bottom-lines through the modelled interventions (several in Otago, Canterbury, and the West Coast) are fed by glacial headwaters. They would be subject to an exception for "naturally occurring processes", and would not need to meet the bottom-lines. The other catchments that were unable to meet bottom-lines through the modelled interventions are predominantly lowland or have little agricultural land. The package of modelled interventions would not be suitable for those areas, and a mix of more suitable interventions (erosion and sediment control activities on farms in the plains, improved earthworks controls, improved stormwater networks, etc.) would be used to achieve the bottom-lines.

The CBA estimated costs based on the most economically efficient intervention, which in many places is afforestation. However, whole farm plans and/or riparian exclusion would also be sufficient to meet the bottom-lines in almost all large catchments. These results indicate that there is a choice about how bottom-lines are met, and the extent to which land use is changed.

Modelled interventions on around 600,000 ha would be adequate to meet the bottom-lines in the majority of catchments. The CBA modelled an additional 400,000 ha of interventions for remaining catchments, without meeting bottom-lines. This second set is primarily in catchments for which the glacial headwaters exception would apply.

Monetised and non-monetised costs

The monetised costs shown in Table 4 represent a major component, and likely the majority, of the anticipated monetary costs of the proposals. They do not include costs related to urban expansion or infrastructure development and operation, as there is insufficient information available to assess these costs at the national level in a monetised way. Urban development case studies provide indicative costs or individual developments,[164] and Table 4 describes these types of costs qualitatively. There will be choices about how costs are distributed.

At present:

- Regional councils and central government subsidise the development, and in some cases implementation, of erosion and sediment control plans in hill country farms.
- Regional councils spend ~$14.5million/year (not including staff time) on erosion-related goods and services.[165]
- National programmes such as the Hill Country Erosion Fund (over $35 million approved between 2019 and 2023) and One Billion Trees support development and implementation of measures to reduce erosion.[166]

The assumption in Table 4 is that monetised costs constitute new spending that is split between regulated parties (landowners/farmers: 50 per cent), regulators (regional councils: 25 per cent) and central government (25 per cent). The proposals will also impose other types of costs on local government, such as for environmental monitoring, plan development, reporting, compliance, and other administrative matters.[167]

[164] Morphum (2019). Sediment Attributes and Urban Development. Literature Review. Prepared by Morphum for the Ministry for the Environment.

[165] Robb, C. & Brown, I. 2018. Regional Sector Capacity and Capability - Erosion and sediment. Report commissioned by Resource Managers' Group.

[166] MPI 2019.

[167] Castalia 2020. Administrative Costs of Proposed Essential Freshwater Package on Regional Councils. Client report prepared for the Ministry for the Environment.

Monetised and non-monetised benefits

The monetised benefits shown in Table 4 represent a significant proportion, but likely not the majority, of the total benefits. This is because the CBA is unable to monetise or quantify a wide range of anticipated benefits. Whereas the costs are mostly up-front (with relatively small ongoing costs), the anticipated benefits are mostly ongoing. Table 6 provides more detailed examples of the types and magnitudes of anticipated benefits.

Table 4 - Summary assessment of proposals' costs and benefits

Affected parties	Comment	Impact[168] (CBA); other	Evidence certainty[169] (CBA); other
Additional costs of proposed approach, compared to taking no action			
Regulated parties (businesses, infrastructure operators, farmers, developers, general public, etc.)	Costs of implementing interventions in order to improve water quality above proposed thresholds such as afforestation costs, soil conservation components in freshwater modules in farm plans, enhanced erosion and sediment control works, staging earthworks for urban development, space-planting pasture hill-slopes, etc.	($2.5 billion); High	(Medium: modelling uncertainty); Low: highly catchment specific
Regulators (local government)	Implementation support subsidies and works that are not required by the regulation but are anticipated to be a major regional council response to the attributes. Mandated new spend relates primarily to planning processes and monitoring and compliance programmes, which is expected to be significantly lower than the monetised cost figure.	($1.3 billion); low	(Low: depends on funding choices); high: variable by region
Wider government (central government and state-owned entities)	New spend in continued/expanded central government support measures like the Hill Country Erosion Fund beyond current mandate; changed practices required of state-owned entities like NZTA and 3 Waters operators.	($1.3 billion); Low apart from state-owned entities, which are included in "regulated parties"	(Low: depends on funding choices); Medium: depends on future policy implement-ation
Wider public, rural and urban communities	These effects are linked explicitly to impacts on regulated parties. Flow-on effects may include impacts on agricultural processors or social changes in hill country communities due to land use change, or effects on housing development costs with attendant impacts on urban communities. See Table 8	Medium (see Table 8)	Medium (see table 8)
Total Monetised Cost	Total figure stems from the CBA results. Cost estimates primarily reflect up-front costs, and these will be implemented over long (25 years+) timeframes.	($5.3 billion);	(Medium: value; low: distribution of costs)
Non-monetised costs	Non-monetised costs described above (everything except land-management and change interventions to achieve bottom-lines per the CBA).	Very high	Low

[168] Costs in parentheses stem only from the CBA (Neverman et al 2019). Other costs represent a synthesis of the information presented in this section.

[169] The evidence certainty text in the parentheses relates solely to monetised costs provided by Neverman et al. 2019. Other text represents the other costs discussed.

Additional benefits of proposed approach, compared to taking no action[170]			
Regulated parties (as above)	Benefits primarily include ETS carbon credits, increased resilience to landslides and associated natural hazards; retention and, in some cases, increases of natural capital stocks; increases in ecosystem services flows (provisioning, regulating, and supporting services); increased recreational and cultural values; improved perception of "100 percent Pure" New Zealand brand image. (CBA, using 6 percent discount rates, shows NPV of $6.4 billion for ETS profits).	($6.4 billion); High	(Medium: uncertainty & inability to quantify or monetise some benefits); High
Regulators (as above)	Avoided costs of degradation and maintenance costs, primarily in relation to natural hazards.	High	Medium
Wider government (as above)	Improved critical infrastructure resilience to natural hazards (eg transport, energy, water); reduced infrastructure maintenance costs (eg port dredging, dam infill, road washout, flood damage); reduced infrastructure operation costs (eg water treatment).	High	Medium
Wider public, rural and urban communities	Reduced risk of flooding; less financial pressure on ratepayers given improved infrastructure resilience to natural hazards, and lower maintenance and operation costs; improved water quality for drinking and recreation (eg swimming and fishing); Improved perception of the farming community as stewards of the land; improved mauri of waterbodies; and more opportunities for food gathering/mahinga kai. The types of benefits accruing to different communities vary. For example, upstream communities may benefit more from avoided costs of infrastructure damage due to landslides, whereas downstream communities may benefit more from reduced flooding costs and biodiversity improvements. (CBA shows NPV of $334 million for benefit of improved visual clarity of waterbodies; $19-22 million for avoided dredging of hydropower reservoirs, $51-154 million of erosion reduction, and carbon benefits ranging from $5-21 billion).	(excluding carbon benefits - $400-$500 million); Very high	Medium
Total Monetised Benefit	Total figure stems entirely from the CBA estimates and the range is driven by the carbon valuation used. Using ETS profits, monetised benefits are approximately $6.8 to $6.9 billion.	($ 5.4 billion – 21. 4 billion)	Medium
Non-monetised benefits	Estimate stems from information in this section and Tables 15 and 16. Benefits are primarily ongoing.	Very high	High

Table 5 – Summary assessment of the proposals' impacts on wellbeing

Indicative costs to wellbeing		
Wellbeing dimension	**Description of impact**	**Scale; timeframe; and affected groups**
Income and consumption	Negative effect on some businesses and communities if the farming, forestry, and construction/development workforce has less disposable income as a result of interventions; financial costs if	Medium or High; Medium and long term;

[170] Benefits in parentheses stem from Neverman et al 2019. Other benefits represent a synthesis of the information presented in this section and table shown in Additional information (6).

	regulated parties choose to participate in regional plan-making processes (submissions, hearings, appeals).	Primarily affects regulated parties and to a lesser extent wider public and communities
Health	Negative effect on wellbeing (anxiety/mental health) if financial costs of interventions affect, or are perceived to affect, farm viability, and if farmers are concerned they do not have the necessary skills to implement interventions or do not believe them to be effective and necessary.[171]	Small; Mainly in the short term and may decrease over time; Primarily affects regulated parties and to a lesser extent wider public and communities
Knowledge and skills	Change to some work/management practices will require re-training of some staff.	Small; Mainly in the short term and may decrease over time; Almost exclusively affects regulated parties
Environment	Risk of continued degradation of water quality in some areas prior to new regional provisions being implemented if the plan change process is lengthy.	Medium; Mainly in the short and medium term; Affects all who receive benefits from the proposals
Indicative benefits to wellbeing		
Wellbeing dimension	**Description of impact**	**Scale; timeframe; and affected groups**
Income and consumption	After interventions have been implemented, reduced financial pressure on ratepayers due to improvements critical infrastructure resilience to natural hazards; reduced infrastructure maintenance costs (eg port dredging, dam infill, road washout, flood damage); Reduced infrastructure operation costs (eg water treatment); tourism sector benefits; improvements to "100% Pure NZ" brand image and flow-on benefits for image-reliant sectors.[172]	Medium; Over the long term; Primarily regulated parties and wider public and communities
Jobs	Increased opportunities for land managers and professionals with soil conservation skills.	Medium; On a continuous basis, but particularly on the short term; Wider public and communities
Health	Positive effect on primary sector wellbeing (sense of self/mental wellbeing) if changing practices build the primary sector's social licence to operate; Reduced risk to health by reducing sediment in waterways (improved water quality for drinking and recreation, and reduced risk of flooding).	Small; Medium and long term; Primarily wider public and communities, to a lesser extent regulated parties

[171] Farmers' mental health: A review of the literature (ACC Policy Team, 2014); https://www.mentalhealth.org.nz/assets/ResourceFinder/wpc134609.pdf; Botha N, Roth H and Brown M 2013. '*The Adaptation of Pastoral Farmers to Environmental Policy Changes: A New Zealand Case Study*.' South African Journal of Agricultural Extension, Vol. 41: 16-25

[172] 10 years of 100% Pure

Knowledge and skills	Higher-skilled workforce: • increased skill-base in primary sector, developers, and 3 waters • upskilled council staff where necessary, and additional jobs may result	Medium; Medium and long term; Primarily regulated parties and regulators
Environment	Retention and, in some cases, increases of natural capital stocks such as biodiversity; increases in ecosystem services flows (provisioning, regulating, and supporting services); Increased recreation/leisure opportunities as a result of reduced sediment impacts.[173]	Large; Medium and long term; Wider public and communities
Cultural identity	Improved perception of the primary sector community as stewards of the land (social licence to operate).[174] Contributes to New Zealanders' cultural identity and values associated with high quality natural environment (particularly water resources);[175] Increased opportunities for food gathering / mahinga kai as a result of improved ecosystem health; Improved mauri of waterbodies and facilitate kaitiakitanga / stewardship roles.	Large; Medium and long term; Primarily wider public and communities, to a lesser extent regulated parties
Safety	Reduced flooding risk and vulnerability; increased societal resilience to natural hazards.	Large; Medium and long term; All parties

[173] Morrison et al 2014.

[174] Clark-Hall 2018.

[175] Stout Research Centre for New Zealand Studies, 2008.

Table 6 - Framework and examples of benefits related to the proposals[176]

Category of effect of sediment	Quantify	Monetise	Link to well-being dimensions	Description
Impacts on Navigational waterways	Harbour dredging – Ports of Auckland Limited holds consents to conduct maintenance dredging of up to 175,000m3 over 5 years (in some locations) and 70,000m3 over 5 years in other locations – this is part of regular operations and not dredging related to capital programmes.[177]	N/A	1, 2, 3, 9, 10	The accumulation of sediment in navigational channels and harbours can affect transport, shipping, fishing, and other uses.
Reservoir impacts		Could be evaluated in a comparable manner to hydroelectric facility impacts described below.	1, 2, 6, 9, 11, 12	Reservoirs and other water storage facilities provide drinking water, flood control, and other benefits. Sediment accumulation affects these abilities. An avoided cost approach could be used to monetise these effects, using the dredging costs as a proxy for the full effect.
Hydroelectric facility impacts*	For example, turbine replacement due to scouring from suspended sediment	**$ 19-31 million depending on the dredging cost and discount rate applied.**[178]	1, 2, 11	Sediment can impose additional treatment costs on hydroelectric facilities. These avoided costs could be used to measure impacts.
Drinking water treatment	Drinking water quality from lakes poor, declining[179]		1, 5, 6, 7, 8, 10, 11, 12	Sediment in the water can diminish water quality and hence increase the treatment costs to turn it into drinking water. These treatment costs could be used to estimate the impacts of improved water quality, and are an avoided cost.
Agricultural water uses		Sediment removal (10,000 m3/year) from one irrigation water scheme on the south island costs $160,000 per year	1, 2, 7, 11	If irrigation water is pulled from waterbodies with high sediment content, it can harm crops and reduce agricultural productivity.
Commercial fishing		$20 million in Marlborough paua fishery decline due to habitat loss, of which much is due to sediment deposition.[180]	1, 2, 7, 8, 10	Sediment in the water can have a negative impact on fish populations through impacts on aquatic habitat. This can affect commercial harvests. Quantification of this effect requires analysis of fishing harvest and sediment inputs.

[176] All categories (far-left column) in bold and with an * have monetised benefit values specific to the policy shown in bold and described in Net Present Value. Figures are from Neverman et al 2019. Other quantified and monetised values should be considered as ongoing costs of degradation that the proposals would reduce to some extent.

[177] Ports of Auckland 2018

[178] Neverman et al 2019

[179] Schallenberg et al 2015

[180] Larned et al 2018

Category of effect of sediment	Quantify	Monetise	Link to well-being dimensions	Description
Recreational fishing	Closure of recreational fishery in Kaipara due to sediment impacts on habitat and recruitment;[181] Noticeable decline in mahinga kai. Indicator of 0.29 (out of 1).[182]		1, 3, 4, 5, 7, 8, 10	Sediment-related reductions in water quality can affect the demand for recreational fishing, as well as the experience of recreational fishing. Recreation demand models could be used to monetise these impacts.
Flood damage		Direct damage costs can be significant, for example, the estimated national cost of direct erosion damage in New Zealand is $38.8 million (1998 dollars).[183]	6, 7, 8, 11, 12	Accumulating sediment in rivers and streams can increase the frequency and severity of floods. If a relationship could be established between floods and sediment, the reduced flood damages could be used to estimate impact.
Water-based recreation	Increase in skin and gut infections (could be monetised given further information).[184]	Recreational use value of the lower waitaki valued at $2 million per year. Preservation of current state of Rakaia and Waimakariri valued at mean of $42 to $43 per household per year.[185]	1, 2, 3, 4, 5, 6, 7, 8, 10, 11	Sediment can reduce the quality of water-based recreation. Stated preference surveys could be used to monetise these impacts.
Reduced aesthetics*		**$334 million (6% discount rate) or $504 million (4% discount rate)**	1, 2, 3, 4, 5, 6, 7, 8, 10, 11	Sediment-related water pollution can make rivers and streams less aesthetically appealing. Stated preference surveys could be used to monetise these impacts.
Water-related non-use impacts	Degradation of natural capital (due to erosion) has contributed to reduced cultural identity and expression.[186]	$4.13 for each 1% increase in proportion of waterbodies that achieve "moderate clarity".[187]	1, 2, 3, 4, 5, 6, 7, 8, 10, 11	People who do not directly recreate in the water may still hold values for clean water. They may value bequeathing good water to future generations, or simply value clean water or a healthy environment. Stated preference surveys could be used to monetise these impacts.
Biodiversity-related impacts	The policy is predicated on the preservation of ecosystem health as measured by in-stream sediment effects on macroinvertebrates and fish. See, for example, Appendices J and I in Franklin et al 2019 for information on the protection for specific taxa and species expected from achievement of proposed bottom-lines and bands.		1, 2, 3, 4, 5, 6, 7, 8, 10	Water quality has a range of impacts on aquatic animal populations. People may hold non-use values for the preservation of species. Stated preference surveys could be used to monetise these impacts.

[181] MPI 2018

[182] MPI 2014

[183] Krause et al 2001

[184] Field & Tunks 2011

[185] Sharp & Kerr 2005

[186] MPI 2012

[187] MPI 2016

Category of effect of sediment	Quantify	Monetise	Link to well-being dimensions	Description
Carbon impacts from ESC practices*		**$5 billion – 31 billion depending on social cost of carbon, ETS price, or discount rate applied.**[188]	1, 2	The mix of ESC practices chosen for the policy option will cause changes in carbon. For example, riparian buffers or afforestation will deploy trees widely, which will reduce carbon.
Carbon impacts from changes in production*		**CBA grouped this category with the one above.**	1, 2	The sediment policy may change the distribution and composition of producers, which can affect carbon emissions.
Reductions in erosion*		**$51 million to 226 million depending on the erosion cost and discount rate applied.**[189]		Erosion is associated with a range of negative outcomes, including reduced agricultural production, an increased risk of landslides, and increased risk of flooding.
Home price increases				Improvements in water quality can produce aesthetic benefits which can improve home prices.
Impacts on threatened and endangered species	See biodiversity-related impacts above			Habitat improvements may help threatened and endangered species. People hold additional values for these species.
Landslide impacts		Costs of shallow landsliding estimated at $250-300 million per annum.[190]		Sediment and erosion policies also decrease the probability of a landslide. This results in both a reduction in damage and a reduction in risk perception.
Health impacts		Death due to landslide is incorporated in the cost value above.		Primary contact recreation can result in illness. Improvements in water quality will decrease the likelihood of sickness.

[188] Neverman et al 2019

[189] Neverman et al 2019

[190] Page 2015.

Analysis of issues arising during consultation for which no change is recommended.

Issue A: Using "limit-setting" or "action-plan" attributes

Submitters (in particular those representing the primary sector) questioned the appropriateness of suspended sediment being a limit-setting attribute rather than an action-plan attribute, and deposited sediment being an action-plan attribute rather than a monitoring requirement due to uncertainty in their management in the face of extreme events and other concerns.

We consider it appropriate for suspended sediment to remain a limit-setting attribute, because:

- suspended sediment is a key driver of ecosystem health degradation
- there is adequate certainty for regulation and for councils to implement limits to achieve suspended sediment thresholds
- short-term natural changes in sediment loading (eg, from extreme events and climate cycles)[191] can be accommodated within the long-term objective to "maintain or improve" the attribute.

We consider it appropriate for deposited sediment to remain an action-plan attribute, because:

- deposited sediment is a critical element of habitat (and the only habitat indicator in the draft NPS-FM)
- links to, and threshold effects on, ecosystem health are clearly established
- standard measurement methods exist
- while clear relationships with land-use management do not exist on a wide scale now, information will improve over time if this characteristic is monitored.

Recommendation A: No change – retain suspended sediment as a limit-setting attribute and deposited sediment as an action-plan attribute as proposed for consultation.

Issue B: The method used to define bottom-lines and bands

Submitters, primarily representing the primary sector, questioned the robustness of the method used to set the proposed bottom-lines and bands. Notably, Dairy NZ submitted detailed technical critiques of the method.

Following consultation, the Ministry commissioned two independent peer reviews of the method.[192] [193]

Both reviewers considered the evidence for proposed bottom-lines to be adequate, clear, and reflective of current knowledge. They considered the evidence for ecological effects between bands to be weaker. The STAG also considered this issue and agreed with the reviewers' assessment.

The bands (unlike the bottom-lines) do not have regulatory effect, but rather provide a basis for communication with communities about the state of waterways.

In this context, we consider the method suitable for development of both bottom-lines and bands.

[191] E.g. see Basher et al (2018)

[192] Closs, 2020. Review of Appendix J, Franklin et al. 2019.

[193] McIntosh, 2020. Review of Appendix J, Franklin et al. 2019

Recommendation B: No change – continue to use the same method for setting suspended and deposited fine sediment bottom-lines and bands.

Issue C: Precision of bands (compared with monitoring methods)

Some submitters considered the attribute bands to be too narrow, since individual observations of the proposed indicators can have measurement error greater than the attribute band range.

Measurement error is of more concern for turbidity than for deposited sediment measures.

- Individual measurement error for the deposited sediment indicator is typically +/-5 per cent.[194] [195] The measurement error is random and not systematically biased, so median values of long-term observations are not expected to be skewed.
- Turbidity measurements can have more error. This issue is discussed further below in (Issue D). We propose to address it by changing the indicator (not the band thresholds).

Recommendation C: No change – continue to incorporate band thresholds as proposed for both suspended and deposited fine sediment.

[194] Franklin et al 2019

[195] NEMS - Water Quality Part 2 of 4: Sampling, Measuring, Processing and Archiving of Discrete River Water Quality Data

Chapter 7: Improving water for contact recreation – Update on Interim Analysis

This section is an update to the corresponding section on pages 164 to 177 of the Interim Regulatory Impact Analysis (available here: https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/interim-regulatory-impact-analysis-for-consultation-essential-freshwater-part-2.pdf).

Summary of policy issue

The high levels of *E. coli* in many rivers and lakes indicate that people who are in contact with the water, particularly where there is a high incidence of ingestion or inhalation of water and water vapour, have an unacceptable risk of infection or illness. This situation is getting worse in some rivers and current direction in regional plans and the NPS-FM is not driving sufficient improvements.

The incidence of water borne notifiable diseases has not changed much over the last ten years. Recreational water contact was the fourth most commonly cited risk factor for campylobacteriosis (6482 cases) in 2017. Recreational water contact is also cited as a risk factor for salmonellosis (1,119 cases), giardiasis (1,648 cases), and cryptosporidiosis (1,192 cases). Health professionals estimate the actual number of cases to be at least ten times higher than the notified cases.[196]

Action for healthy waterways proposed to address this issue by directing regional councils to identify primary contact sites in their regional plans, and improve water quality at those sites so that it is at least better than the proposed national bottom line for *E. coli* set out in proposed Table 23.

Regional councils must give effect to national policy statements in their regional plans. The Minister for the Environment has powers available under the Resource Management Act to address any failure to give effect to national policy statements.

Summary of submissions on topic

Submissions on the draft amendments to the National Policy Statement for Freshwater Management NPS-FM 2017 in the discussion document (for which the interim RIA was completed) raised the following issues and themes:

- Technical concerns with drafting and implementation (surveillance monitoring, two tables for *E. coli*, and notifying the public)
- General support for applying higher standards to places where people swim and recreate, and a desire for this to be applied more widely
- Mixed support for the use of action plans rather than limits to achieve the higher standards, their usefulness in relation to faecal source tracking and targeting solutions, with some concern with enforceability
- Scepticism that the higher standards are correctly targeted or will be effective
- The attribute table thresholds are based on the 2003 guidelines,[197] which are in need of review.

[196] ESR 2019. Notifiable diseases in New Zealand Annual Report 2017.

[197] Ministry for the Environment and Ministry of Health (2003) Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas.

Technical concerns - surveillance monitoring

The NPS-FM 2017 requires councils to increase sampling frequency to daily, where practicable, when weekly surveillance monitoring yields a result more than 260 *E. coli* per 100 ml. This direction was retained in the proposals (draft Policy 3.18(3)). The 2003 Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas refer to results above 260 *E. coli* per 100 ml as the "alert" mode. If *E. coli* levels reach the "Action" mode (above 540 *E. coli* per 100 ml), they recommend that the public is notified that a public health problem exists (540 *E. coli* per 100 ml is the proposed new national bottom line for *E. coli*, and where the public would be notified that a public health problem exists under the proposal).

Councils raised similar concerns during consultation on *Action for healthy waterways* to those raised in 2016 about the high costs of increasing surveillance monitoring microbial monitoring, especially in remote sites or during weekends, relative to the poor information received in terms of health safeguards. The concerns were addressed in 2017 by adding "where practicable" to the policy.

A 2017 NIWA report set out the regional sector's view of current recreational water quality monitoring and reporting requirements and describes some drawbacks of relying on surveillance monitoring. These are that the microbial risk information is retrospective (weekly results are generally not available for at least 24 hours), and the information is spatially and temporally limited (only one or two spots are sampled, rain may have washed more faecal matter since the sample date, or increased faecal matter may no longer be present).[198] Some councils cited this NIWA report in their submission.

Greater Wellington and Auckland council use predictive forecasting to work out expected microbial water quality conditions at a given site or sites, and warn people when there is likely to be an elevated risk of illness caused by contact with water. While, like weather forecasts, predictions inherently carry a degree of uncertainty, their strongest value is that they provide recreational water users with advance warning of the likely risk associated with recreation. These predictive models require significant investment and are not yet ready to apply everywhere as an alternative to surveillance monitoring.

Options to address submitter concerns

1. Add an information note to proposed Policy 3.18(3) in the draft NPS-FM explaining the scope of "where practicable". For example, it may not be practicable to re-sample where primary contact sites are remote.
2. Change proposed Policy 3.18(3) in the draft NPS-FM to require sampling frequency to be increased to daily unless it is impracticable, or the council is satisfied that the elevated results are temporary or the cause is being addressed.

Options analysis

Advantages and disadvantages

Option	Advantages	Disadvantages
1	Provides transparency to councils and communities about the flexibility of returning to remote sites.	Does not address the concern where follow up sampling can be done but where the council already knows the cause of the high result. This may mean

[198] Milne, J.R., Madarasz-Smith, A., Davies, T. (2017) Recreational water quality monitoring and reporting in New Zealand: A discussion paper for Regional and Unitary Councils. NIWA Science and Technology Series Report No. 82.

		the council has to do further sampling that does not provide useful information in relation to protecting public health
2	Removes the high costs related to repeat sampling when the council is satisfied the elevated result is temporary (eg because of rainfall) or the cause is being addressed (eg a pollution incident that has been remedied).	Relies on the council having transparent processes for establishing when elevated results are likely to be temporary. May miss a significant event that allows people to be exposed to unacceptable risk.

Analysis against RIS criteria

Criterion	**3.** Add information note to Policy 3.18(3) about "where practicable"	**4.** Extend Policy 3.18(3) to excuse follow up sampling if the council is satisfied the elevated results are likely to be temporary or are being addressed
Effectiveness	+ More consistent approach to when follow up sampling will not be done if it is impracticable	+ Follow up sampling is only done where necessary
Timeliness	**0** the improvements to the water body are calculated over the bathing season and this change will not affect that	**0** the improvements to the water body are calculated over the bathing season and this change will not affect that
Fairness	+ People would have more information about circumstances when follow up sampling may not occur	+ *E. coli* levels may exceed the alert level but not the action level when the public should be notified that the site is unsuitable
Efficiency	+ Reduces council uncertainty about circumstances when repeat sampling in difficult or remote areas can be omitted	+ Gives councils the ability to reduce high costs related to repeat sampling that is likely to be unnecessary and provide no health benefit
Principles of the Treaty of Waitangi	**0** no change to the policy	- does not promote partnership or protect Māori rights/interests and relationships with their taonga
Te Mana o te Wai	- People may perceive that the essential human health needs are not given sufficient priority	- People may perceive that the essential human health needs are not given sufficient priority
Overall Assessment	+	+

Conclusion: Change the proposal in accordance with both option 1 and option 2.

Technical concerns – two *E. coli* attribute tables

The proposed policy 3.9 in the draft NPS-FM directs regional councils to adopt limits in their regional plan to achieve target attribute states to improve *E. coli* levels in a freshwater management unit (Table 11 of the draft NPS-FM), and to develop action plans to achieve target attribute states at

primary contact sites (Table 23 of the draft NPS-FM). Each table serves a different purpose and each is relevant to managing water quality in terms of *E. coli*. The Ministry will prepare guidance for monitoring and reporting *E. coli* levels at the primary contact sites and across the freshwater management unit, including taking account of weather conditions. The NPS-FM also includes a national target for improving water quality for primary contact. The Ministry currently reports on progress towards this target as part of its annual report. In future, this may be done as part of the regular Environmental Reporting.

Conclusion: Retain both attribute tables.

Technical concerns – notifying the public

Some councils and LGNZ submitted that the duty to notify the public about the unsuitability of water for swimming should remain with district health units or territorial authorities, as recommended in the 2003 guidelines. The general powers of territorial authorities under the Health Act do not constrain the ability of regional councils to inform the public when water sampling indicates a known health risk. Currently, regional councils report elevated *E. coli* results and toxic algae alerts online at: LAWA (scientific data for land, air and water).

Conclusion: Retain proposed Policy 3.18(3)(b) in the draft NPS-FM.

Other themes

Tourism Industry Aotearoa submitted that 11.5 million visitors (both domestic and international) would interact with freshwater through rafting, kayaking, canoeing, jet boating and fishing in 2019, and this was forecast to increase to 11.6 million in 2020. NZ Professional Fishing Guides Association (NZPFGA) research estimates that the economic contribution of guided freshwater fishing to New Zealand ranges from $28.9m (when assessing the direct benefit to the commercial freshwater fishing sector) to $96.6m p.a. when the wider benefit to the tourism industry such as accommodation, transport, food and beverage are also taken into account. If rivers continue to be unsafe for recreational contact, the benefit these industries have from New Zealand's high quality environment risks being reduced.

Applying the national bottom line more widely than identified primary contact sites was assessed and rejected prior to consultation, because it is more efficient and effective to target efforts to improve water quality in regularly-used areas. This targeted approach may be reassessed once studies have re-established the extent of the health risk associated with elevated *E. coli* levels in freshwater. In the meantime, requirements to at least reduce *E. coli* levels in areas that are used less regularly would still apply to recognise the health risk indicated by *E. coli*.

Using an action plan to achieve target attribute states at primary contact sites is appropriate, because it can accommodate possible proactive approaches the councils may need to take to manage sources of *E. coli* and associated pathogens at those sites, including from wild life. Setting these approaches in an action plan allow them to be changed to meet new or changing information.

Scepticism that the higher standards are correctly targeted or will be effective was generally related to the effects of wild life and rainfall runoff. Councils can address the effects of wildlife on *E. coli* levels in their action plans if they determine that there is a public health risk. Reducing instances of elevated *E. coli* levels during and after rainfall will require addressing diffuse pollution in rural areas and sewage overflows in urban areas. Both call for complex and often expensive solutions. The NPS-FM allows these solutions to be developed and set out in action plans, and adapted over time.

The risk that councils would choose to identify few or no primary contact sites in order to avoid improving water quality at the site is likely to be very small. Councils have already identified these sites and report on their suitability for recreation in terms of *E. coli* and toxic algae on the public website Land, Air, Water Aotearoa.[199] New Zealanders have been publicly seeking improvements to water quality in terms of its suitability for recreation since 2013[200] and any amendment to a regional plan that reduces the number of sites is likely to be opposed during the public process of consultation and submissions for the regional plan.

The Ministry is aware of the need to review the 2003 Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas, and has contracted a pilot project to validate methods for a new Quantitative Microbial Risk Assessment (QMRA). A full QMRA is a necessary first step in reviewing the guidelines so that there is appropriate direction in them for monitoring, reporting and controlling the public health risk posed by microbiological contamination of recreational waters.

Conclusion: Retain the proposed policies.

Minor and technical changes

Proposed policy 3.9(2)(a) of the draft NPS-FM directs regional councils to set target attribute states "for attributes relating to the value Human Contact, be above the current state of that attribute" (proposed Policy 3.9 (2)). This is likely to be a drafting error where the intent of the current policy A6(b) in the 2017 NPS-FM was not carried over.

Conclusion: Restore the direction in policy A6(b) in the 2017 NPS-FM to Policy 3.9 (2) of the draft NPS-FM. That is, the target attribute state for *E. coli* can be set at the current state if regional swimming targets have been achieved at the site, or the current state is in the "Excellent" band.

Changes incorporated as a result of public submissions

Rewrite proposed Policy 3.18(3) to require sampling frequency to be increased to daily unless it is impracticable, or the council is satisfied that the elevated results are likely to be temporary, or the cause is being addressed.

Add an information note to proposed Policy 3.18(3) providing examples of where councils could exercise the discretion in not undertaking follow-up sampling.

Additional impact testing to supplement the interim regulatory impact statement

In February 2020, NIWA modelled changes in *E. coli* levels that are likely to occur as result of two of the Action for healthy waterways proposals: the proposed stock exclusion regulations, and the proposed national bottom line for *E. coli* levels at primary contact sites. The modelled scenario for reducing *E. coli* levels was to fence every stream on a pastoral farm upstream of 152 separate primary contact sites in rivers, and compare the results with the reductions that would be achieved by the stock exclusion regulations alone. The modelled results took into account the fencing already required by in regional plans.

The results indicate that if the stock exclusion regulations are made, 22 sites that currently do not meet the proposed national bottom line for *E. coli* would improve to be better than the national bottom line. Another six sites would improve if there was comprehensive upstream fencing in addition to what is proposed under the stock exclusion regulations.

[199] https://www.lawa.org.nz/

[200] See for example, Regulatory impact statement – Amendments to the National Policy Statement for Freshwater Management 2011

The results indicate that comprehensive fencing, in addition to what would be required by the stock exclusion regulations, would not be an effective means to deliver the improvements required to meet the proposed national bottom line for *E. coli*. Instead, councils are more likely to set out actions that allow them identify *E. coli* hot-spots, and take appropriate targeted action.[201] Where critical source areas are on pastoral farms, targeted mitigation and remedial actions could be required in council approve farm plans (this approach was used for pastoral farms in the Rere stream catchment in Gisborne[202]). Other critical source areas would be poorly performing septic tanks, wastewater overflows to stormwater systems, and wild fowl. It is not possible to quantify the costs of mitigating the effects of these sources, and some, like wild fowl, may require the erection of permanent warning signs rather at the site rather than removing the source. The general magnitude of the costs is likely to be medium.

The below table should be read in lieu of the table in the interim RIS:

Summary table of costs and benefits of the preferred approach

Affected parties	Comment:	Impact	Evidence certainty
Additional costs of proposed approach, compared to taking no action			
Regulated parties	one-off costs for specific mitigations (regional councils will target *E. coli* hot spots) One-off upgrade costs of wastewater treatment plants, plus ongoing treatment (unlikely to add significantly to costs)	medium Very low additional costs	Medium Medium
Regulators	Ongoing monitoring costs the same (councils already monitor recreational sites during the bathing season)	None	High
Wider government	No impact		High
Other parties	None identified		High
Total Monetised Cost		medium	
Non-monetised costs		Low	
Expected benefits of proposed approach, compared to taking no action			
Regulated parties	Ongoing benefits of better environmental ratings for farmers	Low	
Regulators			

[201] Essential Freshwater proposed that councils set out the actions they would take to improve water quality in terms of *E. coli* levels in an action plan (proposed policy 3.9).

[202] Trotman, R. July 2017. Engaging farmers in improving water quality: the Rere Story. https://weavingchange.nz/project/rere-water-quality-improvement/

Wider government	Ongoing reduced hospital costs from admissions	Low	Low
Other parties	Ongoing reduced costs on households affected by illness Ongoing use of rivers and lakes for outdoor activities (swimming, kayaking etc., but also picnicking and tramping) Ongoing tourism reputation, particularly for international trout fishers.	Between $10 and $80 million annually low to medium low to medium	medium
Total Monetised Benefit		Between $10 and $80 million annually	
Non-monetised benefits		Low to medium	

Chapter 8: Strengthening Māori values – Update on Interim Analysis

Please note that this section should be read as an update to the corresponding section found at page 178 of the Interim Regulatory Impact Analysis (available here: https://www.mfe.govt.nz/consultation/action-for-healthy-waterways).

Summary of policy issue

Problem / opportunity

New Zealand's freshwater management system, as supported by the NPS-FM, is not fully enabling Māori to participate in freshwater management and freshwater planning processes. An example of this is that Māori values and measures of health are not being adequately identified, reflected or incorporated into regional freshwater planning processes, or considered a priority against other biophysical compulsory values or attributes.[203]

Options consulted on

The Government consulted on two proposals to strengthen Māori values in the NPS-FM. These two proposals are not mutually exclusive:

- Proposal one ('option 3' in the interim RIA): Elevate the status of mahinga kai to a compulsory value. This proposal involves combining the two existing mahinga kai values in the 'other national values' category – 'kai are safe to harvest and eat' and 'kei te ora te mauri (the mauri of the place is intact)' – into a single compulsory value.
- Proposal two ('option 4' in the interim RIA): Strengthen the priority given to tangata whenua freshwater values. This proposal envisages that a new 'tangata whenua freshwater values' category be created in the National Objectives Framework (NOF). When tangata whenua freshwater values are identified by iwi and hapū, these values would be incorporated into regional freshwater planning processes.

Constraints on interim RIA

The interim RIA noted that the preferred options had not been fully impact tested, as we had not had time to talk to regional councils or hapū/iwi to understand the practicalities of implementing each option.[204]

Additional impacts testing has since been undertaken by:

- Engaging with hapū/iwi and regional councils during public consultation, and through targeted hui with Māori and regional council technical experts
- Reviewing the submissions concerning these proposals
- Drawing information from the projects contracted by MfE to assess the impacts of the proposals on regional councils and tangata whenua.

This information, which is set out in the following sections of this document, includes:

- Preferred options of hapū/iwi and regional councils, including whether attributes for any compulsory Māori values should be set nationally or determined locally
- The benefits and costs to hapū/iwi and regional councils

[203] Tipoki, V, Campbell, L, Tovell-Soundy, C, Milner, D (2019). *Scoping report – issues and options for incorporating Māori values and outcomes in freshwater management planning, decision-making and implementation*. Wellington: Ministry for the Environment. 26-27; Ministry for the Environment (2017). *National Policy Statement for Freshwater Management Implementation Review: National Themes Report*. Wellington: Ministry for the Environment. 37-41.

[204] Interim RIA. 180.

- The current capacity and capability barriers faced by hapū/iwi and regional councils, and options to address these.

Updated views from advisory groups and the IAP

KWM

The KWM's position on these proposals was set out in its letter to Minister Parker dated 29 August 2019 and its submission on the Action for healthy waterways Package.[205] In sum, KWM:

- Primarily supported proposal one, and only supported proposal two as a supplement to proposal one
- Recommended that attributes for Māori values be developed locally by tangata whenua rather than being set nationally.

In their letter to Minister Parker dated 6 March 2020, KWM noted that only tangata whenua can identify their freshwater values. They stressed that tangata whenua need to be supported and resourced by regional councils to undertake this work, in the same way that regional councils contract other freshwater experts.[206]

FLG

The FLG supported making mahinga kai a compulsory value in the NPS-FM (proposal one), alongside fishing/food gathering.[207]

STAG

Commenting on proposals to strengthen Māori values was largely outside of the STAG's mandate. However, they did recommend amending the NPS-FM to better bring mātauranga Māori into the management framework by supporting the development of mātauranga-based indicators and facilitating better engagement between scientists and kaitiaki in freshwater monitoring and management.[208]

RSWS

The RSWS did not comment on the two proposals.

IAP

The IAP support elevating mahinga kai to a compulsory value. They also recommend removing the existing requirement to engage with communities and tangata whenua at every stage of the NOF process.[209]

Summary of submissions

In total, 3851 submitters commented on the proposals to strengthen Māori values. This included 397 unique submissions and 3454 pro-forma submissions prepared by Greenpeace.

Submitters overwhelmingly supported strengthening Māori values in the NPS-FM. Most submitters supported proposal one, while a smaller number supported implementing both proposals. The level

[205] Letter from KWM to Minister Parker on the Essential Freshwater package, 29 August 2019, paras 4-8; KWM submission on Action for healthy waterways (no. 2139), paras 58-60.

[206] Letter from KWM to Minister Parker on the Essential Freshwater package, 6 March 2020, paras 11-12

[207] Report of the Freshwater Leaders Group to the Ministry for the Environment, July 2019. 16.

[208] Freshwater Science and Technical Advisory Group report to the Minister for the Environment, June 2019. 15-16.

[209] Essential Freshwater: Report of the Freshwater Independent Advisory Panel, 27 February 2020. 35-36, 47

of support for proposal two by itself was negligible, and many submitters raised concerns about its lack of clarity and practicability.

The issues raised most frequently by submitters about the proposals were:

- Tangata whenua and regional councils must work together to identify, develop, implement and monitor Māori freshwater values for their awa
- Additional direction is required in the NPS-FM to achieve the proposals, in particular in section 3.3 of the new NPS-FM

Submitters also made the following comments about implementation support:

- Tangata whenua will need to be sufficiently resourced to implement the proposals
- Implementation support tools, such as guidance and kaupapa Māori frameworks and resources, are required
- Regional councils will require additional resourcing to implement the proposals

See the summary of submissions for more information.

Options analysis

An initial analysis of the two proposals was undertaken as part of the interim RIA.[210] We are now in a position to refine this analysis, based on the wealth of information we have received through public submissions, an independent assessment of the impacts of the proposals commissioned by the Ministry[211], and our own further analysis.

We have included as an additional criterion in our analysis the relevant recommendations of the Waitangi Tribunal in its report on stage two of its inquiry into claims concerning freshwater and geothermal resources (Wai 2358).[212]

We have also assessed the IAP's recommendations against these criteria.

[210] Interim RIA. 181-185.

[211] Poipoia Ltd., Essential Freshwater - Action on Healthy Waterways: Impacts on Māori Values (February 2020). 27-30.

[212] Waitangi Tribunal, *The stage two report on the national freshwater and geothermal resource claims* (Legislation Direct, 2020). 562.

Criterion	Proposal one: elevate mahinga kai to a compulsory value	IAP's proposal: elevate mahinga kai to a compulsory value, but remove the existing requirement to engage with communities and tangata whenua at every stage of the NOF process	Proposal two: Amend the NPS-FM to provide for a 'tangata whenua freshwater values' category of value in the NOF
Effectiveness	++ Provides strong direction to regional councils and compels regional councils to incorporate at least one Māori value (mahinga kai) into regional freshwater planning. Mahinga kai is a broad and multi-faceted indicator, which will ensure that a wide variety of quantitative and qualitative Māori measures of health are incorporated into regional freshwater planning. There are significant capacity and capability issues which may impact on the ability of regional councils and iwi/hapū to implement the proposals.	+ Provides direction to regional councils and compels regional councils to incorporate at least one Māori value (mahinga kai) into regional freshwater planning. Mahinga kai is a broad and multi-faceted indicator, which will ensure that a wide variety of quantitative and qualitative Māori measures of health are incorporated into regional freshwater planning. There are significant capacity and capability issues which may impact on the ability of regional councils and iwi/hapū to implement the proposals. The overall effectiveness of this option is offset by the lower engagement requirements.	++ Provides a clear mechanism for incorporating Māori values and measures into freshwater planning processes. This also sets a clear expectation that regional councils must incorporate Māori values into regional freshwater planning processes, where hapū/iwi have identified values and are able to develop the information required by the NPS-FM. There are significant capacity and capability issues which may impact on the ability of regional councils and iwi/hapū to implement the proposals.
Timeliness	0 Provides greater certainty about the process required for implementing the NPS-FM. Implementation may be resource intensive.	+ Will require less time and resources to implement given that less engagement will be required.	0 Timeliness will depend on local priorities and the development of information to satisfy the NPS-FM requirements. Implementation may be resource intensive.
Fairness	+ Improves the ability of Māori to input their mahinga kai values into regional freshwater planning processes. This will mean that mahinga kai is managed for and monitored. This addresses part of the problem that biophysical measures are often prioritised over Māori measures, which improves fairness by increasing Māori involvement in freshwater management. Enables tangata whenua to manage fresh water in accordance with Māori values and tikanga as opposed to being subject solely to western values and processes Enhances mātauranga Māori, enabling the collection of data to better inform kaitiaki decisions and a more holistic, less siloed approach Supports the mana motuhake and mātauranga of iwi and hapū by leaving attributes to be determined locally Enhances te mauri o te wai	0 Some improvement in the ability of Māori to input their mahinga kai values into regional freshwater planning processes, but this is offset by the lower engagement requirements. Knowledge of Māori values is typically local and site specific, and is held by iwi and hapū in accordance with tikanga Māori. Failing to work collaboratively with tangata whenua at each stage would require regional councils to substitute their own knowledge for that held by tangata whenua, which would be inappropriate.	+ Improves the ability of Māori to input their values into regional freshwater planning processes. This addresses part of the problem that biophysical measures are often prioritised over Māori measures, which improves fairness by enabling better uptake of Māori values informing freshwater management. Enables tangata whenua to manage fresh water in accordance with Māori values and tikanga as opposed to being subject solely to western values and processes Enhances mātauranga Māori, enabling the collection of data to better inform kaitiaki decisions and a more holistic, less siloed approach Supports the mana motuhake and mātauranga of iwi and hapū by leaving values and attributes to be determined locally Enhances te mauri o te wai

Criterion	Proposal one: elevate mahinga kai to a compulsory value	IAP's proposal: elevate mahinga kai to a compulsory value, but remove the existing requirement to engage with communities and tangata whenua at every stage of the NOF process	Proposal two: Amend the NPS-FM to provide for a 'tangata whenua freshwater values' category of value in the NOF
Efficiency	++ Regional Councils are often uncertain about how to incorporate, reflect and measure Māori values and mātauranga Māori. Providing direction and outlining central government expectations for engagement to councils in this area will improve efficiency. Enables tangata whenua to have immediate input and effect into freshwater management due to the existing knowledge systems and guidance around mahinga kai that has been established through the NPS-FM 2017 and elsewhere Submitters suggested that further clarity is needed on how regional councils and tangata whenua are expected to work together to implement this option. This option is likely to increase costs associated with engagement, capacity and capability and overall resourcing.	+ Likely to be less resource intensive given that less engagement will be required. Not requiring engagement at every step of the NOF process will have a negative impact on the ability of tangata whenua to incorporate their views into freshwater management and planning.	- While this option potentially provides for a wider range of Māori values, regional councils may be unsure of how to incorporate these values into regional planning. Flexibility may also increase uncertainty. Submitters raised concerns about the lack of clarity and feasibility of this option. This option is likely to increase costs associated with engagement, capacity and capability and overall resourcing.
Principles of the Treaty of Waitangi	+ Promotes greater participation of Māori in freshwater management. Greater involvement allows for Māori to provide input and inform councils about their values, measures of wellbeing and mātauranga, which is critical to actively protect Māori interests.	- Does not substantially increase the participation of tangata whenua in freshwater management, nor the active protection of their freshwater taonga. Not engaging at every stage would miss an opportunity to strengthen Māori involvement in freshwater management, in accordance with Te Mana o te Wai and sections 6-8 of the RMA. The importance of involving tangata whenua at every stage was one of the main issues raised by submitters.	+ Promotes greater participation of Māori in freshwater management. Greater involvement allows for Māori to provide input and inform councils about their values, measures of wellbeing and mātauranga, which is critical to actively protect Māori interests.
Te Mana o te Wai	+ Mana whakahaere: This option strengthens the ability of tangata whenua to identify their own freshwater values and ensure that these are reflected in regional councils' decision-making. However, it does not substantially provide for the ability of tangata whenua	0 Mana whakahaere: This option has the potential to strengthen the ability of tangata whenua to identify their own freshwater values and ensure that these are reflected in regional councils' decision-making. However, removing the requirement to engage at every step reduces the ability to guarantee this outcome.	+ Mana whakahaere: This option strengthens the ability of tangata whenua to identify their own freshwater values and ensure that these are reflected in regional councils' decision-making. However, it does not substantially provide for the ability of tangata whenua to exercise their authority in governance and decision-making.

Criterion	Proposal one: elevate mahinga kai to a compulsory value	IAP's proposal: elevate mahinga kai to a compulsory value, but remove the existing requirement to engage with communities and tangata whenua at every stage of the NOF process	Proposal two: Amend the NPS-FM to provide for a 'tangata whenua freshwater values' category of value in the NOF
	to exercise their authority in governance and decision-making. Kaitiakitanga: This option strengthens the ability of tangata whenua to exercise their inherited obligations to preserve, restore and enhance their freshwater taonga for future generations. Manaakitanga: This option strengthens the ability of tangata whenua to protect their values, which will increase their ability to draw upon traditional species to manaaki manuhiri.	This option does not substantially provide for the ability of tangata whenua to exercise their authority in governance and decision-making. Kaitiakitanga: This option may strengthen the ability of tangata whenua to exercise their inherited obligations to preserve, restore and enhance their freshwater taonga for future generations. Manaakitanga: This option strengthens the ability of tangata whenua to protect their values, which will increase their ability to draw upon traditional species to manaaki manuhiri.	Kaitiakitanga: This option strengthens the ability of tangata whenua to exercise their inherited obligations to preserve, restore and enhance their freshwater taonga for future generations. Manaakitanga: This option strengthens the ability of tangata whenua to protect their values. This may enhance their ability to draw upon traditional species to manaaki manuhiri, although this is not explicitly part of this option.
Wai 2358	++ The Tribunal recommended developing attributes and bottom-lines for the mahinga kai value in the NOF. This option would make mahinga kai compulsory, but with attributes determined locally rather than set nationally.	+ The Tribunal recommended developing attributes and bottom-lines for the mahinga kai value in the NOF. This option would make mahinga kai compulsory, but with attributes determined locally rather than set nationally. The ability of tangata whenua to participate in this process will be reduced by removing the requirement to engage at each step of the NOF process.	+ This option does not make mahinga kai compulsory, although it provides space for hapū/iwi to identify mahinga kai as a value in each FMU where it is relevant.
Overall Assessment	++ Overall, this option would be an improvement to the status quo. It largely addresses the problem definition, and it does not prevent other values from being identified.	+ Overall, this option would be an improvement to the status quo. It compels regional councils to incorporate at least one Māori value into freshwater planning, but it does not require regional councils to engage comprehensively with tangata whenua in doing so.	+ Overall, this option would be an improvement to the status quo. It potentially allows for a wider set of values to be identified, but it also provides less certainty.

Changes incorporated as a result

We believe that proposal one – elevating mahinga kai to a compulsory value – is the best option for enabling Māori values and measures of health to be better identified, reflected and incorporated into regional freshwater planning processes, and balancing out biophysical compulsory values or attributes. We agree with submitters that further clarity needs to be provided on how regional councils and tangata whenua are meant to work together to implement this proposal.

We do not believe that a separate 'tangata whenua values' category in the NPS-FM is the best mechanism to strengthen Māori values in the NPS-FM. However, we believe it is important to ensure that regional councils and tangata whenua can still collaboratively identify other values in each FMU where required.

Similarly, we also do not believe that the IAP's recommendation to remove the requirement for regional councils to engage with tangata whenua at each stage of the NOF process will help to resolve the problem definition.

We therefore recommend proceeding with proposal one, with some refinements to clarify the policy intent. These are as follows:

- Removing the word 'indigenous' from the definition of mahinga kai
- Directing regional councils to work with and enable tangata whenua to identify, develop, implement and monitor Māori freshwater values, and incorporate them into freshwater management and decision-making
- Establishing a clear process for how regional councils are expected to do this.

These are discussed further below.

These recommendations were developed in collaboration with a KWM sub-group. However, as at the time of writing this (early March 2020), the KWM had not agreed whether it supported these recommendations. The KWM's stated position on the proposals to strengthen Māori values is summarised above.

Elevate mahinga kai to a compulsory value and remove the word 'indigenous' from the definition

We recommend proceeding with proposal one, with one minor change to the definition of mahinga kai: removing the word 'indigenous' to reflect the fact that some introduced species are used as mahinga kai (such as watercress). Attributes and bottom-lines should be determined locally, which can be supported by implementation tools and frameworks developed nationally (see the section below on implementation support). This change is merely intended to clarify the intent of the existing mahinga kai definition.

Some submitters have questioned whether all aspects of the mahinga kai definition are within regional councils' control (especially 'intergenerational knowledge transfer' and 'kei te ora te mauri'). We do not consider this is sufficient reason to remove these parts of the description, which have been in the NPS-FM since 2014. Regional councils and tangata whenua can collaboratively develop attributes which draw upon the description that are measurable and achievable. Some iwi and hapū have already done that. Te Atiawa ki Whakarongotai have worked with Greater Wellington Regional Council to identify various quantitative and qualitative attributes for mahinga kai that include measurements of intergenerational knowledge transfer and Māori involvement in decision-making.[213] Other councils have adopted values and measures such as mauri, kaitiakitanga, wairua, mana and

[213] *Options to provide for compulsory Māori values of freshwater health,* Kāhui Wai Māori briefing to Minister Parker, 21 June 2019

Tauranga waka.[214] It is also worth noting that a similar number of submitters supported the definition as-is.

A small number of submitters have suggested that national attributes and bottom-lines be set in the NPS-FM for a compulsory mahinga kai value. While some of the existing national attributes (such as *E.*coli) may be applicable to mahinga kai in some circumstances, we believe that setting national attributes would be contrary to one of the key intentions of the policy, which is to better enable Māori to participate in freshwater management and planning processes. It would remove an opportunity to recognise the mana whakahaere of iwi and hapū by allowing them to identify attributes locally. Knowledge of mahinga kai is typically local and site specific, and is held by iwi and hapū in accordance with tikanga Māori. Nationally-set attributes would not account for this local variation. Finally, developing new national attributes would also take a significant amount of time and resources, which could delay the implementation of the package.

A small number of submitters have suggested that the definition of mahinga kai be determined locally. While this would provide an additional opportunity for tangata whenua to exercise their mana whakahaere, we believe that this would not provide the degree of clarity and direction that the proposals aim to address. The definition itself is also broad enough to encompass a diverse range of local practices and customs. Such variations can also be catered for by the ability to define environmental outcomes and attributes locally.

A handful of submitters expressed concern that making mahinga kai compulsory would require private landowners to provide access to mahinga kai sites on their properties. One submitter questioned whether this would also make landowners responsible for health and safety matters. These proposals are not intended to require access across private land; indeed, this would be beyond what can be directed through an NPS.

We no longer believe that a separate 'tangata whenua values' category in the NPS-FM will be an effective mechanism to strengthen Māori values in the NPS-FM. However, there remains a lack of direction and clarity in section 3.3 of the NPS-FM on how regional councils are expected to identify and reflect tangata whenua values. In addition, some submitters asked the Government to consider creating other compulsory Māori values, such as kaitiakitanga, mahi mara, and wai tapu. While we do not recommend creating any additional compulsory Māori values other than mahinga kai, there needs to be a process for regional councils to work with and enable tangata whenua to identify other values where relevant. The following recommendations address this.

Direct regional councils to work with and enable tangata whenua to identify, develop, implement and monitor Māori freshwater values, and incorporate them into freshwater management and decision-making

The intent of the two proposals was that Māori would play the lead role in identifying, developing, implementing and monitoring Māori freshwater values (compulsory or otherwise) for their awa. The current direction in the NPS-FM for Māori value setting (section 3.3(2)(b)-(c)) does not provide for this level of involvement for tangata whenua. It directs regional councils to take reasonable steps to:

- Identify tangata whenua values and interests in relation to waterbodies and freshwater ecosystems
- Reflect those values and interests in the management of, and decision-making regarding, the waterbodies and freshwater ecosystems in the region.

[214] Submission of Nelson City Council (no. 2108)

We recommend that the policy be made more directive to clarify the intent of the proposals, given that this was a common theme raised by submitters. To this end, the duty on regional councils to take reasonable steps should be framed as follows:

- Work with and enable tangata whenua to identify, develop, implement and monitor Māori freshwater values and interests in relation to waterbodies and freshwater ecosystems
- Incorporate those values and interests in the management of, and decision-making regarding, the waterbodies and freshwater ecosystems in the region.

This would signal to regional councils that the Government expects them to work collaboratively with Māori to identify, develop, implement and monitor Māori freshwater values, and to provide some form of active support to facilitate this.

Establish a process for regional councils outlining how they are expected to work with and enable tangata whenua in the Māori value setting process

We recommend that a process be included in section 3.3 of the NPS-FM that provides clear direction to regional councils on how they are expected to work with and enable tangata whenua in the Māori value setting process. This process would make the policy intent explicit, and acknowledge that tangata whenua are the knowledge holders about Māori freshwater values in their awa.

The process would require regional councils to:

1. Enable and support tangata whenua in each FMU to:
    a. Identify any additional values that tangata whenua wish to implement which are not captured under the mahinga kai value definition
    b. Describe the desired environmental outcomes for each value
    c. Identify attributes for each value (including the mahinga kai compulsory value), as well as the current and target attribute states
2. Work collaboratively with tangata whenua in each FMU to:
    a. Develop action plans for achieving target attribute states (where applicable)
    b. Develop a monitoring strategy that:
        i. Identifies sites to be used for monitoring attributes
        ii. Establishes methods to monitor progress towards achieving target attribute states and desired environmental outcomes
        iii. Establishes a process to develop action plans where there is a trend indicating deterioration in any attribute state
        iv. Ensures that this information is used appropriately, and that agreed safeguards are applied to protect customary knowledge (such as mahinga kai sites) and intellectual property rights.
    c. Develop a process for this information to contribute to regional council's annual reporting.

This direction clarifies that regional councils must empower tangata whenua to identify the values, attributes and outcomes that are important to them, and to work collaboratively with them to figure out how these values and attributes will be implemented and monitored. This process largely mirrors the steps set out in the NOF. The main difference is that it centres the role of tangata whenua in acknowledgement of their expertise as the knowledge holders for their freshwater values.

This direction also achieves the policy intent of both proposal one and two, in that it enables tangata whenua to identify values other than mahinga kai where relevant in each FMU. Furthermore, it supports the stronger engagement directions in the Te Mana o te Wai proposals.

While this process is designed to allow regional councils and tangata whenua to work more collaboratively, final decisions on the contents of regional plans will still need to be made by elected councillors. However, notified regional plans will need to go to the new freshwater hearing panels before entering into force. These panels will be tasked with assessing how well these plans give effect to national policy statements, including the NPS-FM. If tangata whenua do not believe that the Māori value policies have been given effect to, they will be able to file submissions to this effect.

Further information on potential costs

The interim RIA provided some information on the costs that hapū/iwi and regional councils may incur as a result of our recommended option.[215] This information, along with additional analysis, is outlined below.

Potential additional costs to tangata whenua

- Developing a kaupapa-Māori monitoring framework, which sets out Māori values, attributes, and associated information, could cost between $40,000 and $80,000 per iwi or hapū. This would be a one-off cost in the early stages of implementing the NPS-FM.[216] This cost may be offset by the fact that there are already a considerable number of Māori monitoring frameworks in existence, such as the Cultural Health Index and the Mauri Compass.[217] Tangata whenua may decide to utilise these frameworks, or to customise them to meet their requirements.
- Undertaking monitoring (to measure the attributes identified at a regular interval) could cost between $30,000 and $50,000 annually per FMU.[218]
- Engaging or employing Māori technical experts to undertake the value setting process and advise on the development of regional plans could cost $500,000 annually per region where there are a large number of iwi and hapū.[219]

Regional councils may opt to meet some or all of these costs in order to meet the policy requirement to work with and enable tangata whenua. However, many regional councils have a limited rating base to draw on. Some of these costs could be met by a robust implementation support package from central government (see below).

Potential additional costs to regional councils

- Regional councils will likely need to employ more in-house kaupapa Māori specialists. The interim RIA suggested that this would require employing an additional 1-2 FTE per region, at a cost of $90,000 to $200,000 annually. A draft of a report commissioned by MfE on the impacts of the proposals on regional councils extrapolated this cost to $6,685,980 nationally on the basis of an additional 1.5FTE per region.[220] Further information from one regional council suggested they may need to employ up to 3 additional FTE.[221] It is possible that there may be a shortage of suitably qualified and/or experienced individuals to meet this demand,

[215] Interim RIA. 187-189.

[216] Email advice from regional councils

[217] Rainforth, H. J. & Harmsworth, G. R. (2019). *Kaupapa Māori Freshwater Assessments: A summary of iwi and hapū-based tools, frameworks and methods for assessing freshwater environments*. Perception Planning Ltd.

[218] Email advice from regional councils

[219] Email advice from regional councils

[220] Castalia, Administrative Costs of Proposed Essential Freshwater Package on Regional Councils, 14.

[221] Email advice from regional councils

which would require councils to invest time in developing the capacity of new staff. However, we have no quantifiable data on this.

- Regional councils will need to undertake more intensive engagement with tangata whenua. The Local Government New Zealand submission estimates that the current costs for regional councils to work with tangata whenua to identify values are between $20,000 and $50,000 per FMU where there is a single iwi or established grouping.[222] However, this engagement should already occurring as part of the current NPS-FM requirements. Additional meetings above the current baseline could cost $1,000 - $4,000 per meeting, or $35,000 per iwi.[223]

These staffing and engagement costs are shared with the Te Mana o te Wai recommendations – that is, they do not just apply to the recommendations to strengthen Māori values. They are also likely to be proportionate to the number of iwi and hapū in each region / FMU.

Central government

Central government is intending to prepare a robust implementation support package with Māori and regional councils. While this is not an outcome of the proposals, it is designed to ensure that the proposals are implemented in a timely fashion and their intent is upheld. Some examples of what this could involve are listed further below in this section.

Implementation

Our recommendations will require regional councils to undertake more robust and ongoing engagement with tangata whenua in each FMU. The extent of this additional engagement will vary between regional councils because:

- Some regional councils are already undertaking collaborative value setting processes with tangata whenua, including a commitment of human and financial resourcing – for example, the Whaitua process being run by Greater Wellington Regional Council.
- There are already a number of kaupapa Māori freshwater assessment tools and frameworks in existence, although the extent to which regional councils are using them varies.[224]
- Regional council and tangata whenua capacity and capability varies from region to region. Some regional councils have dedicated teams or staff members focused on Māori engagement, developing mātauranga Māori and/or providing advice to farmers on upholding Māori values, while others only have one or two staff members. Similarly, some iwi are better resourced than others through having concluded Treaty settlements with the Crown, or are funded by regional councils to participate in freshwater management processes.[225]
- Some regional councils have already made significant progress in carrying out the value-setting process for FMU within their regions, while others have not.[226]
- The number of iwi and hapū in each FMU varies considerably.

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[222] Local Government New Zealand submission (no. 2284). Appendix 4, 76.

[223] Email advice from regional councils

[224] Rainforth, H. J. & Harmsworth, G. R. (2019). *Kaupapa Māori Freshwater Assessments: A summary of iwi and hapū-based tools, frameworks and methods for assessing freshwater environments*. Perception Planning Ltd.

[225] National Monitoring System data for 2017/18 indicated that 54% of local authorities had a budgetary commitment to assist iwi/hapū participation in regional policy statement and plan-making processes. However, the 2012 Kaitiaki Survey run by Te Puni Kōkiri found that a large proportion of those surveyed do work that is mostly unpaid. We have also heard from tangata whenua and regional councils that iwi should not be expected to use their Treaty settlement money to participate in freshwater management processes.

[226] Ministry for the Environment (2017). *National Policy Statement for Freshwater Management Implementation Review: National Themes Report*. Wellington: Ministry for the Environment.

While implementation support planning is still in its early stages, we have identified some initial projects that we believe will support the proposals to strengthen Māori values. These represent our preliminary thinking only. We intend to work with Māori and regional councils to collaboratively identify a range of implementation support options that will support them in carrying out these proposals. We also recently received a scoping report from Perception Planning which outlines a number of options for incorporating Māori values and outcomes in freshwater management planning, decision-making and implementation.[227]

Develop a national toolbox for Māori freshwater values and measures

The purpose of this toolbox would be to collate existing information on Māori freshwater values and measures to assist regional councils and tangata whenua to implement the NPS-FM in each FMU for Māori freshwater values (compulsory or otherwise). It could:

- Identify existing examples of Māori values and attributes in regional plans, as well as other potential values that could be drawn from tikanga Māori
- Indicate potential overlaps between Māori freshwater values and other values, in particular the ecosystem and human health values (including the new and existing biophysical attributes in the NPS-FM, such as *E. coli*, as well as monitoring methods and practices)
- Compile an updated list of kaupapa Māori-based freshwater monitoring frameworks, tools and report cards
- Identify examples of collaborative value setting with Māori, such as the Whaitua process carried out by Greater Wellington Regional Council
- Outline a step by step process for regional councils to work with tangata whenua to identify, develop, implement and monitor Māori freshwater values in each FMU, with templates if required.

A national toolbox would also assist regional councils to implement section 3.13 of the NPS-FM, which carries over an existing requirement that monitoring methods must include mātauranga Māori.

The toolbox would not be a mandatory tool or an attempt to impose a one-size-fits-all approach. This would be contrary to the policy intent. Rather, the toolbox would be intended solely as an advisory tool. It is anticipated that tangata whenua who are already actively participating in the NPS-FM process, and/or who have developed their own tools and frameworks, may not find a national toolbox useful.

Other implementation support tools

Submitters requested guidance and/or support on the following areas:

- How the Crown expects regional councils to collaborate with tangata whenua to meet its delegated Treaty responsibilities, based on Cabinet's agreed Guidelines and Framework for Engaging with Māori and Partnership Principles[228]
- How regional councils can positively collaborate with multiple tangata whenua groups within the same FMU
- How regional councils can engage with tangata whenua to identify opportunities to enter into joint management agreements or transfers of authority. This guidance could compile

[227] Tipoki, V, Campbell, L, Tovell-Soundy, C, Milner, D (2019). *Scoping report – issues and options for incorporating Māori values and outcomes in freshwater management planning, decision-making and implementation*. Wellington: Ministry for the Environment.

[228] CAB-18-MIN-0456 and CAB-19-MIN-0077 refer

information on existing co-governance and co-management arrangements, how they have been implemented, and their impacts.

These could build on existing guidance that was produced to support the implementation of the current NPS-FM.[229]

It is worth noting, however, that at a hui with regional council technicians on 10 February 2020, attendees strongly advised that further guidance will be of limited use to regional councils. Instead, they recommended that central government provide funding to tangata whenua to support the implementation of the proposals.

In addition to (or perhaps as part of) the national toolbox, we could explore the idea of developing a national 'report card' or report card template for monitoring mahinga kai. This could outline some of the key shared indicators for mahinga kai, similar to the ecosystem health report card. It could also compile existing report cards, such as the one developed by the Waikato River Authority.[230]

It may also be useful to develop a digital hub where tangata whenua can share their knowledge, experiences and resources regarding freshwater planning processes. This would allow Māori technicians and kaitiaki to share in the journey of identifying, developing, implementing and monitoring Māori values.

MfE staff could also make themselves available to answer implementation questions and to facilitate the sharing of knowledge (either through the digital hub or some other channel), or Māori freshwater technical experts could be contracted to do this.

These tools do not necessarily apply only to Māori freshwater values – they could apply to the entire freshwater package.

Resourcing

We consider that resourcing for tangata whenua to participate in freshwater management processes will continue to remain a key issue until a source of substantial and ongoing funding is provided. There is a risk that the proposals to strengthen Māori values will not be achievable by 2025 without some effort to address this issue.

We will gather further information to quantify the costs that tangata whenua incur across the entire freshwater management process – from reviewing resource consents, to participating in plan drafting, to performing monitoring, to participating in hearings processes. We will continue to advise Ministers about potential options for central government to meet some of these costs.

If central government does not meet some of the costs likely to be incurred by tangata whenua, there may be an expectation that regional councils are required to meet them. The limited rating base of some regional councils will make it difficult for them to do so. While some regional councils already have a budgetary commitment to assist tangata whenua participation in regional policy statement and plan-making processes, a large number of iwi and hapū are not compensated for most of their work.[231]

This resourcing question is also relevant to the Te Mana o te Wai proposals.

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[229] Ministry for the Environment. 2018. *A Guide to Communicating and Managing Uncertainty When Implementing the National Policy Statement for Freshwater Management 2014*. Wellington: Ministry for the Environment; Suiiner J., Samarasinge O., Newton M. (2014). *Tools for working with freshwater values*. Wellington: Ministry for the Environment.

[230] http://versite.co.nz/~2016/19099/

[231] See the footnote above regarding the data from NMS

Compliance with Treaty settlement commitments

Our overarching analysis indicates that the proposals to strengthen Māori values are consistent with the Crown's Treaty settlement commitments to 'have particular regard to' the intrinsic values, objectives and strategies of Waikato-Waipā River iwi, Whanganui River iwi, and Ngāti Rangi. Furthermore, we anticipate that they may provide one mechanism by which these values, objectives and strategies could be provided for through regional plans.

Chapter 9: Te Mana o te Wai – Update on Interim Analysis

This section is an update to the corresponding section on pages 192-206 of the Interim Regulatory Impact Analysis (available here: https://www.mfe.govt.nz/more/briefings-cabinet-papers-and-related-material-search/regulatory-impact-statements/interim*).*

Summary of policy issue

Problem/opportunity

The concept of Te Mana o te Wai was incorporated into the NPS-FM in 2014 and strengthened in the NPS-FM 2014 (2017 amendment). The 2017 amendments provided further clarity for Te Mana o te Wai as a concept[232] and elevated it to an objective, requiring that regional councils 'consider and recognise Te Mana o te Wai in the management of fresh water'.[233] This was a result of work between the Ministry and the Iwi Leaders Group (ILG).

Following these changes, we heard that practitioners considered the directions of Te Mana o te Wai to be unclear[234]. The connections between the directions in the NPS-FM and Te Mana o te Wai were not clear.

Additionally, the RMA provides mechanisms for Treaty partnership with Māori in freshwater governance, but these have not been widely used. Direction in the NPS-FM for councils to engage with iwi/hapū has been poorly implemented in some regions. Our knowledge on this problem has been reinforced by submissions on the proposals.

Although the RMA refers to the sustainable management of natural resources, local actions have tended to focus on the economic benefits of water use and have contributed to a continuing trend of rapidly decreasing water quality.

What is Te Mana o te Wai?

Prior to consultation, officials and Te Kāhui Wai Māori (KWM) worked together to establish a shared understanding of Te Mana o te Wai (the mana/authority of the water) and what the concept would require in practice. This work aimed to build on the previous work on Te Mana o te Wai in the NPS-FM by the Iwi Leaders Group (ILG) and the Ministry.

Te Mana o te Wai is a Te Ao Māori concept. It refers to the essential value of water and recognises that when we protect the health of freshwater, the health and wellbeing of the wider environment and communities is ensured. It is a concept that upholds New Zealanders' special connection with freshwater.

In the freshwater management system, the Ministry and members of the KWM described Te Mana o te Wai as a framework that establishes a set of guiding principles and hierarchy of obligations.

These principles are:

Mana whakahaere	the power, authority and obligations of tangata whenua to make decisions that maintain, protect and sustain the health and wellbeing of, and their relationship with, freshwater

[232] Ministry for the Environment. 2013. Proposed amendments to the National Policy Statement for Freshwater Management 2011: A discussion document. Wellington: Ministry for the Environment. https://www.mfe.govt.nz/sites/default/files/proposed-amendments-nps-freshwater-management.pdf

[233] For further detail, see New Zealand Government. 2017. National Policy Statement for Freshwater Management 2014. https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/nps-freshwater-ameneded-2017_0.pdf

[234] Ministry for the Environment. 2017. National Policy Statement for Freshwater Management Implementation Review: National Themes Report. Wellington: Ministry for the Environment. https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/NPS-FM-implementation-review-national-themes-report.pdf

Kaitiakitanga	the obligation of tangata whenua to preserve, restore, enhance and sustainably utilise water for the benefit of present and future generations
Manaakitanga	the process by which tangata whenua show respect, generosity and care for freshwater and for others
Governance	the legislative roles and responsibilities entrusted to those with direct responsibility for making decisions about our freshwater
Stewardship	the obligation that all New Zealanders have to manage freshwater to ensure it sustains present and future generations
Care and respect	the responsibility that all New Zealanders have to care for freshwater in providing for the health of our nation

Te Mana o te Wai also establishes a hierarchy of obligations that states that:

1. the first obligation is to protect the health and wellbeing of the water
2. the second obligation is to provide for essential human health needs (such as drinking water)
3. the third obligation is to enable other consumptive use.

From these principles and hierarchy of obligations, we established five underpinning components. These are:

- protecting and sustainably managing the needs of the water first
- ensuring a values-based approach to freshwater care
- enabling different systems of knowledge for freshwater care, and enabling wider aspects of water health to be cared for
- adopting a holistic and integrated approach to freshwater management
- Te Tiriti o Waitangi upholds Te Mana o te Wai.

This narrative and framework provided a basis for the Te Mana o te Wai policies in the NPS-FM.

Proposal

In September 2019, we consulted on proposals to strengthen and clarify Te Mana o te Wai in the NPS-FM. This proposal was developed through working with KWM.

We recommended 'reframing Te Mana o te Wai in the current NPS-FM'. This option (option D in the Interim Regulatory Impact Analysis: *Essential Freshwater* Parts 1[235] and Part 2[236]) provides clearer and more specific direction to regional councils by promoting an approach that prioritises freshwater bodies and provides a long-term trajectory for how freshwater is managed.

We consulted on proposals to:

1. Clarify the descriptor of Te Mana o te Wai so that it more clearly underpins the whole framework for the regulation
2. Clarify how new and existing components of the NPS-FM relate to Te Mana o te Wai

[235] mfe.govt.nz/sites/default/files/media/Fresh%20water/interim-regulatory-impact-analysis-for-consultation-essential-freshwater-part-1.pdf page 31

[236] https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/interim-regulatory-impact-analysis-for-consultation-essential-freshwater-part-2.pdf pages 192 to 206

3. Require regional councils to develop and articulate a long-term vision that gives effect to Te Mana o te Wai
4. Require councils to report on the long-term vision.

Further detail on this option is in the Interim Regulatory Impact Analysis for Consultation: *Essential Freshwater* Parts 1[237] and 2[238] and the Draft National Policy Statement for Freshwater Management 2019[239].

We discussed the direction (wording) preceding Te Mana o te Wai with KWM prior to consultation. KWM were of the view that the NPS-FM should direct councils to give effect to Te Mana o te Wai. While we had concerns that using legal terminology may create risks for councils[240], we considered that these risks would be mitigated under option D as the NPS-FM would give clearer direction as to how Te Mana o te Wai is to be given effect to. The direction to 'give effect to' would also be consistent with the fact that councils are required to give effect to the NPS-FM.

Following consultation, and analysis of submissions we continue to recommend this option. However, we recommend some minor drafting and clarification changes to the policies. We consider that incorporating these changes will further address the problems outlined above and address some of the concerns highlighted in submissions.

Limitations and constraints

Many iwi/hapū submitters and KWM expressed the view that the NPS-FM should require the co-governance and co-management of freshwater resources, as per the recommendations of the Stage 2 Report on the National Freshwater and Geothermal Resources Claim (Wai 2358). As an instrument of the RMA, we consider that the NPS-FM is not the right mechanism to direct co-governance or co-management, nor is it possible to direct this under the current resource management framework. We consider that any changes to governance arrangements should be considered through changes to the wider resource management system, not the NPS-FM. This has limited the extent to which we can address issues raised by submitters around mana whakahaere and Māori decision-making within freshwater management.

We note that Te Mana o te Wai also has links to allocation. However allocation is not part of this package and we are unable to address the connections between Te Mana o te Wai and allocation at this time.

Updated views from advisory groups and the IAP

Independent Advisory Panel (IAP)

The IAP recognise Te Mana o te Wai as a fundamentally important concept that deserves prominent position within the NPS-FM. However they recommend some changes to how Te Mana o te Wai is incorporated in the NPS-FM. They consider that:

1. Reference to Te Tiriti o Waitangi should be the subject of a separate clause within the NPS-FM, between 1.3 and 1.4.

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[237] mfe.govt.nz/sites/default/files/media/Fresh%20water/interim-regulatory-impact-analysis-for-consultation-essential-freshwater-part-1.pdf page 31

[238] https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/interim-regulatory-impact-analysis-for-consultation-essential-freshwater-part-2.pdf pages 192 to 206

[239] Ministry for the Environment 2019 Draft National Policy Statement for Freshwater Management https://www.mfe.govt.nz/publications/fresh-water/draft-national-policy-statement-freshwater-management

[240] See Interim RIS Option C for detail

2. The sections on Te Mana o te Wai priorities and obligations should be revised the sections to reduce risk of challenge and remove directive language, and integrate directions with other requirements on regional councils.
3. The long-term vision should be removed to speed process and reduce administrative burden.
4. Co-governance, co-management and co-decision-making is currently permissible under the Resource Management Act 1991 (RMA) and greater requirement of such arrangements would require amendment to the RMA. Current minimum consultation requirements in the NPS-FM as drafted may frustrate the intention of urgency for completion of regional plans.
5. The NPS-FM should require councils to involve iwi in monitoring to support the consideration of mātauranga Māori in monitoring. In the NPS-FM 3.3(2)(c): after 'management of' insert the words 'monitoring, and' and the word 'relevant' before 'water bodies'.
6. Descriptions for the terms 'mātauranga Māori' and 'ki uta ki tai' should be added to provide clarity to councils.

KWM

KWM support the Te Mana o te Wai proposals, including the changes that we are proposing to make as a result of consultation. In particular they support:

- retaining Te Mana o te Wai as the fundamental concept of the NPS-FM and clarifying in drafting how Te Mana o te Wai is described and woven into the instrument
- clarifying the underlying policy intent in the drafting of the hierarchy of obligations and how councils are expected to give effect to Te Mana o te Wai
- retaining the long-term vision requirement in the NPS-FM and clarifying its role and scale.

KWM, however, consider that the NPS-FM should require stronger co-governance or transfer of power requirement. KWM also do not consider that ki uta ki tai and mātauranga Māori should be defined in the NPS-FM.

FLG

Freshwater Leaders Group (FLG) support Te Mana o te Wai as an integral part of the freshwater management framework, and state that "better tools and regulation for governance and management practice should aim towards Te Mana o te Wai"[241].

FLG were also particularly supportive of the hierarchy of obligations; that the water comes first and maintaining the health of waterbodies must be the first priority and providing for essential health needs of people such as drinking water come second.

The FLG consider that the hierarchy of obligations, specifically the second tier would not require drinking water standards to be achieved in all waterways. FLG state in their report that sanitation is also an essential human need "but care is needed in how this is framed so as not to allow a free ride for certain activities that might fall under that heading (such as sewage treatment)".[242]

In their submission, FLG also express support for the objective of the NPS-FM (part 2), which mirrors the hierarchy of obligations.[243]

[241] Report of the Freshwater Leaders Group to the Ministry for the Environment, July 2019. 10.

[242] Report of the Freshwater Leaders Group to the Ministry for the Environment, July 2019. 10.

[243] Freshwater Leaders Group submission to Action for healthy waterways

RSWS

In their report, the Regional Sector Water Sub-Group (RSWS) are supportive in principle of building on the Te Mana o te Wai framework. RSWS consider it to be "an important framework to guide management and require that the health and well-being of freshwater is at the forefront of all discussions and decisions about freshwater. The health and well-being of water-bodies must come first".[244]

RSWS, however, support the IAP's recommendation that the long-term vision be removed and that council should not be required to 'consult at every stage of the process' with communities and tangata whenua.

STAG

Science and Technical Advisory Group (STAG) recognise the importance of taking a more integrated and holistic view of "the things we need to measure and manage to protect and enhance our shared values for water", and can see the opportunities of viewing "ecosystems through a Te Ao Māori lens, via Te Mana o te Wai". STAG recommend more work to "bring mātauranga Māori into the management framework".[245]

Summary of submissions on Te Mana o te Wai

There was strong support for Te Mana o te Wai as a concept for freshwater management and a framework that councils would have to give effect to.

General themes included:

- Retaining the integrity of Te Mana o te Wai in drafting and implementation is important.
- Giving effect to Te Mana o te Wai will require stronger provisions for Māori decision-making, including providing tangata whenua with a key role in the interpretation and application of Te Mana o te Wai.
- General support of the hierarchy of obligations. There were some concerns around the impacts of the hierarchy and consistency with the Resource Management Act (RMA).
- Implementation support and resourcing would be required to implement the policies effectively.
- General support for the long-term vision, but some clarification required to ensure it has the intended impact. Some submitters queried the need for a long-term vision.
- The Government must work with Māori to develop a robust and durable settlement of Māori rights and interests in freshwater.

A more detailed summary of the submissions feedback is available in the summary of submissions.[246]

Changes incorporated as a result of feedback from the public, advisory groups and the Independent Advisory Panel

We have collaborated with KWM on our response to feedback from consultation and the Independent Advisory Panel. We are recommending to:

1. Retain Te Mana o te Wai as the fundamental concept of the NPS-FM and clarify in drafting how Te Mana o te Wai is described and woven into the instrument.

[244] Regional Sector Water Subgroup report to the Minister for the Environment, September 2019. 4.

[245] Freshwater Science and Technical Advisory Group report to the Minister for the Environment, June 2019. 15-16.

[246] Ministry for the Environment 2020 Summary of submissions

2. Clarify the underlying policy intent in the drafting of the hierarchy of obligations and how councils are expected to give effect to Te Mana o te Wai. Reduce obvious avenues of legal challenges through drafting (e.g. how the hierarchy applies in the application of the NPS-FM).
3. Retain the long-term vision requirement in the NPS-FM and clarify its role and scale.
4. Further align engagement requirements with Te Mana o te Wai by requiring councils to:
    a. actively involve tangata whenua in freshwater management and decision-making regarding how the NPS-FM is implemented (eg, monitoring and preparation of policy statements and plans)
    b. actively investigate the use of tools in the RMA that facilitate transfer of powers, joint management agreements and Mana Whakahono ā Rohe, and
    c. justify mechanisms for engagement that have been adopted/have not been adopted.
5. Make other technical and drafting changes, including elevating the Treaty of Waitangi to a separate section and retaining its reference in the concept section, and exploring with KWM whether descriptions for mātauranga Māori and ki uta ki tai should be included in a national instrument.
6. Provide information boxes and implementation support in the instrument to further facilitate interpretation.

These options are explained further below. We consider that some of the proposals above, coupled with sufficient implementation support, will mitigate some of the concerns identified by the IAP and feedback heard in submissions.

Clarify the description of Te Mana o te Wai and further weave it into the instrument

While the concept was largely supported by submitters and all of the advisory groups, some feedback from submitters and the IAP suggests that how drafting has reflected the concept is unclear and has left it open to misinterpretation. Feedback from KWM and public submissions from iwi/hapū has also signalled a need to better describe Te Mana o te Wai in a way that maintains its integrity as a Māori concept.

We will work with the drafter to ensure that Te Mana o te Wai, as the fundamental concept, underpins and informs the application of the NOF and the specific requirements within the NPS-FM. We will be working closely with KWM to ensure that Te Ao Māori and the principles that underpin Te Mana o te Wai are expressed clearly.

As it is framed in the Draft NPS-FM 2019, the concept informs how the National Objectives Framework (NOF) is implemented and the specific requirements (subpart 3) that councils are to meet. The five components in the fundamental concept section 1.5 (a)-(e) intend to mirror the requirements in subpart 3 of the NPS-FM. Changes to the descriptor will not change what councils will have to 'give effect to', nor will it change the impacts. The descriptor will be based on the description of Te Mana o te Wai outlined at the beginning of this RIS. We will also be providing further guidance on the implementation of the concept to support councils.

Further align engagement requirements with Te Mana o te Wai

While we agree with the IAP's view the NPS-FM should not direct co-governance, we agree with submitters that the NPS-FM can and should provide clearer direction on how we expect councils to engage with tangata whenua. We recommend requiring councils to:

- actively involve tangata whenua in freshwater management and decision-making regarding how the NPS-FM is implemented[247];
- actively investigate the use of tools in the RMA that facilitate transfer of powers, joint management agreements and Mana Whakahono ā Rohe; and
- justify why mechanisms for engagement have or have not been adopted.

We consider that encouraging (but not mandating) increased opportunities for Māori decision-making and the use of existing tools within the RMA is appropriate and will contribute to upholding Te Mana o te Wai and to some extent, recognise the principle of mana whakahaere.

Māori values work is also recommending strengthening engagement requirements with respect to value-setting for Māori values to improve consistency of the NPS-FM directions with Te Mana o te Wai[248] and will further contribute to giving effect to Te Mana o te Wai.

This direction is not a significant shift away from what is already in the NPS-FM or provided for in the resource management system. The direction will serve as a purpose to encourage the use of mechanisms already available to councils and tangata whenua. Many councils already have co-governance arrangements, memoranda of understanding, and forms of joint management agreements that have been formed either through treaty settlements or through negotiation between councils and iwi. This direction would be for specifically councils who have not yet used these tools to the same level.

Clarify the hierarchy of obligations

While many submissions were supportive of the hierarchy of obligations, some submitters expressed concerns about the lack of clarity around it. Some submitters may have interpreted the hierarchy of obligations as a goal to achieve a pristine state of the water or returning the water to a pre-human state and have raised concerns of potential social and economic costs.

The intent of the hierarchy of obligations is to shift the way that we think about managing freshwater and guide the implementation of the National Objectives Framework (NOF), rather than imposing new thresholds, hard limits or bottom-lines to the NPS-FM.

In response, we recommend to:

- clarify the hierarchy of obligations to specify that it is to be read and applied in conjunction with the other provisions of the NPS and in particular, at the limit-setting process that forms part of the NOF process;
- specifying that the second tier in the hierarchy of obligations includes sanitation and drinking water, so that it is not misinterpreted as including other human needs such as food growing for commercial use;
- provide additional guidance and/or including information notes within the NPS-FM itself to clarify that the hierarchy is to be considered within the context of the sustainable management in Part 2 of the RMA, and provide examples of values that can be considered in the different tiers.

In practice, we expect that councils will work with communities and tangata whenua to determine what values are included in the different tiers and what limits are set for these values. However, as

[247] This may include providing opportunities to tangata whenua to be involved in decisions on consents or decisions on plans, or providing opportunities to tangata whenua to engage in a memorandum of understanding or have an agreement with the councils on matters of decision-making regarding freshwater management.

[248] i.e, , directing local authorities to work together with tangata whenua (working together with tangata whenua in decision-making in freshwater management, identifying freshwater values and incorporating those values in the management of freshwater).

an example, the health and wellbeing of the water can refer to ecosystem health, mahinga kai and threatened species. Essential health needs of people would refer to drinking water and human health for recreation, and other uses would refer to irrigation for commercial uses.

Retain the long-term vision requirement in the NPS-FM and clarify its role and scale

While we agree with the IAP that the vision setting should not be overly bureaucratic and the process should not over-burden iwi, councils and communities, we disagree with removing the requirement to set a long-term vision and consider this would be inconsistent with submissions feedback. Removing the vision could also reduce the benefits of Te Mana o te Wai and managing for freshwater values for the longer-term. The Waikato example has demonstrated the benefits of having a clear long-term vision, which each subsequent regional plan would work towards achieving.

In response to feedback from submitters, we recommend specifying that the long-term vision is to be set at the catchment or FMU scale, must be time-bound (must be ambitions and set reasonable timeframes) and articulated as an objective in the regional policy statement.

We also intend to provide additional guidance to support implementation of this policy. This may take the form of case studies, examples of vision statements or suggestions for a process that councils might follow in order to meet the vision-setting requirements. We consider additional implementation support would reduce some of the concerns that the IAP have raised.

In practice, the long-term vision would include statement, descriptions, or objectives for how communities and tangata whenua would like their waterbodies to look like in the future, and the values they would like the catchment to provide for. The long-term vision will provide an aim and a basis for setting the target attribute states, environmental outcomes and the objectives required under the NPS-FM.

Other technical and drafting changes and provide information boxes and implementation support

In response to the IAP and submissions, we also recommend making technical and drafting changes. Consistent with IAP advice, these changes include elevating the Treaty of Waitangi to a separate section and retaining its reference in the concept section, and exploring with KWM whether descriptions for mātauranga Māori and ki uta ki tai should be included in a national instrument.

We will also provide additional implementation support and information boxes in the instrument itself to further facilitate interpretation and implementation. We will work through implementation support and needs with iwi/Māori and KWM.

We also recommend clarifying some nuances, such as that councils would need to work together with tangata whenua and communities to determine how the framework of Te Mana o te Wai – as it is described in the NPS-FM - should be given effect to in specific catchments, rather than requiring Te Mana o te Wai to be redefined or reinterpreted locally.

Updated impact assessment

In the Interim Regulatory Impact Analysis, we estimated that the Te Mana o te Wai policies would impose low to medium material impact (cost and benefits). Through submissions analysis, further engagement and further impacts analysis, our assessment of the impacts has not changed significantly.

Assumptions underpinning the cost benefit analysis

We note that we are not able to estimate in clear numerical terms the cost and benefits to regulated parties, tangata whenua, councils, and communities because how these policies will be given effect to largely depends on how communities, tangata whenua, and councils will work together to

implement them. How Te Mana o te Wai is implemented, and therefore the costs and benefits, will vary by region. This is because:

- The population and number of iwi/hapū varies by region, which means the cost for engagement will vary significantly.
- We are not mandating specific engagement processes. Some councils may choose a process like the Whaitua process in Wellington, other councils may choose other methods for engagement.
- The number of catchments and FMUs varies by region. Some regions may develop more long-term visions than other regions.
- We are not setting a national bottom line and where communities and tangata whenua set their limits to give effect to Te Mana o te Wai (specifically the hierarchy of obligations) will vary locally.
- The values included in the long-term vision will be determined locally, and how the hierarchy of obligations is applied will also be determined by region.

Further, as Te Mana o te Wai is the overarching framework of the NPS and the NES, these cost estimates and impacts are not stand-alone. The costs and impacts of the Te Mana o te Wai policies are difficult to isolate from the combined impacts of the whole package. For instance, requirements to 'maintain or improve', to set flows, ecosystem health, and the existing requirements in the NPS-FM will also contribute to these impacts. Some of the costs associated with engagement on and monitoring required as part of the Māori values policy area are also linked to the components of Te Mana o te Wai. These costs have been explored as part of the impact assessment for Māori values [page xx].

Benefits and costs

Noting the assumptions mentioned above, we have estimated (largely qualitative) benefits and costs based on reports, discussions that we have had with advisory groups, councils and iwi/hapū and our assessment of the policies. We consider that the majority of the costs imposed by these policies will be administrative costs on councils. Other impacts and benefits will depend on how these policies are implemented locally.

A high-level summary of these are outlined in the table below.

Impacts on regulated parties

Impacts on regulated parties are unknown, but we consider that these policies could impose additional costs to regulated parties if tangata whenua, communities and councils recommend that more stringent limits are set through the NOF.

Costs to regional councils

We consider there will be administrative costs on councils who will be required to implement these policies.

In a report commissioned by MfE on the impacts of the policies on councils, it is estimated that the Te Mana o te Wai policies would impose 'small incremental costs' and consider that these 'requirements are immaterial because Regional Councils are already required to work with hapū/iwi to set priorities and develop plans'.

The report also highlights that Māori involvement as part of the Māori values work will 'impose engagement, co-governance support, planning, and monitoring costs on Regional Councils'. We assess that these impacts will also be connected to the additional Te Mana o te Wai requirements. The report estimates that total costs to councils nationally due to the additional requirements

related to engagement with Māori would be $6,685,980. This cost is based on an estimate that the average council will require 1.5 additional FTEs to meet these requirements at rate of $145 per hour.[249] These costs are the combined costs for the Te Mana o te Wai and Māori values policies relating to Māori engagement.

The report estimates that a significant part of the costs for increased engagement with tangata whenua would be incurred at the start of the planning process, prior to the notification of regional plans, and closer to the deadline of 2025. Once implemented, the likely costs to councils would be through monitoring requirements for the Māori values and Te Mana o te Wai policies and ongoing engagement and maintaining relationships with tangata whenua on freshwater values.

More detail on the costs of Māori involvement can also be found in the Māori values policies in the previous chapter.

The councils may also consider having additional FTE experts in te Ao Māori and mātauranga Māori to support the implementation of these policies, which may require additional FTE at the council and possibly resourcing tangata whenua. Additional costs may fall on councils if they provide resourcing to tangata whenua to engage in the process. We do not have an estimate of these costs in cases where councils provide support and resourcing to tangata whenua.

Estimated costs of co-governance and development of river documents for regional councils

One approach to implementing Te Mana o te Wai polices could be additional co-governance and river documents such as Te Ture Whaimana o te Awa Waikato/ Vision and Strategy for the Waikato River, or the Te Ara Whānui o Rangitāiki river document for the Rangitāiki river to be developed. Although councils would not be required to develop a river document, it has been a successful approach through Treaty Settlement legislation. Some councils may adopt this as an implementation approach to these policies. Some of the costs below may apply whether or not councils choose to develop a full river document (e.g. costs to change a Regional Policy Statement). The costs for this are estimated to be higher prior to implementation of the document. These costs for river document are indicative of costs to implement.

This approach would require:

- governance services (such as staff time, venue, catering, meeting fees, and agenda production)
- capacity and support (such as induction and supporting members building knowledge and understanding and ongoing support of members in their role)
- development of the river document (policy staff time to develop and write the document, administrative staff time, management time, design and document costs)
- Regional Policy Statement change (planning staff time and other specialist staff, legal fees, consultant fees etc.).

[249] This is based on "the average of fully loaded staff costs reports by all Regional Councils in New Zealand and charged to resource consent applicants".

The estimated costs for developing a river document are[250]:

Area of work	Activities included	Total cost
River Document Development	Policy staff time, document writing, technical support, community engagement, graphics, printing and distribution.	$583,535
Governance Services	Meeting costs for supporting 5 meetings per year.	$109,000
Iwi capability and capacity support	Staff time to support capacity development.	$232,000
RPS Change	Planning and specialist staff and external legal fees.	$169,467
Plan Development	Staff time, meetings, and consultants' fees.	$39,249
	Estimated total cost	**$1,133,251**

As noted above, we estimate that costs would vary proportional to the population size, the number of iwi and hapū in the region and the population size of that region and the number of FMU and catchments in the region and, the methods of engagement adopted.

Potential impacts on Māori

We consider that costs may fall on tangata whenua and communities if councils do not provide resourcing and support for engagement. Costs may also be greater for tangata whenua if councils do not have the necessary resources and expertise to implement the policies. For example, tangata whenua may be relied on in terms of building capability of council staff in te ao Māori and mātauranga Māori. As highlighted in the Waitangi Tribunal findings[251] and in submissions from iwi and hapū, expertise and engagement from tangata whenua might not always be resourced in the same way as scientists or environmental planners in regional councils.

A report commissioned by MfE on the impacts of the proposals on Māori[252] has tested the Te Mana o te Wai policies against the principles of Mana motuhake (self-determination, autonomy and control), mātauranga Māori (all aspects of knowledge), Mauri (life force), and Whānau Ora (human health and wellbeing). Note that this assessment was made on the Te Mana o te Wai proposals that were consulted on during consultation. Some of the additional options and clarifications identified above could address or improve some of these impacts.

These impacts have been summarised in the table below.

	Impact			Extent of impact			
Te Ao framework	Enhanced	Neutral	Diminished	High	Medium	Low	Commentary from the report
Mana Motuhake		x					**neither enhances or diminishes** mana motuhake. This is based on the fact that tangata whenua are not positioned as decision makers

[250] Based on costs of the development of a river document in the Bay of Plenty

[251] Waitangi Tribunal Wai 2358

[252] Note these are draft findings at this stage

Mātauranga Māori	x				x		further clarifying TMotW as a Te Ao Māori concept and involving tangata whenua in TMotW planning both short-term and long term and at a local level will **enhance** mātauranga Māori to a **medium** extent
Mauri	x					x	**improve** mauri indirectly in that further articulation of TMotW includes concepts that are relevant to upholding and supporting mauri. However, **enhancemen**t is of a **low** extent as the extent to which mauri is incorporated into TMotW in practice depends largely on local communities and regional councils.
Whānau ora	x						the Freshwater Proposals *enhance* whānau ora, (modified to diminished due to failure to meet mana motuhake)
Overall improve Māori cultural values							

This report, while noting the potentially positive impacts of the proposals on Māori cultural values, largely cites concerns of implementation and tangata capacity, and capacity, capability and willingness of council staff and councillors to work with tangata whenua. The report also notes that "it is also risky where the capacity and capability of Iwi and Hapū practitioners are often grossly underfunded against larger industry advocates or community groups".

On the principle of mana whakahaere, the concern in the report is that tangata whenua will not have a decision-making role. We consider that clarifying the engagement provisions will encourage councils to utilise tools and mechanisms that enable a decision-making role for tangata whenua.

On the principle of mauri, the report notes that the hierarchy of obligations will support the adoption of mauri by prioritising the health and wellbeing of the water. It also notes that some of the components of Te Mana o te Wai proposals (understanding the history and current pressures of the waterbodies) align with a kaitiaki approach to consider freshwater bodies holistically.

On the principle of Whānau Ora, the report assesses that the Te Mana o te Wai proposals position tangata whenua alongside other members of the community where tangata whenua may be placed in an adversarial position. The report states that the Te Mana o te Wai proposals are likely to generate stress and trauma to tangata whenua due to the reasons highlighted above.

The report also considers that where tangata whenua are marginalised by council processes and have to conform to a western paradigm or where decision-making powers are unequal can have detrimental effects on the wairua of tangata whenua practitioners. Iwi and hapū talk of 'burn out' and 'hui fatigue', and experience push back from council staff and councillors on resourcing for Māori values, perspectives and aspirations.

Summary table of costs and benefits of the preferred approach

Te Mana o te Wai is the overarching framework of the package and informs all elements of the package, including the NOF and the specific requirements that councils must meet.

As a concept that will be applied at a regional level, we expect the impacts of Te Mana o te Wai will vary with each region and this is represented in the table below based on how it is implemented.

Affected parties	Comment	Impact	Evidence certainty
Additional costs of proposed approach, compared to taking no action			
Regulated parties	**Water users** - possible additional costs to water users to meet thresholds if more conservative limits are set as a result of the long-term vision and the hierarchy. -Potential additional costs if new technology and different ways of managing freshwater are required to meet long-term aspirations of communities.	**Low/ medium** impact on communities possible. Impacts will depend on implementation of the policies in the different regions.	Low
Regulators	- Additional marginal costs may arise for councils due to increased engagement requirements, capability requirements to apply mātauranga Māori and Te Ao Māori, and the additional requirement to set a long-term vision. -These estimated impacts and costs overlap with the Māori values work. These could be combined costs, and not additional impact to the Māori values work.	**Medium** (medium costs over the short term, and low over the long-term). - Estimated cost for involving tangata whenua in monitoring between $30,000 and $50,000 annually - Estimated cost for engaging Māori technicians may cost $500,000 annually per region where there are a large number of iwi and hapū - Estimated cost of approximately $1,100,000 to develop a long-term vision for a catchment. The costs will vary by region, depending on the number of catchments and/or iwi/hapū groups in a particular region.	Medium
Wider government	There will be additional costs to central government to ensure that councils implement these policies as intended and that councils, iwi/ hapū and communities have sufficient implementation support and resourcing.	**Medium** (in the short and long-term).	Medium
	Tangata whenua and communities - additional costs (time, funds, and resources) for tangata whenua to engage in	**Low/medium** impacts on tangata whenua and communities (this estimate is over the long-term).	

	the process if funding or implementation support is not provided. - possible impact on whanau ora/stress of tangata whenua, depending on communities and council staff/ councillors in specific regions. **Communities** - additional costs for communities to engage may fall on community members.	The impacts will depend on implementation of the policies in the different regions and resourcing from central or local government.	
Total monetised costs		Unknown	Medium
Non-monetised costs	Medium	Medium	Medium

Expected benefits of proposed approach, compared to taking no action			
Regulated parties	**Water users** - Additional certainty of what actions can be taken to improve the health and wellbeing of water.	**Low** (this estimate is over the long term).	Low
Regulators	**Local authorities** - Greater certainty added for what is expected in relation to requirements of Te Mana o te Wai. - Long-term goal expected to inform and facilitate the setting of target attribute states and objectives.	**Low**	**Medium**
Wider government	- Greater understanding nationally on how Te Mana o te Wai should be implemented, and how success of implementation can be monitored by central government.	**Low**	**Medium**

Other parties	**Tangata whenua and communities** - Increased civic engagement and governance when communities contribute to discussions about their aspirations for waterbodies and help determine a pathway to get there, and greater opportunity to hold councils to account on meeting these aspirations. - Associated benefits to people's subjective well-being and cultural identify through reconnecting people back to their waterbodies and enhancing the values that they	Estimate benefits over time are to a **Medium** extent (this estimate is over the long term). This option could have significant short-term and long-term benefits. The extent of the benefits will vary by region, depending on implementation.	**Low**

	are connected to be expected in the long-term. - Potential for mātauranga and the mauri of waterbodies to be enhanced. **Environment** - Expected improvement to environmental state by giving priority to the health and wellbeing of water and setting more conservative environmental limits. - Potential for water quality to be improved incrementally and freshwater to be managed sustainably for future generations.		
Total monetised benefit	Unknown	Unknown	
Non-monetised benefits	Medium	Medium	Medium

Implementation

Implementation support and understanding how we will measure the successful implementation of Te Mana o te Wai will also be necessary to mitigate costs and impacts. A plan for implementation and monitoring will be developed with iwi and regional councils.

Measures of success

As mentioned previously, how Te Mana o te Wai will be implemented may vary significantly in different regions. A plan for assessing whether Te Mana o te Wai has been or is being successfully implemented will need to be developed with iwi, hapū and communities more broadly. It may also be more appropriate for such plans to be developed in different regions to ensure that these measures of success are also considered appropriate to that region.

Some questions to assess whether Te Mana o te Wai is being implemented effectively could include:

- Do councils have mechanisms in place to involve tangata whenua in decision-making for freshwater management? What are these mechanisms? Do these work for tangata whenua?
- If not, are councils in the process of developing a relationship agreement with tangata whenua on how tangata whenua will be involved processes?
- Have councils increased their capability to understand and apply Te Ao Māori and mātauranga Māori in freshwater management?
- Have councils hired tangata whenua or resourced tangata whenua to conduct the monitoring?
- Have councils engaged with tangata whenua and communities to develop a long-term vision? Does this long-term vision reflect local aspirations and contribute to the improvement of the health and wellbeing of water over time?
- Do objectives, target attributes states, contribute to giving effect to this long-term vision?
- Have councils developed other approaches to supporting and meeting the long-term vision?
- Do limits and objectives prioritise the protection of ecosystem health and mahinga kai (or mauri) over the use of water in those waterbodies?

Resourcing of iwi and hapū

Resourcing for tangata whenua to participate in freshwater decision-making and freshwater management processes is a key and systemic issue that will remain until funding is provided. Without such funding or a plan to address this issue, there is a risk that these proposals may not be effectively implemented or achievable by 2025. As identified in the Māori values RIS, we will put together a 'business case' to quantity the costs that tangata whenua face by being involved in the freshwater management process. We will continue to advise Ministers about potential options for central government to meet some of these costs.

If central government does not provide some of the funding, regional councils may be expected to provide funding. We understand that some councils may have a limited rating base, and while some councils may have budgeted commitments to assist tangata whenua, some may not. Therefore a large number of iwi an hapū may not be compensated for their involvement in the process.

Implementation support

We will be developing the implementation approaches with iwi and councils, and form an implementation plan to address issues and mitigate some of the impacts. Public submissions from iwi/hapū highlighted that many iwi/hapū are not adequately funded or supported to be involved in freshwater management. We are also cognisant that the capacity of Iwi and Hapū practitioners to engage can be limited, given other demands on their time and lack of funding relative to larger industry advocates and community groups. This is an ongoing issue in freshwater management and in the broader context of resource management. We are aware of this issue, and are scoping a plan to provide resourcing options and implementation support that may assist iwi/hapū to participate in freshwater management. Other implementation tools to support tangata whenua that we are exploring include:

- Independent experts in the regions to support tangata whenua in engaging with council processes
- Training tools for tangata whenua wanting to be involved in the freshwater management processes
- Capacity development and resourcing for iwi/Māori.

We also acknowledge the potential capability and capacity gaps for councils to implement these policies and to potentially work more closely with tangata whenua. Some implementation tools to support councils include[253]:

- Overall guidance for implementation of the NPS-FM, similar to a step by step guide or framework or diagram, that includes the hierarchy of obligations, 'giving effect to' Te Mana o te Wai, and the long-term vision
- Toolbox of examples of how Te Mana o te Wai can be applied in local catchments
- Providing guidance for regional councils' approaches for engaging with tangata whenua and communities in a way that gives effect to Te Mana o te Wai
- Toolbox of examples of how a long-term vision could be expressed and a toolkit for developing a long-term vision
- Training and guidance tools for commissioners, council staff, and councillors
- Other tools, such as monitoring 'report cards', digital hubs, and making MfE staff or other experts available to answer implementation questions and to facilitate the sharing of knowledge.

[253] Some of these tools may also be available to communities and tangata whenua engaging in the processes

Chapter 10: Providing for Hydroelectric Generation Infrastructure – Update on Interim Analysis

This section is an update to the corresponding section on pages 207-217 of the Interim Regulatory Impact Analysis (available here: https://www.mfe.govt.nz/more/briefings-cabinet-papers-and-related-material-search/regulatory-impact-statements/interim*).*

Summary of the policy issue

Scale of hydroelectric generation

Hydroelectric generation provides the majority of New Zealand's electricity and has a critical role in the wider electricity system because of its size, flexibility and the potential of some schemes to store large amounts of energy. Electricity is generated at about 100 sites nationwide, although the majority of hydroelectric generation (approximately 86%) occurs in five schemes – Waitaki, Waikato, Manupouri, Clutha and Tongariro. These five schemes affect some of our largest river systems, including the Waikato, Clutha and Waitaki Rivers.

Effect of hydroelectric generation on freshwater ecosystems

Due to its ability to significantly alter freshwater systems, such as slowing or reducing water flows or affecting river morphology, hydroelectricity generation production has significant effects on the freshwater ecosystems in which they are located. Slowing or reducing water flows can enable nuisance plants to grow and spread further than they would in a system that has natural flows, or alter river channels and destroy habitat, negatively affecting freshwater ecosystem health. In-stream infrastructure, such as dams, creates significant and potentially lethal barriers for migratory fish.

Contribution of hydroelectric generation on New Zealand's climate change obligations

Hydroelectricity contributes significantly to New Zealand's efforts to reduce greenhouse gas emissions under both domestic targets and international treaties, and the Government's goal to achieve 100 per cent renewable electricity generation by 2035. On average, 55-60% of New Zealand's electricity is generated by hydro-electric schemes each year.

The current NPS-FM 'exceptions' mechanism

The current NPS-FM includes an exceptions mechanism –water quality that is below a national bottom line can remain in that state if it is necessary to secure the benefits of hydroelectricity infrastructure listed in Appendix 3 of the NPS-FM. This appendix has never been populated. Regional councils are required to at least maintain water quality, so cannot manage freshwater systems in a manner that permits degradation. Any 'exception' that is provided through the Appendix 3 mechanism can only be used in freshwater systems where the water quality is already below a national bottom line and it cannot allow degradation, i.e. the water quality must at least remain at its current level.

While there is no obligation on a regional council to set a freshwater objective below a national bottom line, regardless of a listing of infrastructure in Appendix 3, a Regional Council's discretion is fettered by the National Policy Statement for Renewable Electricity Generation which requires regional councils to recognise the benefits of renewable electricity generation activities.

The problem

Environmental constraints on the operation of hydroelectric schemes are established through the conditions of their resource consents, which must comply with the relevant provisions of the regional plan. There are several consenting processes for major hydro-electric schemes set to begin in 2025.

In water bodies where water quality does not meet national bottom-lines and hydro-electricity schemes are present, including parts of rivers affected by the Waiau, Waitaki and Tongariro schemes,

regional councils, in an effort to improve water quality, could issue new resource consents with conditions – or choose not to issue resource consents – that reduce electricity production. This places a risk on New Zealand's security of electricity supply and would make reaching the goal of 100% renewable electricity generation by 2035 challenging. Power companies, many of which until recently were wholly owned by the New Zealand Government, could be left with partially stranded assets of significant value.

Policy objective

When developing policy proposals in respect of this issue, we aimed to strike an appropriate and sustainable balance between the competing interests of securing New Zealand's security of electricity supply, addressing the challenges of climate change and improving the health of our freshwater ecosystems.

Policy proposals

We consulted on three options (which are set out in detail in the interim RIS that is linked above), including our recommended policy proposal B1 that recommended populating Appendix 3 with New Zealand's six largest hydroelectricity schemes by generating capacity.

Summary of submissions on topic

Submissions raised the following issues and themes.

Fairness

Many submitters perceived that it was unfair not to require hydro-generators to contribute to fixing water quality issues.

Environmental degradation

Some submitters were concerned that the exceptions framework would lead to declines in water quality in waters affected by exempted hydro-infrastructure.

Safeguarding renewable electricity generation

A small number of submitters supported the proposed option (including owners of the infrastructure potentially affected by this proposal) and maintained that the policy was attempting to navigate a difficult balancing act between the interests of renewable electricity generation as a tool to reduce New Zealand's emissions and achieving good water quality outcomes.

Competition

A small number of submitters including Business NZ, Trustpower and Westpower all commented on the potential advantage to the businesses that own listed schemes. They suggested that the proposal would give those businesses an unfair advantage in the market and create an uneven playing field for competitors. These submitters also outlined that an exemption for listed schemes is inconsistent with the approach in the NPS for Renewable Electricity Generation (the NPS-REG) and, to an extent, the Resource Management Act 1991, as both treat all hydro-generators equally.

The Lower Waiau River

Some submitters were concerned specifically about water in the lower Waiau River, which is affected by the Manapouri Power Scheme. Many submitters thought that the quality of the lower Waiau River would degrade. Some submitters were specifically concerned that the policy proposal would make it impossible to obtain an increase in minimum flows or in the frequency and size of flushing flows.

Changes incorporated as a result of public submissions

Our option as recommended in the interim RIA for consultation is still preferred though with some refinements as outlined below.

Removal of the Waikaremoana Scheme

In response to submitter concerns about the equity of providing for an exception to hydroelectricity generation, we think it appropriate to remove the Waikaremoana Scheme from the list of schemes identified in the NPS-FM. The Waikaremoana Scheme is responsible for approximately 3% of hydroelectric generation. If it is removed, the five remaining schemes listed in the NPS-FM represent approximately 86% of New Zealand's hydroelectric generation.

We are not aware of any evidence demonstrating the water bodies affected by the Waikaremoana Scheme have water quality below national bottom-lines. We acknowledge that if water quality is below national bottom-lines in the affected water bodies the regional council may direct action that improves water quality while reducing the potential output of the Waikaremoana Scheme. It would potentially also reduce the amount of generating capacity that could be exempt from the national bottom-lines in the North Island. This increases the risk to the security of New Zealand's electricity supply should there be a sustained drought in the South Island or problems with the HVDC Cable that crosses the Cook Strait.

It is very difficult to predict the impact that removing the Waikaremoana Scheme from the list of identified schemes would have on energy markets, as it not possible to predict future regional council plan proposals or consenting decisions. As a general point, constraints on generating capacity can be expected to increase wholesale electricity prices or incentivise other forms of generation. Any such impact in relation directly to the Waikaremoana Scheme is likely to be marginal, given it generates 1-2% of New Zealand's electricity each year.

Given that the Waikaremoana Scheme's generating output is significantly lower relative to the five other schemes, and noting the risks highlighted above, we consider removing it provides the best balance between protecting freshwater ecosystems, meeting our climate change obligations, and safeguarding New Zealand's security of electricity supply. This approach also partly recognises the views of the large number of submitters who did not support this proposal and perceived that water quality was a more important goal.

Clarifying the extent of the policy application

Many submitters were concerned about the prospect of entire catchments being exempt from the provisions of the NPS-FM. While this is not the intent of the policy, we consider that the proposed wording within the NPS-FM could be improved so as to properly reflect the intended scope of the policy. We would do this by:

- Making explicit that a regional council should "have regard to the importance of not adversely impacting the generation capacity, storage and operational flexibility of a Scheme" when implementing the NPS-FM
- Clarifying that the obligation to maintain or improve water quality supersedes this policy and continues to apply[254]

The appropriate decision-making balance

We consider that the current draft policy suitably balances regional council discretion (to deliver the aims of their communities for their fresh water) and central government direction (to safeguard New Zealand's security of supply and meet our climate change obligations). It will give regional councils

[254] For this particular policy, as proposed, the obligation to maintain or improve will be enhanced – if a regional council sets a target attribute state below a national bottom line then the obligation will switch from 'maintain or improve' to 'improve'. This means that not only will there be no declines from the status quo in terms of water quality (ie, water quality is not allowed to get worse) but regional councils will be required to set freshwater objectives that would improve water quality (albeit not necessarily to a state at or above national bottom-lines – due to the need to recognise the importance of the hydroelectric infrastructure).

sufficient flexibility to augment minimum flows where necessary (such as in the Lower Waiau if this is deemed necessary, desirable and consistent with national direction by Environment Southland).

We consider that regional councils, having all the context, information and relationships with communities and stakeholders, are the appropriate entities to make decisions about the best balance between these competing interests: a specific intervention from central government in a particular catchment or scheme would potentially undermine the central tenet of the NPS-FM – that local communities make decisions about their local environment.

We consider that as regional councils are required to implement both the NPS-REG and NPS-FM – and that neither one trumps the other – the two policy statements can be read consistently and will feed into decisions taken by councils about whether, and to what extent, exceptions should be made.

Ultimately, the policy proposal attempts to strike a pragmatic balance between meeting New Zealand's climate change obligations, securing its electricity supply and improving the quality of its freshwater.

Chapter 11: Maintaining or improving freshwater and ecosystem health – Update on Interim Analysis

Please note that this section should be read as an update to the corresponding section found at page 218-233 of the Interim Regulatory Impact Analysis (available here: https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/interim-regulatory-impact-analysis-for-consultation-essential-freshwater-part-2.pdf).

Summary of the status quo and problem

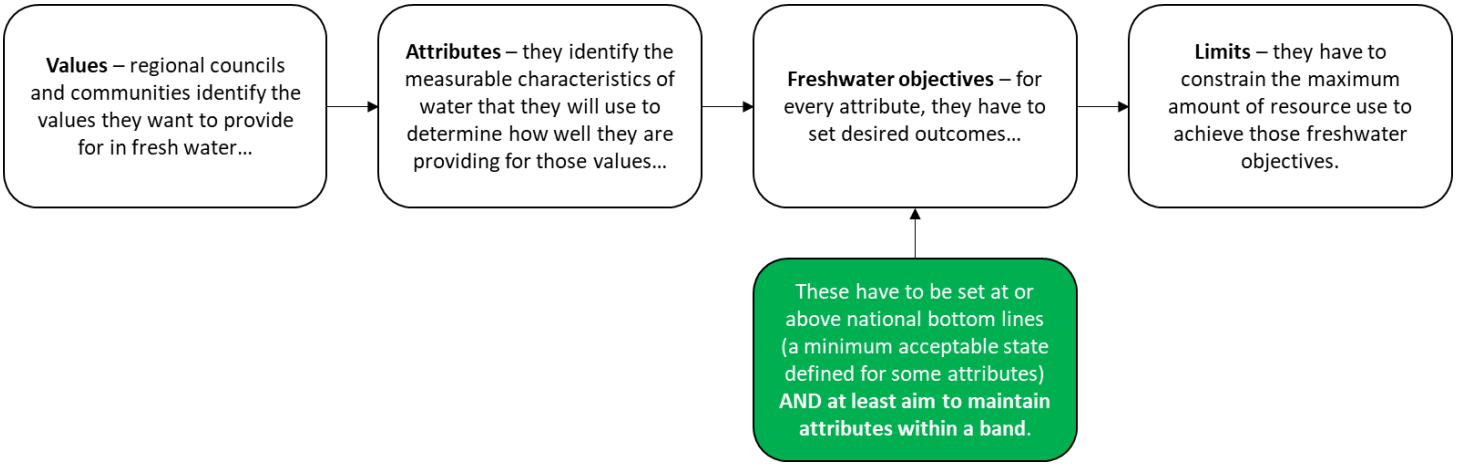
The NPS-FM requires regional councils to **maintain or improve** overall water quality within a freshwater management unit.[255]

The requirement is implemented through regional planning by setting freshwater objectives (ie, desired outcomes in terms of specific measures of water quality called "attributes"). These must at least maintain freshwater, and regional councils and communities can choose to set target states that improve freshwater. Regional council must then put limits on resource use to achieve the objectives over time (eg, restrictions on the ability to discharge contaminants).[256]

When setting freshwater objectives, **maintaining** means setting those objectives:

(a) within the same attribute band (a defined numeric range) as the current state of freshwater (assessed at the time of planning), or
(b) if bands are not defined, so that the value the attribute supports will not be worse off (as determined by the regional council).

The following diagram illustrates this process of implementing the existing NPS-FM, and how the requirement to maintain affects it:[257]



However, as currently drafted:

(a) regional plans can permit freshwater to decline within attribute bands, or "lock in" declines that occur before the NPS-FM is implemented; and

[255] Objective A2 of the National Policy Statement for Freshwater Management.

[256] Policy CA2 of the National Policy Statement for Freshwater Management.

[257] Note that "maintaining" is one of two minimum standards that must be achieved through regional planning in relation to freshwater. As such it is a baseline requirement that informs impact analysis of any new attributes. There is a dependency between these proposals (ie, to remove opportunities for further declines) and the expected impact of new attributes (which are assessed separately in dedicated analyses for each attribute).

(b) it is unclear how regional councils are expected to demonstrate that freshwater has been maintained over time, which is likely to contribute to debate and litigation and, in turn, delays to regional planning.

Summary of proposals that were consulted on

To address these issues, consultation proposed amending the NPS-FM to:

(a) require regional plans to set more specific, measurable and time-bound freshwater objectives to maintain freshwater *at its current state* (rather than within attribute bands). This will ensure that state is not allowed to decline within a band, and also make it more straightforward to assess whether the objectives have been achieved
(b) define current state as at the date that the amendment comes into force, to ensure that the policy does not "lock in" declines that may occur after this date.

The marginal impacts of these changes have been assessed and are detailed in the interim RIA. This includes the reduction in headroom associated with maintaining existing attributes at their current state (rather than within a band range), as well as more detail on the cost of continued degradation of freshwater and ecosystem health. It is not possible to reproduce all of this information here, and readers should refer directly to the interim RIA for more detail.

Proposals also included clearer reporting requirements for councils, which are discussed at pages 227-229 of the interim RIA. There are no changes to that proposal. Clearer reporting requirements will give councils more direction on how to assess whether freshwater has been maintained over time. They recognise that this assessment is more complex than simply measuring achievement of freshwater objectives. For example, proposed reporting requirements include direction to consider changes across mutiple attributes and locations (and what this means for catchments as a whole) and predicted changes (eg, as a result of climate influences or historic land use).

Summary of submissions on topic

Almost all submissions expressed support for the underlying policy intent of "maintain or improve" proposals and the Government's work programme – that is, halting further declines to freshwater and ecosystem health. Some submissions (including from parts of local government, ENGOs and Māori) explicitly supported the detail of proposals.

However, few individuals commented on these specific proposals and detailed feedback primarily came from larger organisations – particularly scientific and research institutions (eg, Crown Research Institutes), ENGOs, industry bodies, and regional councils. While these submissions expressed support for the underlying intent, they raised specific issues with *how* the proposals attempt to achieve it.

In some cases submissions raised issues that are not strictly related to the proposals (eg, concerns about the wider implications of existing policies). These are noted here as they provide useful information for regulatory impact analysis, for example, as a fuller description of the status quo or wider context within which the proposals will apply.

For additional detail on what submissions said, refer to the full Summary of Submissions available on the Ministry for the Environment's website.

An Independent Advisory Panel (the Panel) considered submissions in detail, and has provided its own views on the issues raised. The Panels' report and recommendations are consistent with those of officials and the analysis within this document. For additional detail, refer to the Panel's full report, which is available on the Ministry for the Environment's website.

Changes incorporated as a result of submissions

Almost all changes incorporated as a result of submissions can be characterised as minor drafting changes and clarifications that do not alter the underlying policy.

However, the following changes are more substantive additions that are expected to have *some* (albeit very limited) impact compared to proposals. These are:

1) Drafting changes to ensure the NPS-FM does not preclude the use of modelling data when assessing whether freshwater objectives are being achieved (an unintended consequence of proposed drafting).
2) Additional drafting to clarify what maintenance, improvement and degradation entail in relation to trends.
3) Defining "current state" as at 2019, or the date at which existing freshwater objectives were set (whichever is more stringent) rather than the date at which the amended NPS-FM comes into force.

Drafting changes to ensure the NPS-FM does not preclude the use of modelling data

The NPS-FM as proposed for consultation appears to preclude the use of modelling when assessing whether freshwater objectives are being achieved. This is, in part because it directs regional councils to set (and assess) freshwater objectives at physical monitoring sites.

This is unintended. The requirement to specify sites at which freshwater objectives apply is intended to assist regional councils in demonstrating whether freshwater has been maintained over time. It is more straightforward to assess whether freshwater objectives are being achieved if a regional plan is explicit about where they apply or where achievement will be assessed.

However, drafting that directs regional councils to identify physical monitoring sites is unrelated to the above, and is only intended to carry over existing monitoring requirements.

Modelling provides an opportunity to reduce the increasing monitoring burden that regional councils face,[258] as well as giving additional information about the state of freshwater and ecosystem health. However, modelling is also associated with higher levels of uncertainty than physical monitoring, and for this reason should not be relied on instead of monitoring where available.

We therefore recommend the following drafting changes to ensure regional councils can use modelling information to supplement monitoring:

(a) Remove direction to set freshwater objectives "at each relevant monitoring site", while ensuring freshwater objectives still specify the representative sites at which they will apply.
(b) Include explicit direction that:
    i. Modelling and other available sources of information can be used to supplement monitoring (ie, the NPS-FM does not preclude the use of this information)
    ii. Regional councils should prefer sources of information that provide the greatest level of certainty in determining current state and detecting changes in it
    iii. Regional councils should take practicable steps to reduce uncertainty, including through improvements to monitoring and validation of any models used.

[258] Proposals to introduce a wider range of attributes that must be monitored and managed, is likely to have a significant impact on regional councils. Note the impacts of introducing new attributes are assessed separately for each attribute. The range of costs faced by regional councils are also assessed separately for the package as a whole – see *Administrative Costs of Proposed Essential Freshwater Package on Regional Councils*, Castalia Limited, March 2020

(c) Supplementing the above direction with an information box directing regional councils to examples of good practice in monitoring network design suggested by the Science and Technical Advisory Group (STAG) members.[259]

These changes will ensure that regional councils are able to make use of modelling to supplement monitoring and potentially reduce costs. We understand that modelling is already used for these purposes, and changes will simply confirm this is acceptable when implementing the NPS-FM (ie, avoiding an unintended outcome) while recognising that modelling may provide less certainty than other sources of information.

Additional drafting to clarify what maintenance, improvement and degradation entail in relation to trends

Proposals were intended to clarify how regional councils should demonstrate whether freshwater has been maintained over time. Submissions, and subsequent discussions with STAG members and regional council officials indicate there is a desire for more detailed direction in relation to trends – that is, direction on what a trend assessment entails and how regional councils should approach uncertainty.

Some attributes already provide additional direction, such as sampling requirements. However, other parameters for assessing trends are situation-specific and it is not possible to prescribe them at a national level. For example the appropriate trend duration may need to vary depending on the attribute in question, or what data is available.

Instead, we recommend additional direction that outlines the procedure that regional councils should follow to assess trends, and the key judgements they will need to make. This will provide additional direction to the extent possible, and mean that regional council decisions are made in a more transparent and consistent way:

(a) When undertaking any trend assessment, a regional council must:
    i. Determine the appropriate trend period to be assessed, unless otherwise specified (eg, within attribute tables)
    ii. Determine the minimum sampling frequency and distribution of sampling dates, unless otherwise specified (eg, within attribute tables)
    iii. Assess the likelihood of a trend occurring, and take action when evidence suggests that a worsening trend is more likely than not (ie, councils should not delay action until evidence for a trend is beyond doubt).
(b) Any response to a trend (eg, investigation into causes, action plan) should be proportionate to the likelihood and magnitude of the trend.
(c) If a trend cannot be detected, a regional council must consider whether monitoring is adequate (ie, whether changes to monitoring are likely to assist in detecting a trend) and, if monitoring is inadequate, take practicable steps improve monitoring.

[259] STAG members suggested a range of technical papers that may provide useful guidance to regional councils on monitoring network design. These have subsequently been reviewed by officials with relevant expertise to ensure it is relevant to the proposal and will assist those implementing it. While these are already publicly available, we consider that referring to them within the NPS-FM via an information box will aid implementation. These include :

- *Spatially Balanced Sampling of Natural Resources*: https://swap.stanford.edu/20110204152857/http:/www.epa.gov/nheerl/arm/documents/grts_asa.pdf
- *Improving region-wide ecological condition of wadeable streams: Risk analyses highlight key stressors for policy and management*: https://www.sciencedirect.com/science/article/pii/S1462901118307512
- *Monitoring network-design influence on assessment of ecological condition in wadeable streams*: http://www.publish.csiro.au/mf/mf12267

We recommend supplementing this direction with an information box referencing technical papers that provide additional technical detail and guidance on communicating uncertainty (ie, reporting results against multiple confidence intervals) and examples of trend analysis procedures.[260]

The proposed direction above describes a procedure similar to what we would expect any regional council to follow in the absence of direction. We anticipate that the recommended changes will provide additional clarity and aid implementation, and otherwise have little impact. There is a small increase in scope for debate and litigations (ie, in relation to the judgments that might otherwise be made in a less transparent way). However, this transparency is necessary to ensure the quality of decisions, which can have a significant impact on the outcomes of trend analysis and its suitability to inform freshwater management decisions.

Defining "current state" as at 2019, or the date at which existing freshwater objectives were set (whichever is more stringent), rather than the date at which the amended NPS-FM comes into force

Proposals that were consulted on were intended to ensure that regional councils cannot permit freshwater to decline.

Officials agree with submissions that proposals need to account for situations where regional councils have already set freshwater objectives to maintain current state (eg, since 2014 when attributes were first introduced). If water has declined since those freshwater objectives were set (eg, because of ineffective planning or lag times), defining current state as at 2020 (or 2019, see next paragraph) would effectively be a lower standard and permit that decline. That outcome would be unintended, and contrary to the policy intent.

Officials also agree with the Independent Advisory Panel that it is appropriate to define the "current state" of freshwater (which is to be maintained) as at 2019. While consultation proposed defining "current state" as at the date the amended NPS-FM comes into force, this was expected in mid-2020 and is not materially different from 2019 in terms of the state of freshwater.

As such, we recommend defining the "current state" of freshwater (which is to be maintained) as at the earlier of:

(a) 2019
(b) the date at which a regional council set existing freshwater objectives.

This will have a minimal effect on expected impacts. The changes will also ensure that regional councils that have already set freshwater objectives continue to be held to that standard – this is intended to address the risk of unintended consequences (as described above) and does not otherwise affect existing regulatory impact analysis.

[260] STAG members suggested a range of technical papers that provide additional technical detail and guidance on communicating uncertainty (ie, reporting results against multiple confidence intervals) and examples of a trend analysis procedures. These have subsequently been reviewed by officials with relevant expertise to ensure it is relevant to the proposal and will assist those implementing it. While these are already publicly available, we consider that referring to them within the NPS-FM via an information box will aid implementation. These include:

- *Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties*: https://www.ipcc.ch/site/assets/uploads/2017/08/AR5_Uncertainty_Guidance_Note.pdf
- *Has Water Quality Improved or Been Maintained? A Quantitative Assessment Procedure*: https://dl.sciencesocieties.org/publications/jeq/pdfs/48/2/412

Additional information on lag times and the "load to come"

LGNZ submitted that maintaining the current state of water will have a real impact (as opposed to just an opportunity cost) where there is a contaminant load to come, and that this has not been adequately recognised within regulatory impact analysis.

A "load to come" exists where lags in the hydrogeological system mean contaminants that were discharged in the past have not yet reached surface water. For more detailed information on lags, refer to the interim RIA.

Officials have subsequently sought additional information on the existence of lags from STAG members and regional council officials. We are aware of analyses of lag times in the Waikato, Horizons, and Southland regions.[261]

(a) In the Waikato region, lags are generally less than 10 years for most of the lower Waikato, Hamilton, and Waipa basins, particularly for elevations less than 100 m. Longer lag times of 10 to 30 years are predicted for elevations above 100 m, but are also predicted at some lower elevations along the catchment boundaries between streams. The longest lag times are predicted beneath, and in the vicinity of, volcanoes and ranges, however there is greater uncertainty in predictions made in these areas.
(b) In the Manawatū/Whanganui region, lags are estimated at:
    i. 6 to 7 years in the Whanganui River
    ii. 3 to 3.5 years in the Rangitikei River
    iii. in the Manawatū catchment, 9 to 11 years in the large discharges from the tertiary sediments east of the Ruahine and Tararua ranges, 2.5 to 4.5 years west of the Ruahine Range, and shorter lags of 0 to 2 years in the discharges from the eastern Ruahine and Tararua Ranges.
(c) In the Southland region, about 80 per cent of the region is expected to have a lag time of less than five years, and 90 per cent less than two years. Longer lag times are associated with higher elevations above the rivers.

These figures provide a coarse summary of available information to indicate the location and temporal scale of known lags. However, characterising lag times is complex and readers should refer to the original reports to ensure they have an accurate understanding (eg, of how lags vary spatially, and the distribution of lags at a site).

In terms of impact analysis, the information indicates that parts of these regions (particularly Waikato) will experience significant lags. As a consequence, maintaining freshwater in these situations is likely to have a real impact (rather than merely restricted opportunity) – that is, practice changes and mitigations will be needed to maintain freshwater at its current state. This also means that there is likely to be a delay between recent mitigations and practice improvements on land and observable improvements in freshwater.

[261] For more information on known lags, please refer to:

- *Estimating Time Lags for Nitrate Response in Shallow Southland Groundwater*: https://www.es.govt.nz/repository/libraries/id:26gi9ayo517q9stt81sd/hierarchy/environment/science/science-summary-reports/estimating_time_lags_for_nitrate_response_in_shallow_southland_groundwater.pdf
- *Groundwater lag times in the water discharges from the Whanganui, Rangitikei and Manawatu catchments*: https://www.envirolink.govt.nz/assets/Envirolink/1419-HZLC103-Groundwater-lag-times-in-the-water-discharges-from-the-Whanganui-Rangitikei-and-Manawatu-catchments.pdf
- *Estimation of lag time of water and nitrate flow through the Vadose Zone: Waikato and Waipa River Catchments*: https://www.waikatoregion.govt.nz/assets/PageFiles/37532/3%20-%20Final%20Draft%20LincolnAg_Unsaturated%20Lag%20time%20in%20the%20Waikato%20catchment.pdf

Longer lag times could lead to greater costs. This is because changes in resource use (eg, intensification of land use) that have occurred over a longer timeframe may have a larger cumulative impact on freshwater, and so require more significant changes to undo. As such, we expect the impact of lags to be greater in the Waikato region compared to others with shorter lag times, such as Southland.

We acknowledge that lag times pose a challenge for regional councils and communities. In some cases, arresting declines in freshwater and achieving desired outcomes will take generations. This is why proposed reporting requirements direct regional councils to comment on predicted changes (which would include loads to come). Reporting can facilitate a community's understanding of lags within their region, and help to manage expectations while working towards desired outcomes.

It is important to recognise the uncertainty associated with the impact of lag times. Regional councils and communities can choose to achieve freshwater objectives over any period of time they consider appropriate, using any combination of approaches.

In the Waikato catchment, it is also important to acknowledge that planning is driven in large part by settlement legislation and the resulting Vision and Strategy for the river – these aim to make significant improvements over an 80 year timeframe. This means that more stringent requirements to maintain freshwater are unlikely to have a significant impact.

The new information on lags is reflected in the updated costs and benefits table below. No changes to proposals are considered as a result of this issue.

Table of costs and benefits of the preferred approach

Affected parties	Comment	Impact	Evidence certainty
Additional costs of proposed approach, compared to taking no action			
	Administrative costs associated with analysis and production of reports (eg, analysing monitoring results, statistical analysis, procuring relevant expertise, etc.) and formal planning processes.	Medium[262]	Medium
	Opportunity cost, additional discharges and intensification of land use can only occur with mitigations that mean water quality will not decline. Note this is currently an un-costed externality.	Low, 0.8-6.4 percent reduction in headroom for additional contaminant loads – a marginal change from status quo as scope for additional discharges and intensification of land use is already limited.	Medium
	Costs associated with maintaining current state in situations where "lag times" mean existing or historic	Low (potentially Medium in parts of the Waikato region).	Low

[262] This is assessed separately for all proposals as a package, please refer to *Administrative Costs of Proposed Essential Freshwater Package on Regional Councils*, Castalia Limited, March 2020.

	resource use will lead to continued declines (ie, declines are imminent). In these situations, changes to resource use would be needed to maintain the current state of freshwater.		
Total Monetised Cost		-	-
Non-monetised costs		Low	Low

Expected benefits of proposed approach, compared to taking no action			
Public	Avoided declines in water quality, which may result in loss of ecosystem services.	High[263]	Low
Total Monetised Benefit		-	-
Non-monetised benefits		High	Low

Implementation

The Ministry for the Environment will develop and promote technical guidance in relation to requirements to maintain or improve, and particularly trend assessment. Otherwise implementation is not specific to these proposals, and readers should refer to the overall RIA for a detailed description of how proposals to amend the NPS-FM will be implemented.

[263] This is assessed separately for all proposals within the overall RIA for the Essential Freshwater package.

Chapter 12: Direction to Territorial Authorities to Support Integrated Management – Update on Interim Analysis

Please note that this section should be read as an update to the corresponding section found at page 234-247 of the Interim Regulatory Impact Analysis (available here: https://www.mfe.govt.nz/consultation/action-for-healthy-waterways*).*

Summary of policy issue

Although urban waterbodies make up a small fraction of freshwater in New Zealand, they are highly valued ecosystems that offer refuge to some of our most threatened species. Unfortunately, these waterbodies are also some of our most degraded, and are impacted by a range of land-use activities in the urban environment, including increased pollution and unnatural flows from impervious surfaces. This is a multifaceted problem, but this proposal looks at one particular aspect - the lack of integration between decision-making by regional councils (who are primarily responsibility for environmental management of freshwater) and territorial authorities (who have primary responsibility for managing land use and development).

The National Policy Statement for Freshwater Management 2014 (amended 2017) (NPS-FM) includes policies that require regional councils to manage freshwater and the development and use of land in an integrated way to avoid, remedy or mitigate adverse effects, including cumulative effects on freshwater. This requirement in the NPS-FM gives no explicit direction to territorial authorities (TAs) even though they also have an important role to play in integrated catchment management, particularly in urban areas. This ambiguity around the role of TAs in supporting integrated catchment management under the NPS-FM contributes to a lack of integration between the functions of regional councils and TAs under the RMA with some TAs viewing their role in freshwater management as limited to complying with water and discharge permits issued to them by regional councils. This leaves regional councils with the bulk of responsibility to plan for, and manage effects of land use and development on freshwater.

Requiring territorial authorities to play a more proactive role in integrated catchment management would mean that land use and development would increasingly consider impacts related to Te Mana o Te Wai, and the community's values for the health of downstream receiving environments.

Consultation on amending NPS-FM (2014)

To address these issues, the Action for healthy waterways discussion document proposed amending the NPS-FM to create an obligation for TAs to include objectives, policies, and methods in their district plan for the integrated management of the effects of land use and development on freshwater. The proposal also requires that local authorities co-operate in integrated management where they share jurisdiction over a catchment.

The proposed amendment to the NPS-FM does not provide specific directions about what approaches TAs should use to manage the effects of land use and development on fresh water in district plans (eg, requirements to implement Water Sensitive Urban Design or 'Low Impact Design' techniques, limit impervious surfaces, or restrict land use and development). The approach provides flexibility for TAs to determine the objectives, policies, and methods that would best apply in their district. Adopting the preferred option would mean that, for example, decisions about managing urban water would be made in the context of wider decisions on urban development (eg, decisions about urban form and subdivision). This means there would be opportunities for TAs to look at the most effective ways of achieving multiple objectives (eg, amenity, recreation, and water management).

Summary of submissions on topic

The majority of submissions were supportive of the underlying policy intent of this proposal – that freshwater is managed in an integrated way, which considers the effects of land use and development on freshwater, on a whole-of-catchment basis. There was also general support for better management of freshwater in urban environments.

About a quarter of the submissions on these specific proposals were from individuals, but detailed feedback primarily came from local government – mainly territorial authorities, but also from regional councils and LGNZ. In some cases, submissions raised issues that are not strictly related to the proposals (e.g. concerns about the wider implications of existing policies). These are noted where relevant as they provide useful information for regulatory impact analysis and the wider context within which the proposals will apply.

The following sections describe the main issues that submissions raised, our analysis of them, and our recommendations.

Councils want more clarity about their respective roles

A number of submissions from councils expressed concerns that the proposed amendments to the NPS-FM does not provide sufficient clarity on the respective roles of regional councils and territorial authorities. Submitters suggested that these new directives in the NPS-FM may require territorial authorities to take action outside of their explicit functions under the RMA, and that some of these functions may duplicate those of regional councils. Several submitters suggested that amending sections 30 and 31 of the RMA would be a more effective means for providing clarity on the roles and responsibilities of TAs and regional councils.

We note that the proposed amendment to the NPS-FM is intended to help provide greater clarity in regards to the role of TAs under the RMA in relation to managing the impacts of urban development on fresh water – it will ensure all TAs have appropriate objectives, policies and methods in their district plans. Requiring actions from TAs directly would remove any ambiguity about the responsibilities of TAs, in the absence of specific regional council direction.

The interim regulatory impact analysis noted that the options analysis for this policy proposal was focused on what could be achieved through amendments to the NPS-FM and the development of a new NES for freshwater. It did not include options that sat outside these national direction instruments (eg, options that would require amendments to the RMA). The Government's RMA Reform programme will look comprehensively at the resource management system, and any amendments to the RMA that may be necessary. This work may result in modifications or clarifications to the functions of regional councils and territorial authorities under the RMA.

Additional guidance will be provided to councils on how the integrated management provisions can be given effect to after the NPS-FM is amended. This will be a part of the wider implementation package that will be prepared after final policy decisions are made.

These comments are included as they help to identify the concerns of councils, but they do not substantially alter the existing regulatory impact analysis. No changes to the integrated management proposal are recommended as a result.

Cost and resourcing implications for territorial authorities

Several submitters raised concerns about the cost and resourcing implications of requiring TAs to consider the cumulative adverse effects of land use and development on freshwater. Submitters also noted that the implementation of this proposal, alongside other new national direction being

developed (such NPS-UD), will together put greater pressure on the resourcing and capability of many TAs.

The interim regulatory impact analysis assessed the cost implications of these proposals and determined that the costs associated with planning processes to implement the proposals are already expected under the current regulatory settings. The proposed policy is assessed as imposing only a marginal increase on costs that are already borne by TAs when updating district plans. Examples of these costs are increased analysis requirements for TAs when undertaking section 32 analyses. It would also mean that where capacity and capability does not exist with TAs (eg, expertise in assessing cumulative effects of urban development on freshwater objectives) this would need to be developed.

Some TAs, particularly larger city councils, already have existing capability and already undertake a range of initiatives to require good practice water management in urban design, so these proposals may not be significant for them. However, for other TAs this may present a larger impact on resourcing. The cost (and benefit) of an approach chosen by a TA would be highly variable, because they would depend on what types of planning provisions TAs chose to use to give effect to the policy. Assuming this policy drives more proactive management of urban water through district plans, the specific provisions chosen would need to be justified in terms of who would bear the costs (ie, property developers vs ratepayers).

These comments are included as they help to identify the concerns of councils, but they do not substantially alter existing regulatory impact analysis. No changes to the integrated management proposal are recommended as a result.

Align timeframes for implementing the provisions in district plans

As a part of the proposed amendments to the NPS-FM, regional councils would be required to give effect to the NPS-FM by the end of 2025, while part 3.4(6) proposes that TAs would be required to take action on integrated management as part of their next plan review. The requirements of 3.4(6) is dependent on regional councils first giving the direction to TAs in their regional policy statement, as required under the proposed part 3.4(5). Several submitters highlighted that TA's next plan review could be up to 10 years away, and that TA's should be required to amend district plans within a shorter timeframe to give effect to these proposals. Conversely, other submitters raised concerns that the timeframes may not be long enough, given the investment required, and may not align well with regional planning processes and/or processes under LGA.

We note that the inclusion of part 3.4(5) in the proposed amendments to the NPS-FM is an error in the drafting and will not be progressed. Nonetheless, the feedback reinforces our preferred option, which aligns with 3.4(6) to directly instruct TAs to manage the effects of land use from urban development on freshwater in their district plan. This is faster than requiring regional councils to first undertake planning process to introduce provisions into regional policy statements, which would then need to be reflected in district plans through the district planning process.

Although we didn't propose a specific time within which TAs must give effect to these proposals, other than at their next plan review, the intent is for TAs to do as soon as practicable while considering the normal district plan timeframes. However, we recommend removing reference to next review of the plan, thereby requiring that the changes to district plan align with the timing specified in Part 4 of the proposed amendment to the NPS-FM. This would put a deadline by when TAs must consider updating their district plans to accommodate the integrated management proposals. An implication of this is that some TAs might have to bring forward some district plan changes, which may have administrative costs (but there could also be cost savings by TAs working together, particularly those in the same region or catchment).

We do not propose progressing Part 3.4(5) of the proposed amendments to NPS-FM as it was an error in drafting. We recommend that changes to district plans to give effect to the integrated management proposals follow the same time requirement for regional policy statements and regional plans.

Balancing freshwater and urban development considerations.

Several submitters expressed concern that the direction in the NPS-FM does not give TAs sufficient direction to help them consider urban development and freshwater priorities together, where overlaps exists between the two. These concerns were mainly in reference to the stream loss and wetland proposals and have been addressed separately under those policy areas. However, we note that there is merit in clarifying these in additional guidance once the amended NPS-FM is gazetted.

By requiring TAs to consider freshwater outcomes in their district plans we are directing them to think about urban development and freshwater management in an integrated manner. The proposed policy involves placing a broad requirement on TAs to manage the effects of land use and development on freshwater, rather than directing specific approaches that must be used. The existing NPS-FM already requires freshwater to be managed in urban areas to meet freshwater objectives and limits that are set for freshwater bodies in regional plans. This policy is intended to make it more likely that these requirements would be met, by ensuring that when urban growth and development occurs it is accompanied by active consideration of, and decisions about, how to manage the effects of that growth on freshwater.

Further guidance will be provided as a part of the wider implementation package on how TAs should consider urban development and freshwater priorities together.

These comments are included as they help to inform the concerns of councils, but they do not substantially alter existing regulatory impact analysis. No changes to the integrated management proposal are recommended as a result

Local authorities *"must"* be made to co-operate on integrated management

Several submitters noted that part 3.4(4) of the proposed amendment to the NPS-FM is not directive enough to achieve co-operation of local authorities. As drafted, part 3.4(4) says that local authorities *"should"* co-operate on integrated management if they share jurisdiction over a catchment. Submitters suggested that this should be changed to *"must"* to give more weight to this requirement. Generally, there was agreement that this proposal requiring local authorities to co-operate is positive, and moves in the right direction of getting regional councils and TAs to have discussions at the local level.

Based on the submissions received and the strong support for local authorities working together, we recommend changes to Part 3.4(4) requiring that local authorities "must" co-operate on integrated management. In support, we will provide guidance in the implementation package on successful models of local authorities co-operating to achieve integrated management outcomes.

Defining "sensitive receiving environments"

A number of submitters commented that the term "sensitive receiving environments" could create confusion and that it is not clear enough to achieve the intent of this policy. We note that some receiving environments are more sensitive than others to different stressors, and that these should be considered in any integrated management proposals. However, based on the possibility of uncertainty in interpretation, we recommend that this is best covered in guidance as a part of the implementation plan.

We recommend removing reference to "sensitive receiving environments" and provide guidance on the relevant considerations in the implementation plan for the amended NPS-FM.

Require TAs to implement Water Sensitive Urban Design

A number of submitters expressed views that the proposal should make it mandatory that councils implement Water Sensitive Urban Design (WSUD). We believe that while there is merit in requiring the implementation of WSUD, the aim of this policy proposal is to not provide specific direction about approaches TAs should use to manage the effects of land use and development on freshwater. As already discussed in the interim regulatory impact analysis, we understand that in some cases WSUD does not achieve the best outcomes.

Ongoing development in the sector is bringing WSUD forward, and will likely be a key consideration for most TAs, particularly because of the proposed policy requirement for TAs to consider adverse effects on freshwater from use and development.

Further guidance will be provided as a part of the wider implementation package on how TAs can give effect to WSUD and the relevant considerations.

We do not recommend making WSUD a mandatory requirement under the NPS-FM, but we instead propose to offer extensive guidance to councils in the wider implementation package. We also recommend removing the information note in the NPS-FM that reference WSUD as these are better covered in the implementation guidance.

Changes incorporated as a result of public submissions

We do not propose any change to the overall policy intent that freshwater is managed in an integrated way, which considers the effects of land use and development on freshwater, on a whole-of-catchment basis. However, after considering the submissions received and feedback from workshops with councils, we recommend the following changes to the policy wording to better give effect to the policy intent.

- We recommend that changes to district plans required to give effect to the integrated management proposals follow the same timeframe as required for regional policy statements and regional plans.
- We recommend a change to require that local authorities "must" co-operate on integrated management where they share jurisdiction over a catchment.
- We recommend removing reference to "sensitive receiving environments" from the integrated management proposals, and instead provide guidance on the relevant considerations in the implementation package for the amended NPS-FM.
- We recommend removing the information note in the NPS-FM that reference WSUD as these are better covered in the implementation guidance.

Implementation

The overall implementation of this policy will be detailed in the Action for healthy waterways Implementation package, which will help guide and support the implementation of these proposals. The Ministry is working closely with councils and other stakeholder groups to identify implementation projects, which will support the successful rollout of these proposals. The scoping work is ongoing and will conclude after final policy decisions are made.

The implementation strategy will likely identify mechanisms for TAs to build capacity and capability, which may include knowledge transfer processes that TAs can access. This is likely to include guidance on model plan provisions that TAs can consider to give effect to this proposal - important to this will be the stormwater guidance modules being developed by the Ministry. The stormwater

guidance will in part provide directions to TAs on how to implement good stormwater management practices, particularly around water sensitive design approaches and planning provisions.

The overall RIA synthesis report addresses the environmental, economic and social impacts of the Action for healthy waterways Package. It also address the support for councils that will be required to give effect to the Action for healthy waterways Package. Among this is that the Ministry will identify exemplary councils across varying aspects of good practice in water regulation and management, use those exemplars as a guide, and consider what further guidance on implementation may be appropriate.

Chapter 13: Preventing further loss or degradation of wetlands – Update on Interim Analysis

Please note that this section should be read as an update to the corresponding section found at page 248 of the Interim Regulatory Impact Analysis – Detailed Analysis (available here: https://www.mfe.govt.nz/more/briefings-cabinet-papers-and-related-material-search/regulatory-impact-statements/interim).

Summary of policy issue

Extensive loss and degradation of New Zealand's wetlands has resulted in the loss of unique biodiversity and ecosystem services.

Historically the value of wetlands was not recognised, and their extensive drainage to create 'productive land' was incentivised. This led to the loss of over 90% of the original historical inland wetlands.[264]

Recent studies show that the extent of New Zealand's remaining inland wetlands continues to decline.[265] Current national policies are inadequate to protect our remaining inland wetlands, and consequently the strength of regional plans varies considerably between local councils. Lack of data and resources can also make it difficult to implement rules.

Proposal

In the Action for healthy waterways consultation, we proposed:

- NPS-FM polices to avoid loss and degradation of our natural inland wetlands, identify, map and monitor them, and encourage their restoration, and
- NES-F rules to restrict activities most likely to cause loss and degradation of natural inland wetlands and coastal wetlands.

Limitations and constraints

The scope of the NPS-FM wetland polices are limited to natural inland wetlands given coastal wetlands are the domain of the New Zealand Coastal Policy Statement. The NES-F rules do, however, extend to both natural inland wetlands and coastal wetlands as national standards are not bound by topic specific policy domains. Geothermal wetlands are not included in either policy tool because geothermal systems are complex and dynamic and we consider more work is required to identify better-suited options for these ecosystems.

Analysis is restricted to current national mapping datasets and broad estimates of the value of ecosystem services for inland and coastal wetlands. There are recognised limitations within the national maps[266], and coastal wetland area maps are incomplete, covering only saltmarsh and mangrove wetland types. Therefore, there is likely to be an underestimation of national wetland area as smaller inland wetlands and wider coastal wetland habitat are not represented. This will affect estimations of areas affected by the proposed regulations and the value of ecosystem services provided by wetlands.

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[264] Ausseil, A-GE, Chadderton, WL, Gerbeaux, P, Theo Stephens, RT & Leathwick, JR (2011). Applying systematic conservation planning principles to palustrine and inland saline wetlands of New Zealand. Freshwater Biology Vol. 56, No 1, pp. 142-161.

[265] For example, Belliss et al. (2017) Belliss, S., Shepherd, J., Newsome, P., Dymond, J. (2017). An analysis of wetland loss between 2001/02 and 2015/16. Landcare Research Contract Report LC2798 prepared for the Ministry for the Environment. Landcare https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/analysis-of-wetland-loss.pdf

[266] The Freshwater Ecosystems of New Zealand database (FENZ) and has a reasonably coarse resolution (ie, minimum wetland size of >0.5 – 1 ha) and does not cover ephemeral wetland types.

Summary of submissions

Over 13,250 submitters commented on the wetland package. Approximately 435 unique submissions were received with the remainder being pro-forma prepared by environmental affiliated non-government organisations (NGOs) and sector representatives.

Submissions were broadly supportive of protecting natural inland wetlands, with most comments concerned about the details of the approach. Table 1 gives a break down (and approximate number of unique submission received) by submitter type. Table 2 outlines the broad issues and themes raised through submissions.

Table 10 Breakdown of submission received by type

Submitter type	#	Breakdown of submitter type
Businesses	150	The majority identified as farmers. Other sectors represented include: forestry, horticulture, industry – including Fonterra, mining, energy, ski fields, sphagnum moss growers and other sectors such as consultants and contractors.
Individuals	135	Half from the North Island, a third from the South Island, others were either overseas or not stated. Tend to support the proposals, but many are concerned they are not strong enough.
Non-governmental organisations	60	The majority identified as environmental NGOs, including Forest & Bird. One quarter were sector representatives, including farming, horticulture, forestry, airports. Others included QEII and National Wetland Trusts, New Zealand Freshwater Sciences Society and other environmental institutes.
Government agencies	60	All regional councils, 28 local authorities, Local Government New Zealand, and others, including 2 district health boards, 1 conservation board, and 7 Fish & Game New Zealand office submissions, as well as those from Kāhui Wai Māori, FLG.
Māori groups	15	Roughly half were iwi/hapū organisations and rest were other Māori affiliated groups
Community groups	10	Predominantly community catchment and restoration groups.
Academic research	5	Mainly Crown research institutes and Cawthron Institute.

Table 11 Summary of themes raised in submissions

Theme	Summary of submission points
Definitions	• Many submitters raised concerns around the definitions particularly relating to what is and is not included in the definition of "natural inland wetland". • Many also noted that other terms used should be consistent with the National Planning Standards.
Flexibility	• Almost all submitters support the principle of protecting our remaining natural wetlands, although opinions varied to what extent. • Some wanted complete protection, with no leniency afforded to circumstances such as nationally significant infrastructure. Others thought the 'avoid' policy was unachievable and preferred a no-net-loss approach utilising the effects-management hierarchy.[267] • Some submitters raised concerns over the poor implementation and outcomes associated with using the effects-management hierarchy for wetlands. • Some submitters have called for some aspects of regionally significant infrastructure to be included to the leniency proposed for nationally significant infrastructure, particularly for high growth urban development and transport networks. Some businesses also want to be included as "nationally significant" to carry on their operations in and around wetlands. • Some councils call the proposals inequitable and strongly recommend provisions be made for regional differences.

[267] A detailed direction to avoid significant adverse effects, and avoid, remedy, mitigate, offset other adverse effects

Theme	Summary of submission points
	• Submitters noted the package lacked an emphasis on restoration and had no provisions for cultural harvest or the sustainable harvest of sphagnum moss, and thought the NES rules required a more enabling framework for these.
Alignment	• There also were concerns about the interactions and potential lack of alignment with other legislative instruments resulting in the direction for wetland management being bloated and confusing. Councils in high-growth areas believe that the proposals will affect their ability to provide enough housing in urban areas under the NPS-UD. Others think the protection of indigenous biodiversity is lacking with some believing wetlands should be regulated solely under the proposed NPS-IB. • Many individuals are against the NES-PF taking precedence until direction can be aligned in an upcoming review because they think this is inadequate. Some are also concerned that proposed NES wetland provisions are weaker than the NZCPS and therefore the management of coastal wetlands should remain there.
Implementation	• The standard consent conditions within the NES are considered problematic as they are more assessment criteria. Several submitters suggest alternative drafting to improve clarity and consistency and reduce subjectivity in resource consent decisions. • Many submitter commented on details around the mapping and monitoring requirements, thinking they were overly onerous, and there were differences of opinion on the minimum size for wetland mapping. • Support from central government is needed for implementation, mapping and monitoring, and many private landowners think they should be reimbursed or incentivised for retaining their wetlands.
Alternative options	• Many submitters (mainly individuals and ENGOs) supported the wetland attributes as proposed by the STAG.

Changes incorporated as a result of public submissions

Submitters generally support the objective to protect remaining wetlands. Issues and concerns were directed for the most part to the details of how this is achieved and the workability of the proposal. We do not propose substantial changes to the proposed approach and recommend proceeding with Option 3 (amending the NPS-FM policies to strengthen protection of natural inland wetland) and Option 4 (developing NES rules to apply to natural inland wetlands and coastal wetlands).

There is a tension with allowing some scope in ambiguity in plans to allow for local circumstances that we cannot predict at a national scale (ie, NPS-FM provisions) versus the risk of being overly prescriptive in with rules which could be relatively blunt (ie, NES-F provisions). However, we consider the combination of policies and rules will offer an immediate protection which is important because so critically few wetlands remain, and there is a risk that wetland loss and degradation could continue while councils work to implement the NPS policies through their plan reviews.

We recommend drafting changes to the NPS-FM policies and NES-F rules as a result of the consultation feedback, subsequent engagement with council policy experts and government agencies, and the Independent Advisory Panel's recommendations. These changes are intended to clarify the intent of protecting our remaining inland wetlands regardless of their perceived "significance", improve the workability of the package, and to encourage and enable restoration.

Despite wide support for the wetland attributes proposed by the STAG we do not recommend including these into policy because we do not believe these to be achievable under RMA processes. We consider more immediate protection for wetlands is achieved under the policy and rule framework. We also do not recommend extending this to geothermal wetlands for the reasons previously stated.

Changes to Option 3 (NPS)

The key changes to the draft wetland policies supplied for consultation are to:

- **Tighten the definitions** to clarify the intent of protecting our remaining natural inland wetlands. This will minimise confusion about where the policy applies and where it does not.
- **Split the avoid policy** into separate policies to manage "loss of wetland extent" and "wetland degradation" to improve workability of policies because loss and degradation are different issues that respond to different management tools. We propose to retain the direction to avoid loss of wetland extent, and include a policy to policy to manage wetland condition so that it is at least maintained.
- **Clarify exceptions** to include nationally significant infrastructure, public flood control and soil conservation works where publically notified, and allow for some aspects of regionally significant infrastructure where nominated by councils and agreed to by Ministers.
- **Lift some of the NES detail into policy** to direct and aid assessment and decisions for instances where a consent could be granted (eg, for leniency afforded to nationally significant infrastructure, and essential works under flood control and soil conservation programmes).
- **Strengthen the language around the effects-management hierarchy** to clearly set the process and expected outcomes when using this process. This, together with strong policy direction, should improve the implementation of the effects-management hierarchy for wetlands.
- **Redraft requirements around mapping, inventory and the monitoring plan to give effect to policy intent,** and clarify that requirements are not compulsory for wetlands on conservation land. We propose to include a method for prioritising order of mapping areas, and also split the inventory requirements into compulsory information (ie, identifier and location, area GIS polygon, type classification, and currently available monitoring information), and optional information (ie, values, new monitoring information) to be included where available.
- **Use the wetland identification and delineation protocol as an aid** for decision makers rather than as a definitive decision tool, because the tool is not yet complete.
- **Delete the constructed wetland policy** because the focus of the regulations is to protect natural inland wetlands. This will reduce confusion as the stringent policies do not extend to constructed wetlands. Deleting this policy does not discourage the construction of new wetlands, and we think the subject can be better dealt with in guidance.
- **Minor redrafting to promote restoration and clarify protection of indigenous biodiversity.**

The assessment of the option against the criteria remains the same as in the interim RIA.

Changes to option 4 (NES)

The key changes to the draft wetland rules supplied for consultation are to:

- **Tighten the definitions** to clarify the intent of the rules and what is covered, and use terms consistent with the National Planning Standards.
- **Redraft the rules framework** to:
    - Be more enabling for wetland restoration, maintenance, and not inhibit cultural harvest and the sustainable harvest of sphagnum moss as per the original policy intent. This means the activity statuses for these activities would be permitted or restricted discretionary rather than discretionary.
    - Incorporate more effects-based regulation in relation to the size and risk of the activity where possible. This means direction for assessment criteria and conditions

such as monitoring would be more commensurate with the size and risk of effects of activities.
- Separate assessment criteria from consent conditions and clarify the matters over which discretion is given.

There are notable crossovers with other proposed policies NPS-IB, NES-PF and NPS-UD. Officials are working closely with other government agencies to consider the best way to address, package and align the management of wetlands across national policy instruments.

Additional Impacts

While the impacts raised in the interim RIA have not changed, submitters raise some additional impacts. Of particular note are impacts associated with regional differences and the mining sector.

Regional differences

Some councils call the proposal inequitable and strongly recommend provisions be made to account for regional differences. The West Coast Regional Council in particular consider the restrictive regulations to be potentially economically and socially unsustainable in areas where the majority of New Zealand's remaining wetlands are situated. Analysis demonstrates that while some councils have significantly more wetlands than others (ie, West Coast, Southland), the majority of these wetlands are under public conservation land (PCL) (approximately 85 per cent and 70 per cent respectively) (Figure 1). The interim RIS showed that the regions with the most recent loss include Waikato (328 ha), West Coast (307 ha), Southland (284 ha) and Canterbury (104 ha). These tend to be those regions with the most wetlands available to lose.

We do not recommend allowing for regional differences as we consider this would likely lead to further wetland loss, which will not achieve the government goals of halting the loss of our natural inland wetlands. Responsibility for mapping and monitoring on conservation land will not fall to regional councils, so the real costs to these councils will likely be less than anticipated.

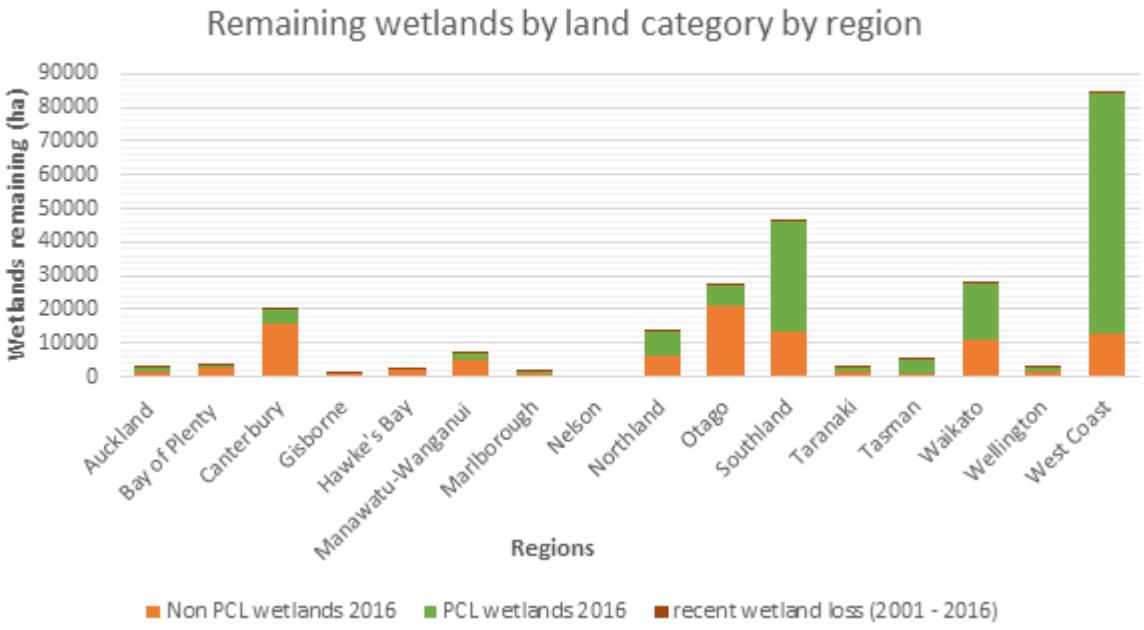

Figure 2 Remaining wetlands per region by non-public conservation land and public conservation land categories. This figure uses FENZ 2008 and Beliss et al. (2017) recent wetland loss data

Mining

Some in the mining sector also raised opposition to the proposal. They consider their operations to be of economic significance,[268] and have a functional need to be located where resources are found. They stated a non-complying status is unworkable and without the ability to mitigate, offset and compensate it could bring a halt to their business.

Some mining operators do undertake offsetting where wetlands have been impacted by their activities, although these tend to include covenants and/or improvements to nearby wetlands and streams. This ultimately results in a net loss of wetland extent but increase in the quality of others or of different ecosystems.

Table 3 shows the breakdown of mineral mining permits according to type (Prospecting, Exploration and Mining) which can be pictured on a sliding scale of impacts to the surrounding environment, with prospecting permits bearing the lowest impact and mining permits having the largest.[269]

[268] Oceana Gold for example considers that the proposal has the potential to leave 4 million ounces of gold (~1 billion NZD equivalent) un-minable.

[269] Prospecting permits allow for low-impact activities including literature reviews, aerial surveys, geological mapping, and sampling –by hand or other low-impact mechanical methods. Exploration permits include drilling and bulk sampling to test the feasibility of establishing operation. Mining permits include the full use and extraction of a specific mineral resource.

Table 12 Active mineral mining permits and mineral mining permit applications per region as at February 2017

Analysis of available datasets[270] show that of the approximately 662,000 ha of area under 202 active mining permits, around 18,850 ha contain inland wetlands. This represents approximately 3 per cent of the land under active mining permits. Of the 19 mining permit applications covering approximately

	Active permits (Permit application)		Wetland Area (ha) within active permit areas (Wetland Area (ha) within permit application areas)						
Region	**# of permits**	**Total Permit area ha**	**Ancillary Coal Mining Licence**	**Coal Mining Licence**	**Prospecting Permit**	**Exploration Permit**	**Mining Permit**	**Total Wetland Area ha**	**Potential permitted area containing wetlands %**
Northland	2 (1)	97,708 (900)			566		 (761)	566 (761)	1 85
Auckland	1 (1)	240 (46,630)			 (176)		2	2 (176)	<1
Waikato	11 (1)	63,067 (46,300)	0.1	289	64 (723)	76	152	581 (723)	1 (2)
Taranaki	1	1683				326		326	19
Tasman	14 (1)	71,569 (901)			444	139 (7)	3	586 (7)	1
Marlborough	1	133					<1	<1	<0.5
Canterbury	2	861				15	<0.05	15	2
West Coast	122 (14)	183,769 (181,356)	50	318	9,665 (3,092)	309 (1626)	954 (74)	14,078 (4,792)	8 (3)
Otago	36	23,1754			1114	627	53	1794	1
Southland	12 (1)	10,969 (30,210)		81	165 (149)	460	197	902 (149)	8 <1
Grand Total	**202 (19)**	**661,752 (306,296)**	**50.51**	**687**	**12,018 (4,139)**	**4,733 (1,626)**	**1,361 (836)**	**18,849 (6,608)**	**~3 (~2)**

306,000 ha, approximately 6,600 ha (representing ~ 2 per cent of the area under mining application) contain wetlands. The largest proportion of mineral mining is concentrated in West Coast and Otago. This analysis does not include petroleum permits, which are located mainly in Taranaki. We assume the associated impacts would be minimal as in New Zealand mines do not generally operate as open cast mines. The analysis also does not include gravel extraction/ aggregate mining, nor any mining activities in coastal wetlands; therefor the impacts for these activities are unknown.

We do not know the costs associated with unmined minerals as these permits are across multiple companies and are for a variety of different minerals. However, based on the wetland extents identified, MBIE estimate in 2018 approximately $1million was spent on exploration of mineral deposits classified as wetlands and likely impacted by the proposed policies. For large mining permits that contain wetlands, it is estimated the value of the minerals impacted by the proposal is at least $600 million. This is a lower-bound estimate as it includes only coal reserves due to data availability. The estimated annual value of the ecosystem services provided by the wetlands potentially impacted by active mining permits alone (excluding prospecting and exploration) is in the

[270] FENZ database for wetlands (data to 2008) and New Zealand Petroleum and Minerals database for minerals permits (data to 2017).

order of $66.2 million per year[271] (2019 NZD) for active permits and $41.9 million per year for those under mining permit application.

Given the above analysis and ultimate objective of preventing further loss of wetlands, we do not propose to include the mining sector with leniency to the policies, as it is difficult to justify leniency to one commercial sector over others such as agriculture.

Implementation approaches

Councils will require support and guidance to effectively implement the proposed wetlands regulations. MfE is currently drawing together an implementation work programme to provide technical guidance, education, and support to regulators around the application of the proposed policies and rules. Guidance, case studies and training on various aspects of the policy such as the effects management hierarchy would significantly improve the desired outcomes for wetlands and upskill landowners and decision makers on what is acceptable for activities in and around natural wetlands. Guidance for monitoring would include referring to the wetland condition index and other more high-level monitoring techniques would be useful.

Procurement for projects to complete the hydrological tool component of the wetland delineation protocol and identify the best method for high-resolution wetland mapping is underway. Councils would be helped considerably if central government procured and supplied one national high-resolution wetland map based on the best method that councils can refer to and check. However, this is dependent on available budget to undertake.

Summary of costs and benefits

Tables 4 and 5 provide a summary of costs and benefits of the preferred approach. Costs to identify and monitor inland wetlands, and process consents are already a responsibility of councils. Costs around these will likely increase especially for areas where the majority of wetlands remain and those with urban development pressures. Council capability and capacity issues may require additional upskilling and funding to achieve desired outcomes for wetland management and protection.

Over all the proposed policies and rules would incorporate a more stringent and consistent approach for inland and coastal wetlands than is currently the case. This is likely to affect several sectors such as agriculture, mining and other extractive industries, and urban development. However, the retention of wetlands in will also have direct economic benefits, from fisheries productivity, amenity values and tourism, and reducing the financial costs for nutrient, sediment, and flood management elsewhere.

[271] Based on converted estimated value of inland wetland ecosystem services of $48,640 per hectare per year (2019 NZD) from Constanza (2014)

Table 13 Summary table of costs of the preferred approach

	Additional costs of proposed approach, compared to taking no action		
Affected parties	Comment*: nature of cost or benefit (eg ongoing, one-off), evidence and assumption (eg compliance rates), risks*	Impact: *$m present value, for monetised impacts; high, medium or low for non-monetised impacts*	Evidence certainty
Regulated parties	Consenting costs including proving activities are not degrading to wetlands and wetland identification where necessary – would depend on size of development, proposed activity, and consultant's time. Opportunity cost to landowners and commercial businesses of not developing wetland area, taking water etc. overall generally low nationally due to small percentage of privately owned non-protected wetlands to be affected by policies and rules. Impacts of the wetland regulations will fall on some areas more than others because some regions have significantly more wetlands remaining than others.[272]	Unknown potential costs to landowners but not expected to be high because of the small proportion of non-protected wetlands on fertile land. Indicative costs to mining sector where wetlands are found within areas with mining permits conservatively estimated to be $600m (calculated for coal mining only).	Low Medium
Regulators	Cost of implementation including monitoring and mapping requirements and maintaining an inventory. Removing mapping and monitoring requirements for wetlands on PCL would go some way to minimising burden for councils with a large proportion of wetlands within public conservation land. Costs of processing consent applications or wetland management plans for activities where exceptions apply or restoration groups. Costs of upskilling staff on technical matters.	Monitoring – approx. $100k/y per council, although this will differ between councils depending on percent of natural wetlands remaining. Inland mapping – med/high depending on method used high resolution costs ranged $0.5 – $2.5m (although cheaper methods could also be used) Inventory – low	Medium Medium Low
Wider government	Complementary measures – such as wetland mapping methodology, and potentially a high resolution national map, and guidance on water level variations, drainage setbacks etc. Continued restoration funding	Approx. $550k initially If central government provided a national high-resolution wetland map additional costs could be high, approx. $4m High	Medium
Other parties		No costs	Low
Total monetised Cost		Not possible to aggregate cost due to uncertainty of costs to landowners. Medium	Medium
Non-monetised Cost		Medium	

[272] Those regions with the most non-protected inland wetlands on fertile land classes are within the Canterbury, West Coast, Otago, Southland, and Waikato regions. Councils and landowners in these regions will likely be more affected by the new regulations, although these regions also reap the benefits of the ecosystem services provided by these wetlands. The majority of coastal wetland area lies within the Northland and Auckland regions. Therefore, similar to inland wetlands, the costs and benefits of the NES rules for coastal will be unbalanced across the regions for both councils and landowners.

Table 14 Summary table of costs of the preferred approach

	Additional benefits of proposed approach, compared to taking no action		
Affected parties	**Comment**: *nature of cost or benefit (eg ongoing, one-off), evidence and assumption (eg compliance rates), risks*	**Impact:** *$m present value, for monetised impacts; high, medium or low for non-monetised impacts*	**Evidence certainty**
Regulated parties	More certainty as all wetlands treated the same. Better water quality and retention of other ecosystem services and amenity for retaining wetlands on property. Many landowners enjoy the positive effects of the amenity wetlands provide such as bird watching/ hunting etc. Increased tourism opportunities for areas with high naturalness	Medium Values included in national values below.	Low
Regulators	More certainty for decision making through nationally consistent approach to wetlands. Wetland delineation tool removes debate and avenue for appeal. Better understanding of extent and values of wetlands in regions.	Medium High High	Medium
Wider government	Better able to analyse and report on wetland extent and health. Increased ability to support international agreements (ie, Ramsar Convention). Benefits to government's biodiversity enhancement objectives.	High	Medium
Other parties	Wider community benefits from retaining ecosystem services of inland and coastal wetlands. Increased protection of habitat for indigenous biodiversity.	Non-protected Inland wetlands on fertile land ~$1.4 b/yr. nationally All coastal wetlands ~$16.9 b/yr. nationally	Medium
Total monetised benefit	The cost of reinstating constructed wetlands to achieve the ecosystem service benefit of nutrient attenuation etc., or the cost of restoring wetlands for indigenous biodiversity habitat is likely to be far greater than the opportunity cost of protecting remaining wetlands in the first place.	In the order of ~18.3 b/yr. for retaining ecosystem services of inland and coastal wetlands nationally	Medium
Non-monetised benefit		High	Medium

Chapter 14: Improving water quality through better farm practice

Context

There is extensive applied research and modelled data to indicate water quality improvements would flow from the adoption of improved farming practice. For example, Environment Canterbury's substantive Matrix of Good Management modelling exercise found that dairy farm nitrogen losses would fall by 22 percent and phosphorus losses by 15 percent; sheep, beef and deer farms' nitrogen losses would fall by 16 percent; and cropping farm nitrogen losses by 16 percent.[273][274] Nitrogen, phosphorus (and the sediment phosphorus is bound to) and associated pathogens are key drivers of declining water quality and ecosystem health. Reductions of the magnitude suggested by these studies suggest there are significant benefits to the health of New Zealand's waterways from improving farm practice.

As described below, there is increasing interest in using freshwater modules in farm plans (FW-FPs)[275] to address a range of environmental issues. While water quality is the initial focus, there is also discussion of using farm plans to assist with climate change and biodiversity challenges. In addition, MPI's integrated farm planning project is looking at the role of farm plans more generally (eg, including areas such as animal welfare and business planning); and promoting effective integration across different aspects of farm planning.

Proposal

The Action for healthy waterways consultation included the preferred option of mandatory FW-FPs. It proposed all farmers and growers above a size threshold would be required to have a FW-FP by 2025. The FW-FP would need to address property specific risks to water quality and ecosystem health. The draft NES included proposed minimum content for all such FW-FPs; a requirement for FW-FPS to be approved by a suitably qualified individual as meeting the requirements; and a requirement for farmers and growers to have their FW-FP implementation audited at regular intervals. Feedback was also sought on a voluntary FW-FP regime.

Mandatory FW-FPs remains the preferred approach. However, to strengthen enforcement of actions in FW-FPs, an issue of concern in submissions, it is now proposed that the mandatory FW-FP regime be delivered through regulations rather than the NES. To achieve this it is proposed to amend the RMA via a Supplementary Order Paper to the current RMA Amendment Bill. Once empowering provisions are in place, details of the new FW-FP regime would be developed in regulations over the following 18 months in collaboration with the primary sector, regional sector and iwi/hapū and ENGOs. The regulations will include timeframes; process standards around how FW-FPs are developed, approved, audited; practice standards around content and actions in FW-FPs; and data and information standards about what data and information must be provided and to whom and in what format.

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[273] Environment Canterbury (2015). *Overview report: Canterbury matrix of good management practices*

274 It is important to acknowledge that in catchments that are severely over-allocated, good practice-based FW-FPs will not be the sole tool to deliver large-scale land-use change that may be required to manage within catchment limits.

[275] Also called Land and Environment Plans in the dry stock sectors, and Farm Environment Management Plans by some councils. Typically these plans cover a range of environmental risks and not just those to water quality eg,, biodiversity. In addition, these plans are part of an even broader set of plans the farm may hold including financial planning, animal welfare plans, health and safety plans etc. Throughout this document we have used the term Freshwater Farm Plan (FW-FP) to refer to what is essentially the *water quality module* of what may be a much broader plan, or which may stand alone.

Status quo including regulatory systems in place

Currently a range of approaches are being taken to improve farm practice in relation to water quality. Councils use regional rules, information/advice and (in some cases) part funding for improved practice. Sector organisations publish good management guidelines and codes of practice and offer varying degrees of extension support to their constituents. The dairy sector has implemented the Dairying and Clean Streams Accord and its successor, the Sustainable Dairy: Water Accord to address particular practices such as stock exclusion from waterways.

Adoption of improved practice is patchy, and mostly undocumented. The dairy accords have been reasonably successful with significant improvements in the identified practices documented and audited. A 2015 Federated Farmers/Dairy NZ survey revealed an estimated farmer spend of over $1 billion on protecting and improving the environment over the previous five years.

Increasingly, regional councils, processors and sector organisations are taking a farm-system and risk management-based approach to improving farm practice through the use of FW-FPs that are tailored to the specific water quality risks on each farm. This tailored approach is viewed by the primary sector and regional councils as a useful way to improve freshwater outcomes and can also work in tandem with more prescriptive controls over farming activities. FW-FPs are required for many farms under Environment Canterbury's regional rules; Horizons' One Plan rules; and in the Tukituki catchment in Hawke's Bay. FW-FPs are also proposed under Waikato's Plan Change 1; Bay of Plenty Regional Council's Plan Change 10 for the Rotorua lakes; and Southland's Water and Land Plan. Northland's proposed regional plan requires erosion control plans for high sediment yielding land. A number of councils also support voluntary up-take of FW-FPs.

Sector organisations also have strategic targets for the adoption of FW-FPs by all their levy payers. The targets below illustrate that the primary sector views FW-FPs as a useful way to help farmers and growers improve their environmental performance (and in so doing potentially help promote higher value products and improve the social licence of farmers and growers).

- Beef+ Lamb NZ's Environment Strategy commits to all sheep and beef farmers having a farm environment plan by 2021.
- The dairy sector's Dairy Tomorrow Strategy includes a target for every dairy farmer to have a farm plan by 2025.
- The deer industry is aiming for every deer farmer to have a farm plan by 2020
- Horticulture NZ and the Foundation of Arable Research are signatories to the Good Farming Practice: Action Plan for Water Quality that includes a commitment to all farms having an FW-FP by 2030.

How is the situation expected to develop if no further action is taken?

Uptake of improved practice will continue to be patchy as there will be insufficient incentives for adoption by all farmers and growers. Some farmers will continue to operate with high levels of environmental performance. However, significant barriers to adoption of improved practices exist. These include a lack of awareness about what good practice is; need for greater one-on-one support from skilled individuals for helping build farmer confidence to implement changed and improved practices; and actual or perceived cost barriers.

The use of FW-FPs is expected to increase. Given current trends, it is likely that over time most regional councils will include a FW-FP requirement for at least some of the farmers in their region; and sector organisations will continue to promote the use of FW-FPs.

If the actions in FW-FPs appropriately target water quality risks and are implemented, improved water quality will result (assuming appropriate management of urban activities impacting on freshwater). Implementation of FW-FPs will be higher if councils (or an independent third party) monitor and enforce FW-FP implementation. The voluntary nature of FW-FPs under some sector initiatives mean that willing farmers will adopt and implement FW-FPs, while the unwilling may not. There will also be questions as to the confidence that industry bodies will all have the necessary tools and incentives to ensure poor performers are identified and improve their practices.

With no further action, there will also be little national consistency in the requirements for FW-FPs and the supporting systems. MPI's Integrated Farm Planning project may provide guidelines for example for data standards to help improve national consistency. However, there will likely be missed opportunities to gather meaningful data that can inform evaluation and improvement of FW-FPs and provide a picture of the nature and extent of farming activities across the country. Improved information will help direct research and extension support to where it is most needed and better inform compliance and enforcement activities but without stronger national support for farm planning, implementation support will also be patchy and the farm planner work force will be slower to build up.

The problem/opportunity

Water quality is degrading in many rural catchments. One significant contributing factor is that not all farmers are adopting practices to reduce water quality impacts from their farms, or are not doing so fast enough. Sedimentation (erosion and soil loss) is a particular problem in hill country areas where sheep and beef farming is a common activity. Intensive farm activities, typically on flatter areas, are associated with nitrate losses (eg, through fertiliser use in vegetable growing; and emissions from dairy cattle) that impact on water quality and ecosystem health.

As identified earlier, there is an extensive set of applied research and modelled data to indicate the water quality improvements that would flow from the adoption of improved farming practices. If all farmers and growers operate at good practice levels this will in turn better deliver on the values New Zealanders derive from freshwater resources. In catchments where water quality is already in reasonably good shape benefits are still created. This includes opportunities to better provide for environmental outcomes and associated values and/or free up capacity for additional development opportunities.

While progress is being made, anecdotal evidence and perspectives from conversations with individuals involved in farm planning initiatives indicate scope for on-going improvement. This view is supported by the results of the most recent Manaaki Whenua/Landcare Research survey of rural decision makers.[276] The survey found 49% of respondents were not implementing practices to manage erosion and sediment; 38% of those with farms prone to pugging were not implementing practices to reduce pugging; and 22% of those with stock and streams/wetlands were not restricting stock from waterways.

To be most effective, the practices adopted need to address the particular risks to water quality on each farm. A FW-FP (whether voluntary or mandatory) is a tool to promote improved practices tailored to the specific water quality risks on each farm and the catchment in which it is located, and a continuous improvement approach.

[276] https://www.landcareresearch.co.nz/science/portfolios/enhancing-policy-effectiveness/srdm/srdm2017

Reasons for non-adoption of good practices are multi-factorial and vary from case to case, as described above in the reference to significant barriers. Voluntary compliance can also be undermined if farmers are not confident of the environmental benefits of what they are being asked to do or if the requirements do not make sense to them or preclude other more cost effective approaches. An additional problem is that water quality degradation may have little direct cost for the farmer generating contaminant discharges, but has effects on those downstream and on the health of the waterway.

There is significant opportunity for reductions in water quality impacts from farms without the need for land-use or system change. For example, in the Horizons region, dairy farmers seeking land use consents worked with consultants to reduce nitrate discharges; with modelled reductions of 5 to 20 percent able to be achieved while retaining farm viability.[277] Sediment loss reductions of 47-70 percent from hill country farms implementing FW-FPs have been modelled for the Horizons and Waikato regions respectively.[278] Reductions of this scale would make a significant contribution to achieving the overall objectives of Action for healthy waterways.

Additional constraints on the analysis

Quantifying the costs and benefits of the developing and more particularly implementing actions in FW-FPs associated with good management actions is difficult. The existing NPS-FM requirements including councils setting and managing to catchment water quality limits (by 2025) are already resulting in farmers and growers implementing a range of improved practices (that may also involve farm plans). There are also more specific proposals to manage some high-risk farming activities in other parts of the current freshwater reform proposals. This includes feedlots; intensification of land use and managing high nitrogen leaching activities in highly degraded catchments. Section 360 regulations are proposed for excluding stock from water bodies.

This RIA seeks to identify the costs and benefits specific to the general proposals to promote uptake of good management practices to improve water quality and ecosystem health; and to identify where there may be duplication with other requirements. Costs and benefits at the individual level are also influenced by the extent to which the farmer or grower is already operating at good practice and the level of industry and/or council support already provided to them in implementing good management practices.

In addition, actions to improve freshwater quality may be beneficial for meeting other current or future environmental requirements, such as those targeting biodiversity and greenhouse gas emissions. A water quality module of an FW-FP could be integrated with modules for greenhouse gas mitigation, biodiversity enhancement and water-use efficiency. This in turn could be part of a wider plan for the farm business. The freshwater Fair Allocation work stream may in future develop proposals for which FW-FPs may be useful. For example, if a property specific nitrogen discharge allowance was in place, the auditing process for FW-FPs could provide an opportunity for assessing compliance with that allocated discharge. In addition, FW-FPs could be used in parallel with an allocation regime for nitrogen, with the FW-FP used to ensure good management of other contaminants such as sediment and pathogens.

[277] Parminter, T., 2015: Selecting farm practices and preparing farm plans for land-use consents in the Manawatu- Wanganui region. In "Proceedings of the 77th Annual Grassland Conference".

[278] Doole, G. J. (2015). Description of mitigation options defined within the economic model for Healthy Rivers Wai Ora Project: description of options and sensitivity analysis; Snelder, 1 (2018). Assessment of recent reductions in *E.coli* and sediment in rivers of the Manawatu-Whanganui Region: Including associations between water quality trends and management interventions

Options Assessment

Objective

Our policy intent is to promote the on-going up-take of farm management practices that will help improve water quality and ecosystem health.

Summary Assessment

Criterion	Option A: strengthen support for voluntary adoption of improved practices and freshwater modules of farm plans	Option B: Prescribe comprehensive suite of good practice requirements in National Environmental Standard	Option C: Mandatory Freshwater Farm Plans
Effectiveness	+	+	++
Timeliness	+	0	+
Fairness	0	-	+
Efficiency	+	0	++
Principles of the Treaty of Waitangi	0	+	+
Te Mana o te Wai	+	0	++
Overall Assessment	+	0	++

Baseline option: Maintain Status Quo

Continuing the status quo will result in ongoing patchy adoption of improved practice and FW-FPs. It will not accelerate the adoption of practices to the extent needed to halt degradation and help deliver improved water quality in five years. This option will also not drive a significant improvement in the numbers of people undertaking training to be able to provide professional services in farmer extension and delivery of FW-FPs. The voluntary nature of FW-FPs under most sector initiatives mean that willing farmers will adopt and implement FW-FPs, while the unwilling will not. With implementation support likely to be patchy, the quality of FW-FPs and implementation of actions in them may be variable. There will also be lost opportunities to improve consistency in the standards, training and information and reporting systems for FW-FPs. For these reasons this option is not favoured.

If the status quo continues, FW-FPs will likely be required by an increasing number of regional councils, and will continue to be promoted by sectors and processors/exporters. However, this is likely to happen over an extended period as regional plans are developed and renewed. It is also likely that regions with FW-FP requirements may target them to particular catchments only and that not all regions may support FW-FPs. Where FW-FPs are voluntary and not linked to a rule in a regional plan, the actions in them are not directly enforceable. Processor/exporter requirements depend on market drivers and the nature of the industry. Processors targeting top-end consumer markets are more likely to require assurances of good environmental practice of their suppliers to support the brand.

Indicative Social Impact

The status quo is unlikely to impact on farming communities' day-to-day work, and to bring strong incentives for vast numbers of farmers and growers to become early adopters of sustainable practices, as farmers and growers 'wait and see' for regulations as well as for research to demonstrate visible benefits.[279] There will continue to be a range of performance, with poor performers letting the side down. The status quo is unlikely to markedly contribute to perceptions that the farming community are acting as stewards of the land or build the social licence to operate),[280] which will likely be associated with reduced well-being within the farming community.[281]

There is currently no clear role for partnership with Māori and iwi specific to good farming practices and FW-FPs across the country. The status quo is unlikely to improve Māori and iwi's opportunity to express their kaitiakitanga role and improve their sense of cultural identity.

Option A: Strengthen support for voluntary adoption of freshwater modules in farm plans and improved farm practices (support package)

This option of a voluntary approach to FW-FPs would give increased central government priority and publicity to supporting the successful implementation of the *Good Farming Practice: Action Plan for Water Quality*[282] and allied industry farm plan commitments. This would be underpinned by strengthened support for extension programmes, good practice and FW-FP guidance, catchment group initiatives, training of farm plan advisors, and on-going work on efficacy of good practices.

This option provides the primary sector with opportunity to demonstrate leadership in promoting improved performance. Over time, this support package would result in increased uptake of FW-FPs beyond that achieved in the status quo, especially amongst willing farmers and in regions where councils prioritise working with the farming sector. Unwilling farmers would be less likely to adopt and/or implement FW-FPs and an industry led and managed process may be less trusted. A significant risk with this option is that some of the least willing farmers may also be the most damaging to water quality. In addition, lack of a mandatory national requirement is likely to lessen Government focus, commitment and resources supporting effective FW-FPs and improved practice adoption across the country.

It is worth noting Budget 2019 has provided $229M over four years to support major initiatives in the agriculture, environment and climate change portfolio. The success of this bid recognised the myriad of challenges and opportunities facing the primary sector and the increasing prominence being given to farm planning for managing a range of environmental risks. The budget bid includes $12M to support the successful implementation of farm planning generally, including good practice standards; and $5M for developing competency, training and qualification framework for farm advisors. MPI also have $60M to improve decision support tools like Overseer; and $47M for on farm support and Māori agribusiness. There will likely be a need for further funding to support the

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[279] Botha N, Roth H and Brown M 2013. '*The Adaptation of Pastoral Farmers to Environmental Policy Changes: A New Zealand Case Study*.' South African Journal of Agricultural Extension, Vol. 41: 16-25

[280] P Clark-Hall, 2018, *How to Earn a Social Licence to Operate*

[281] Farmers' mental health: A review of the literature (ACC Policy Team, 2014) https://www.mentalhealth.org.nz/assets/ResourceFinder/wpc134609.pdf; Botha N, Roth H and Brown M 2013. '*The Adaptation of Pastoral Farmers to Environmental Policy Changes: A New Zealand Case Study*.' South African Journal of Agricultural Extension, Vol. 41: 16-25; Kennedy A, Maple MJ, McKay K, Brumby SA. 2014. Suicide and accidental death in Australia's rural farming communities: a review of the literature Rural and Remote Health 14: 2517. http://dro.deakin.edu.au/eserv/DU:30062460/kennedy-suicideandaccidental-2014.pdf

[282] This 2018 Action Plan was developed by the primary sector in partnership with regional councils and government.

implementation of this policy and more generally help the primary sector transition to more sustainable ways of operating and support councils in the management of freshwater resources. A further budget bid will likely be developed for this purpose.

Criterion	Option A: strengthen support for voluntary adoption of improved practices and farm plans
Effectiveness	+ Over time many farmers will develop and implement an FW-FP with actions to address specific risks to water quality on their farm, but uptake will be patchy and incomplete and the quality of the plans will likely be variable.
Timeliness	+ Central Government support for councils and sectors would increase voluntary adoption of FW-FPs amongst the willing, and likely accelerate the development of regional plan rules requiring FW-FPs.
Fairness	0 Costs to address water quality impacts would fall on those who choose to develop an FW-FP or are otherwise required to do so because of a council or industry requirement. Others can choose not to do so. Where FW-FPs and improved practices are not adopted, the costs continue to fall externally to the community/the water itself and good work done by responsible farmers can be undermined.
Efficiency	+ Adoption of FW-FPs and good practices would be greater than under the status quo, enabling selection of least-cost ways of reducing discharges from these farms. However, some farmers will not adopt FW-FPs, so some of these least-cost tailored approaches will not be implemented, and the benefits for water quality not achieved.
Principles of the Treaty of Waitangi	0 Aims to reduce the water quality impacts from farms, contributing to improved ecosystem health. However FW-FP adoption would be incomplete. Catchment-scale information including that relating to mahinga kai values should assist in farm planning but there is not a clear role for partnership with Māori in developing FW-FPs requirements and overseeing implementation.
Te Mana o te Wai	+ This option would make a contribution to protecting the health and mauri of water. It would also enable farmers who adopt FW-FPs to better exercise kaitiakitanga or stewardship over the resources in their care.
Overall Assessment	+ Will help and is needed. On its own won't be enough to make a significant contribution to improving water quality

Indicative Social Impact:

The indicative social impacts are likely to be similar to those associated with the status quo. The success of those voluntary programmes to bring effective change will depend on effective design and good farmer engagement (eg, working with the landowners' goals; creating a sense of responsibility; and research demonstrating visible benefits of the alternative practice).[283]

Option B: National regulation prescribing comprehensive good practice standards

Under this option, a comprehensive suite of minimum good practice standards would be prescribed in a national instrument. (These standards would be in addition to any national standards proposed

[283] Botha N, Roth H and Brown M 2013. '*The Adaptation of Pastoral Farmers to Environmental Policy Changes: A New Zealand Case Study*.' South African Journal of Agricultural Extension, Vol. 41: 16-25; Finlayson, K. 2018. Bridging the gap: Linking farm plans to every day farming practice. PhD. Otago University, New Zealand.

for high-risk land-use activities and exclusion of stock from waterways). To provide confidence that the standards would be met, they would need to be clear and specific (and there would also need to be an effective compliance and enforcement regime).

This option is similar to that developed in the NES Plantation Forestry (NES-PF), which sets out good practice. However, the NES-PF also includes a requirement for risk-based management plans for a range of activities. These plans are tailored to the specific forest, recognising that not all practices can be specified in a national instrument. Developing a similar set of practices for the wide range of agricultural and horticultural land uses would take considerable time (with farming and growing activities far more heterogeneous than forestry). Additionally, if the requirements do not make sense to the farmer (one size is not likely to fit everywhere) then the critical incentives for voluntary compliance relating to a wide range of day-to-day farming decisions will be weakened.

Most councils already reference a small number of industry codes of practice in their plans, such as the Farm Dairy Effluent (FDE) Design Code of Practice and Standards and irrigation efficiency requirements that are two generally applicable everywhere though some aspects still involve expert judgement and interpretation. The inherent difficulty in creating prescriptive standards that make sense to the wide range of farming enterprises and the differing environments in which they operate mean there would likely also be a need to fall back on the use of risk-based management plans for many aspects of farm operations.

Criterion	Option B: Prescribe suite of good practice requirements in NES
Effectiveness	+ Will improve practice in the areas specified in the regulations (with a good compliance regime), but will not be tailored to individual farm risks. Attention may be diverted away from managing more significant risks to water quality. Also if the requirements do not make sense voluntary compliance and farmer buy into the prescribed requirements and other voluntary environmental actions may be undermined.
Timeliness	0 The complexity of the task of developing and gazetting a comprehensive set of regulations could take one-two years.
Fairness	- The bluntness of a national instrument would result in some inequities eg, some farmers would be required to comply with costly regulations for a low-risk practice and others would continue with more risky practices that have not been identified in the regulations.
Efficiency	0 Blunt regulatory approach would not take account of variation in farm types and environmental conditions, and would not be tailored to the risks on each farm, imposing additional and unnecessary costs. In some cases, it would be less efficient than the status quo.
Principles of the Treaty of Waitangi	+ Aims to reduce the water quality impacts from farms, but as this approach is relatively ineffective, it would achieve less that options A and C in this regard. This option could provide for partnership in developing the national standards.
Te Mana o te Wai	0 This option would make a lesser contribution to protecting the health and mauri of water than the other options, and would delay action until the regulatory standards are developed.
Overall Assessment	0 May have perverse outcomes from focusing on actions that are more amenable to prescriptive regulation but may be high cost and not the ones that will make the most difference to water quality.

Indicative Social Impact

If a comprehensive range of standards could be developed and regulated, it could help improve public perception of the farming community as stewards of the land. Partnering with Māori and iwi in developing the standards and overseeing their implementation would likely improve Māori and

iwi's opportunity to express their kaitiakitanga role and improve their sense of cultural identity. New national standards could also increase demand for a higher-skilled and larger rural professional workforce, thus creating more job opportunities.

However, it is far from clear that this option would meaningfully contribute to improved water quality and wider social benefits. The process may become protracted and there is a significant risk of producing impractical and inefficient standards. This would negatively impact farmer wellbeing (anxiety/mental health) and reduce social cohesion. This is particularly the case if farmers believe the standards are correct, relevant, or necessary[284] and preclude more targeted and cost effective approaches. This would undermine implementation support and crucial voluntary farmer compliance. Farmer well-being will be adversely affected if financial costs of implementing the standards will, or are perceived to affect farm viability; and farmers are concerned they do not have the necessary skills and resources to implement the standards. Farmers will also be frustrated if they are precluded from using emerging technologies that may better manage risks.

Option C: Mandatory Freshwater Farm Plans

Under this option all farmers and growers above a size threshold (eg, 20 hectares, with a lower threshold of 5 hectares for horticulture) would be required to have a FW-FP by 2025 or 2030 (timeframes to be confirmed in the farm planning regulations that will be developed over the next 18 months). The FW-FP would need to address property specific risks to water quality and ecosystem health and align with minimum content requirements. The draft NES that was consulted on included proposed minimum content for all such FW-FPs; a requirement for FW-FPs to be approved by a suitably qualified individual as meeting the requirements; and a requirement for farmers and growers to have their FW-FP implementation audited at regular intervals.

Stakeholder views on the mandatory FW-FP proposals are summarised under the stakeholder feedback section later in this document.

The overall approach of mandatory FW-FPs remains the preferred approach. However, it is now intended to include the FW-FP regime under a new section in the RMA via a supplementary order paper (SOP) to the RMA Amendment Bill (rather than including the provisions in the Freshwater National Environmental Standard). Amending the RMA will enable specified actions in FW-FPs to be enforceable independent of regional plans or the activity status of the land use under the RMA. Under the existing RMA, failure to comply with a provision in a FW-FP may not always readily be attributed to a breach of sections 9-15 of the RMA and the specific actions in FW-FPs are certified by third parties with no status under the RMA.

We are proposing a regime that encourages farmers and/or growers to 'own' their FW-FP. They will be able to produce their FW-FP themselves or with support from specialist advisors. It is also still intended that the FW-FP be approved by a suitably qualified and experienced person (paid for by the farmer); although it may be necessary to prioritise and phase this requirement. Experience in Canterbury (where the council approved farm plan templates but did not have a certification requirement) is that it would be beneficial to focus on improving the quality of FW-FPs up front. An independent auditor (again funded by the farmer) would then review progress in delivering on the

[284] Farmers' mental health: A review of the literature (ACC Policy Team, 2014) https://www.mentalhealth.org.nz/assets/ResourceFinder/wpc134609.pdf , Botha N, Roth H and Brown M 2013. '*The Adaptation of Pastoral Farmers to Environmental Policy Changes: A New Zealand Case Study*.' South African Journal of Agricultural Extension, Vol. 41: 16-25

FW-FP and provide a level of confidence grade. Non-compliant farmers / growers would be referred to regional councils for compliance, monitoring and enforcement action.

Following enactment of the RMA Amendment Bill, regulations will be developed setting out in greater detail how the new regime will operate. This will include timeframes; governance and associated roles and responsibilities; agreed good practice outcomes, objectives and guidance; requirements for farm plan certifiers and auditors; and monitoring and reporting provisions. Input from iwi, regional councils, the primary sector and ENGOs will be necessary to ensure that the FW-FP regime is fit for purpose and Treaty Settlement obligations are met. A competency framework will be needed for certifying farm planners[285] and auditors as competent, including professional standards and commitment to ethical practice and on-going competency development. It will also be critical to have processes for monitoring integrity of the system (eg, including random checking of approved farm plans).

Leveraging existing industry and council capacity will be important for delivering on the new regime. Industry assurance programmes (eg, Synlait's Lead with Pride, and Horticulture's NZGAP programme) have the potential to be used to help farmers meet the farm plan requirements subject to a transparent process to provide confidence that they are robust and can meet the requirements. This includes having appropriate reporting and ways to identify and manage poor performers so councils can exercise their compliance monitoring and enforcement functions.

The work to develop the regulations will build on the general FW-FP provisions that were included in the draft NES and be informed by the submissions on those clauses. This process is likely to take around 18 months given the level of engagement that will be required. The expectation is that a significant number of farmers and growers would still be required to have a FW-FP by 2025 (which aligns with the He Wake Eke Noa farm plan commitments for Greenhouse Gas Emissions), but the roll-out may need to be prioritised and staged over a longer timeframe (eg, to 2030 for some lower priority farms and/or catchments). Work to promote the up-take of FW-FPs and good management practices (as set out in Option A) will continue as the regulations and supporting implementation package for the new FW-FP regime are developed.

Criterion	Option C: Mandatory enforceable Farm Environment Plans
Effectiveness	++ Requires all farmers to develop and implement a tailored FW-FP, with actions to address specific risks to water quality on their farm. With government, council and industry support, farmers will be provided with the skills, knowledge and one on one support to continuously improve management practices. Where a farmer or grower fails a FW-FP audit, enforcement action will be able to be taken if the non-compliance is not rectified, even if the FW-FP is not part of a consent requirement or linked to a permitted activity condition in a regional plan.
Timeliness	+ Primary sector leaders have recently committed to a target of all farmers and growers having a FW-FP by 2025. The RMA farm planning regulations will need to set out dates by which certified FW-FPs are to be required. 2025 is expected to be a key date, but to manage capacity issues timeframes for some (likely lower risk areas) will likely be extended out to 2030. It will likely take at least 18 months from enactment of the RMA Amendment Bill (expected April 2020) to develop the requirements for the FW-FP regime. Time will also be needed to build the institutional capacity (eg, suitably qualified farm planners) to deliver quality FW-FPs. The intention is that the proposed regime will leverage and develop existing industry and council capacity. Providing tailored one on one support will increase the adoption of better practices and encourage continuous improvement over time as actions in FW-FPs are implemented and up-dated.

[285] Considerable work has already been done on competency requirements and approval processes for certifying freshwater farm planners.

Fairness	+ All farmers would be required to address their water quality impacts through an FW-FP, rather than just the willing and those required to by councils. FW-FP actions will be proportionate to the farm's water quality risks. Cost of FW-FP preparation and auditing fall on farmers, and the benefits fall widely across the community. The way the costs fall is not related to ability to pay, so some lower-profit farms may face high costs; affecting their viability. Implementation support should mean that farmers are not be being asked to do something they do not have the knowledge and skills to perform.
Efficiency	++ Additional costs would be imposed on farmers, councils, government and industry bodies, but the risk-based and tailored nature of FW-FPs mean that they can identify the most efficient method of reducing discharges from an individual farm. However, FW-FPs do not identify the most efficient method of reducing discharges across a whole catchment in order to meet a limit. Additional catchment-scale planning approaches would enable these efficiencies to be captured.
Principles of the Treaty of Waitangi	+ Proposal aims to reduce the water quality impacts from every farm. If implemented well it will provide a significant on-going contribution to improving water quality and ecosystem health. The option will need to provide a role for Iwi Māori into the design of the FW-FP regime and its implementation. For an individual farmer, the development of the FW-FP involves an approved advisor chosen by the farmer, who works in partnership with the farmer to develop a mutually agreed FW-FP. For Māori-owned farms the farmer's aspirations and knowledge (including matauranga Māori) can be incorporated into the FW-FP; helping farmers retain rangatiratanga over their farm resources.
Te Mana o te Wai	++ This option would make a stronger contribution to protecting the health and mauri of water than options A and B. Farmer buy-in will be stronger and there will be a greater level of farmer support (including from industry and regional councils) to promote continuous improvement. It also enables farmers to better exercise kaitiakitanga or stewardship over the resources in their care.
Overall Assessment	++ If well-resourced FW-FPs could deliver significant improvement in water quality and promote continuous improvements in farming practice across a range of environmental parameters.

Indicative Social Impact

There will be costs of preparing, implementing actions within, and auditing FW-FPs (including paying for advice), and this will fall to farmers. Any reductions in farmer disposable income could affect wider rural communities as well as the individual farmers. Some primary sectors are likely to be more affected than others are, with the dairy sector being the most advanced in terms of numbers and quality of FW-FP already done. A benefit of the proposed policy is the likelihood of increased demand for a higher-skilled and larger rural professional workforce, creating job opportunities, especially in regions where fewer FW-FPs have been developed. As mentioned in the constraints on analysis section, some of these costs would occur even without mandatory FW-FPs.

Farm plans are increasingly being promoted by the primary sector on a voluntary basis, with support being provided to farmers to assist them in developing and implementing their plans. Nevertheless, mandatory FW-FPs with certification and audits may cause stress and anxiety to farmers. This is particularly so if costs affect, or are perceived to affect farm viability; if farmers are concerned they do not have the necessary skills to implement the requirements; or if they do not consider aspects of the regime to be necessary or legitimate. Looking at submissions a number of farmer and growers were concerned about the certification process. This was seen as costly and unnecessary with resistance to what was perceived to be someone with limited knowledge telling the farmer how to farm. This concern should reduce if industry assurance programmes are assessed as suitable for delivering on the regime requirements and by making clear the expectation that farmers will play a key role in developing their FW-FPs.

Experience from Canterbury suggests that going through the process of developing a FW-FP (especially with tailored one-on-one support) and a FW-FP audit may improve some farmers'

wellbeing through helping them feel more equipped and resilient in facing the environmental challenges ahead and confident in their role as environmental stewards.

Mandatory FW-FPs are most likely to enhance partnership with iwi and Māori because the development of the new FW-FP regime will be able to provide a role for iwi on-going governance and implementation of the new regime. At the on-farm level, this option is also likely to make a significant contribution to improved water quality and ecosystem health. This will help improve the ability of iwi and hapū to express their kaitiakitanga role and improve their sense of cultural identity. Wider council responsibilities around policies to give effect to Te Mana o te Wai and reflect Māori values in freshwater planning will also provide information to inform farm planning priorities at the catchment level and assist FW-FPs in their role.

Options ruled out of scope, or not considered

A further option previously considered was to establish a national body to administer a farm plan regime, rather than regional councils. This option could be suited to achieving a broader range of national outcomes including "Brand New Zealand" assurances on environmental performance, natural resource use charges, and management of greenhouse gas emissions from the primary sectors. While this option could be part of the longer-term architecture of environmental management in New Zealand, it was not considered further because of the lack of a suitable national institution and the fundamental change this would have on council's wider RMA responsibilities.

Recommendation

Option C: Mandatory FW-FPs for all farms (over a de minimus size threshold) is the favoured option. It is most likely to deliver on the policy objectives and result in greater up-take of management practices that will deliver improved water quality and ecosystem health and provide for associated values. The ability to customise actions to the farm in question and the inclusion of a process to approve FW-FPs and to independently audit plan implementation, and promote effective council compliance, monitoring and enforcement are key elements of driving this change. However, to be successful (rather than a box ticking exercise), a mandatory FW-FP will require high level of government investment and support. The rollout of the FW-FP regime will need to be phased and prioritised though the process to develop the FW-FP regulations.

Costs and benefits of the preferred approach

Costs will be significant for the primary sector, including Māori farmers and growers; and regional and central government. However, if the FW-FP delivery is well-resourced, the policy has potential to provide significant benefits not only in contributing to improved water quality and associated values, but also building a more sustainable and resilient primary sector and farm advisor workforce. Table one below summaries the costs and benefits of the preferred approach. Table two provides additional detail.

Table 1: Summary of Costs and benefits of the preferred approach

Affected parties	Key **costs,** impacts, and evidence certainty	Key **benefits,** and impacts, and evidence certainty
Regulated Parties	Financial costs to farmers and growers of preparing a FW-FP and having it certified is assumed to be $4000 on average amounting to a total cost of approximately $100M) (*medium certainty)* Costs of implementing actions in FW-FPs assumed to average $15,000 per annum per farm. If assume 29000 farms then cost totals $435 M pa *(medium-low certainty)* Costs of FW-FP audits - average of $1500 per audit. Total cost around $22M pa ($1500 * 29,000 farms* 0.5 (if assume audits every two years on average) *(medium certainty).*	A good FW-FP process (with commitment to adequate extension programmes) should help farmers be more resilient and able to tackle other environmental challenges and opportunities. In some cases FW-FP process may identify farm system changes that may improve profitability and provide environmental benefits Potential for market access or market premium benefits by linking FW-FP to an assurance programme. Good farm plan audit results can make it easier to borrow money and impact positively on property values. *(medium impact; medium certainty)*
Regulators	Costs to regional councils to administer the FW-FP regime will be significant and resources will likely be stretched with the range of other freshwater obligations to meet (eg, setting catchment limits in plans) and other pending government policy initiatives *(medium impact; medium high certainty)*	FW-FPs should contribute to better regional environmental outcomes and enhanced ability to provide for cultural and recreational values of citizens. More information on farming activities will be valuable to councils. *(medium-high impact; medium certainty)*
Wider Government	Costs to work with iwi Māori and stakeholders on agreeing good practice objectives and supporting standards and guidance; building the workforce of suitably qualified farm plan professionals; reporting and data standards; and wider implementation support and tools for the new regime will be *(high impact, medium certainty).*	FW-FP framework has potential to be used for other priority environmental areas (eg, GHG, biodiversity) promoting co-benefits (integrated farm planning). And the FW-FP process and associated capability building may help catalyse more sustainable and resilient farm businesses. (*medium-high impact; medium certainty).*
Māori/iwi	Māori farmers and growers will need to comply with the FW-FP requirements. Many Māori land holdings are on lower productivity land meaning the costs as a proportion of revenue may be higher and Te Tumu Paeroa commented that the proposals could impact on rental revenue (medium-low impact and certainty).	The ability of FW-FPs to provide more bespoke tailored solutions has potential to make a significant improvement to water quality and ecosystem health, in turn better enabling Māori to undertake customary food gathering. Getting all farmers and growers to good practice may also create opportunities for development of Māori land in catchments where water quality is not under significant pressure (*medium impact; medium certainty*).

Table 2: More detailed information on costs and benefits of the preferred approach

Affected parties	Comment	Impact	Evidence certainty
Additional **costs** of proposed approach, compared to taking no action			
Regulated Parties	Financial costs to farmers and growers of preparing a FW-FP and having it certified will vary depending on the complexity of the farm system; whether a farmer already has a (good quality) FW-FP; and on the level of support provided to the farmer from government, industry and/or regional council in developing the FW-FP. The cost will primarily be a one-off other than up-dates/reviews that are made to a FW-FP over time (eg, to incorporate new approaches or/and to prepare or respond to an audit). In July 2019 MPI advised there are approximately 29,090 commercial farms in New Zealand and estimated approximately 16,325 had completed a farm plan of some sort; of which around 4000 were estimated to be of reasonable quality and monitored by regional councils. The cost will fall on farmers (unless targeted government support is provided for preparation and/or certification of FW-FPs). Costs should reduce if Government supports improved and more accessible farm-scale mapping of soils etc. and other implementation support measures. Costs of certification component will reduce where existing industry assurance programmes are deemed capable of delivering on the requirements. The consultation proposal assumed an average cost of $3500 per plan. This was informed by information that an agricultural consultancy charged an average of $4700 (range $2200-$7500) for FW-FPs in the Waikato (taking an average of 25 hours and a range of 8-48 hours). Fonterra average 14 hours for preparing an FW-FP (range 11-17 hours). And irrigation schemes in Canterbury costed their FW-FPs at $1000-2000. This figure has been changed to a more conservative $4000. Some submitters thought the average cost estimate of $3500 in the discussion document was a significant underestimate. Some of this may have been because it was assumed an Overseer budget would be needed for all FW-FPs, which is not the intention. BOP RC	Assume $4000 on average though costs will vary considerably. Total approximately $100M ($4000 * 25,000 plans required from scratch or from partially completed).	Medium

	thought $3500 about right providing industry support and recognising many famers already have farm plans in place; and the clear intention to build on existing farm planning programmes. It is also the case that for some lower risk farms in catchments without significant water quality challenges that the FW-FP requirement could be used in place of what otherwise could require a consent to farm, which would likely cost around $3000.		
	Costs of implementing actions in FW-FPs also vary depending on what is required. Irrigation schemes in Canterbury suggest farmers are budgeting $10-$30 K per annum for FW-FP implementation. This excludes one-off infrastructure investments (eg, effluent treatment system upgrade ($100K) that may be required irrespective of the FW-FP Policy) and there may be some duplication with other parts of rural package (and existing NPS-FM and council requirements).	Suggest average on-going cost of $15,000 per annum per farm. If assume 29000 farms then cost totals $435 M pa	Medium-low
	Cost of auditing FW-FPs: ECAN experience is that audit take 6+ hours and average around $1500 (range $1200-$2000) There may be economies of scale where independent audits are part of an industry programme that covers allied environmental issues. Total cost estimate: $1500 * 29,000 farms* 0.5 (if assume audits every two years on average) $22 M	Suggest average of $1500 per audit Total cost around $22M pa	Medium
	Poor audit grade (if grading system used) is likely to reduce value of property/selling price and ability to borrow money (Canterbury experience).	Low But potential high impact on small number of farmers	Medium-Low

Regulators *(central government is covered in section below)*	Costs to regional councils to administer the FW-FP regime will be significant; and resources will likely be stretched with the range of other freshwater obligations to meet (eg, setting catchment limits in plans) and other pending government policy initiatives. There are significant costs associated with administration, data management, farmer extension, education, reporting; and primary industry and central government liaison. However again these costs are driven by a range of NPS-FM and RMA provisions. There may be challenges in retaining highly skilled staff. Using and developing existing industry and regional council capacity will be critical for delivering on the proposed FW-FP regime. Effective monitoring and enforcement is critical to delivering a successful programme. The intention is for the FW-FP regime to enable council costs associated with following up on a failed FW-FP audit to be recovered, even if the FW-FP is not linked to a rule in a council plan. Other monitoring costs will fall on ratepayers but much of these are part of existing council RMA responsibilities. Enforcement will continue to rest with regional councils, in line with their wider RMA responsibilities.	Medium	Medium-High
Wider Government	Work with iwi Māori and stakeholders on agreeing good practice objectives and supporting standards and guidance; building the workforce of suitably qualified farm plan professionals; and reporting and data standards needed for the mandatory FW-FP regime. Government investment in capability building will also be critical. Without continued Government support implementation will fail. Option A is therefore needed as well. Some of this work is already happening (eg, as part of the national science challenge) and the Budget 2019 $229 Sustainable Land Use package. Underpinning work continues to be needed on demonstrating the efficacy of different management practices in different contexts; helping get new technologies tested; on-going improvement of tools such as Overseer; and supporting effective CME.	High	Medium

Māori/ Iwi	Māori farmers and growers will need to comply with the FW-FP requirements. Many Māori land holdings are on lower productivity land meaning the costs as a proportion of revenue may be higher. Te Tumu Paeroa commented in their submission that that the cost of audits and proposals could push their tenants out of the market, lowering the rentals they can collect.	Medium-low	Medium-low
Wider community	Potential negative effects on some business owners and their staff if the farming workforce has less disposable income.	Medium-low	Medium low
Total Monetised Cost		Approximately: $100M to develop FW-FPs $435 M pa to implement actions in FW-FPs $22M auditing	
Non-monetised costs	Costs will be significant for the primary sector, including Māori farmers and growers; regional and central government. However, there are two important points here. Costs need to be considered against business revenue. The Bay of Plenty Regional Council submission estimated the cost of farm plans (including developing, auditing and good practice implementation) to be a 5% reduction in annual operating profit across all affected land uses in the region, from $734m to $726m. Biggest impact: dry stock farmers (18% drop in overall operating profit, from 8%-24% for different farm systems. Least impact: kiwifruit growers (4% overall drop, 2% for gold, 8% for green). Dairy farming: 5% overall drop (from almost zero to 18% reduction for less intensive systems). A significant proportion of the costs being faced are associated with other parts of the rural package and Government's wider environmental agenda (including existing requirements under the National Policy Statement: Freshwater management, rather than the proposed mandatory FW-FP regime per se). This wider environment means significant government support will be required for effective implementation. Capability and capacity building of farmers and rural professionals is particularly important.	Medium-High	Medium-High

Expected **benefits** of proposed approach, compared to taking no action			
Regulated Parties	A good FW-FP process (with commitment to adequate extension programmes) should help farmers be more resilient and able to tackle other environmental challenges and opportunities. In some cases FW-FP process may identify farm system changes that may improve profitability and provide environmental benefits (eg, soil testing could suggest less fertiliser is needed). Demonstrating improved environmental performance is important for building the social licence of the primary sector. A robust mandatory FW-FP regime has the ability to show how FW-FPs and targeted good practice requirements can help deliver on achieving catchment priorities and associated community values	Medium	Medium
	Potential for market access or market premium benefits by linking FW-FP to an assurance programme. Limited evidence of widespread consumer willingness to pay premium. Synlait and Miraka do offer small premium for high environmental performance and brands like Taupo Beef show there can be a premium. Good environmental performance is increasingly what consumers expect as standard practice. FW-FPs could help demonstrate this performance and help farmers be more effective in responding to emerging market demands of this type.	Medium	Medium
	Evidence from Canterbury is that good farm plan audit results can make it easier to borrow money and impact positively on property values (converse for poor audit grades), providing motivation to improve performance. Additional motivation for improved performance may also come through peer pressure where farmers are part of an industry scheme that has to transparently report on audit grades of its members.	Medium	Medium
Regulators – local government	FW-FPs should help deliver on council RMA obligations and contribute to better environmental outcomes in region and enhanced ability to provide for cultural and recreational values of citizens More information on farming activities in their region will be valuable to councils. There is also the potential to improve relationships with farmers and	Medium-High	Medium

	help better target council and/or industry farmer extension programmes and catchment initiatives to where they can have biggest impact.		
Wider government	FW-FP framework has potential to be used for other priority environmental areas (eg, GHG, biodiversity) promoting co-benefits (integrated farm planning). Tailored 1-1 approach of farm planning with follow up/auditing (as workforce capacity builds up), should help improve farmer capability building on an on-going basis. FW-FP process and associated capability building may help catalyse improved farm business planning and more sustainable and resilient farm businesses.	Medium-High	Medium
Māori/iwi	The ability of FW-FPs to provide more bespoke tailored solutions has potential to make a significant improvement to water quality and ecosystem health, in turn better enabling Māori to undertake customary food gathering. Getting all farmers and growers to good practice may also create opportunities for development of Māori land in catchments where water quality is not under significant pressure. Input into the development and implementation of the FW-FP regime from Māori will be critical. Giving effect to Te Mana o te Wai will involve councils working with iwi-hapū in particular catchments to identify how Māori values and aspirations can be incorporated into the catchment context information that will guide farmers, growers and their advisors in the development of FW-FPs, including identification of priority actions.	Medium	Medium
Other parties	The positive social benefits associated with improved water quality that FW-FPs can help deliver are substantial. They include reduced risk to human health (through improved drinking water quality); improvements to environmental amenity; and an increase access to valued natural resources, including for recreational activities, and cultural practices (eg, mahinga kai). These positive impacts are likely to be felt by New Zealanders at large, including Māori and the farming community. There may also be a Brand NZ contribution – tourism, market access benefits as well as a contribution to New Zealanders' cultural identify and values associated with high quality natural environment	High	Medium-High

	though all this is hard to quantify and depends on other environmental management provisions. There will be increased opportunities for suitably qualified rural advisors to help prepare, approve and/or audit FW-FPs and undertake allied advisory roles and new/expanded opportunities for agricultural training providers to deliver appropriate FW-FP courses		
Total Monetised Benefit			
Non-monetised benefits	If FW-FP delivery is well-resourced the policy has potential to provide significant benefits not only in contributing to improved water quality and associated values, but also building a more sustainable and resilient primary sector and farm advisor workforce.	High	Medium

What do stakeholders think?

There was very strong support for the concept of farm planning from submitters. Opinions were divided on whether FW-FPs should be voluntary or mandatory. Beef and Lamb NZ and some regional councils supported voluntary FW-FPs, as do ENGOs and many individual submitters. Those who supported mandatory FW-FPs included Dairy NZ, Fonterra, Federated Farmers, Horticulture NZ and several regional councils.

Those opposed to mandatory FW-FPs cited the costs and bureaucracy involved, including associated preparation, certification and auditing costs. A concern was that farmers would be dictated to about how to farm, with a FW-FP prepared for them with little or no input or ability to influence its contents. There was also a concern that those who had acted early and prepared a FW-FP would be penalised, having to start from scratch and pay for someone else to prepare and approve their FW-FP.

There was also a clear concern from ENGOs that FW-FPs would replace more specific regulatory standards thereby weakening action to improve freshwater ecosystem quality.

Those supporting mandatory FW-FPs cited evidence about the effectiveness of FW-FPs in targeting risks, promoting farmer ownership and mind-set change, and getting improved outcomes quickly. For example, submissions referred to a recent Aparima Community Environment project (Research First 2019) investigating the correlation between farm plans and active management of environment risk showed that those with farm environment plans were more likely to use good practices. The Fertiliser Association of NZ reported that the Lincoln University Dairy Farm and Owl Farm have reduced their nitrogen loss by about 25% while maintaining or increasing profit, by looking at their whole farm system. Bay of Plenty Regional Council commented that they expect significant benefits from farm plans including tailored migration practices, and also better farm financial performance.

The majority commenting on timeframes, including submissions from regional councils and sheep and beef sector, felt timeframes proposed in the draft NES are too short and that implementation should be over a longer period. Fonterra and Horticulture NZ support the 2025 timeframe. DairyNZ

supports moving quickly in catchments with water quality concerns, and supported the earlier 2022 FW-FP requirements that were proposed in the draft NES for some more intensive land uses.

The two main concerns were that a rushed process would result in poor quality plans and questions about the capacity to deliver the plans. Various suggestions were made about how certification and/or auditing requirements could be prioritised to help address capacity issues; and the relative importance of the two steps. There was also a clear view of the importance of promoting farmer ownership of farm plans. Industry bodies felt that that industry assurance schemes should be used to help deliver the FW-FP requirements. The risk of a 'black box' effect with industry schemes, if transparency for the public is restricted due to commercial sensitivity, was also raised.

Local Government NZ questioned the means of taking enforcement action when a farm plan audit results in a failed audit if that FW-FP is not linked to a resource consent. The proposal to establish the farm plan regime through regulations under the RMA, rather than in the NES, is intended to address this issue.

More generally there was also recognition of the critical importance of implementation support if the roll out of FW-FPs is to be successful, and concerns about the impacts of the proposals on farmers and growers.

Advisory Group Views

FLG say that FW-FPs (or Land and Environment Plans as they prefer them to be called), properly constructed, are a useful tool for farmers to manage their activities to limits set by regional plans and to help farmers plan for improvement. They should be based on a robust stock-take of the farm's natural resources and their opportunities and limitations, and require paddock scale land use capability mapping. The majority of the FLG do not support mandatory FW-FPs most see their usefulness as a regulatory tool for regional councils.

The Regional Sector Water Subgroup indicate very strong support for FW-FPs and note that there are implementation issues to resolve and that industry will be critical in FW-FP roll-out. The sector support a national requirement for FW-FPs, staged across time based on risk, starting with risky activities that are to be regulated and existing requirements to deliver FW-FPs in the regions.

The Kāhui Wai Māori submission on the proposals said Farm Environment Plans (FEPs) should be mandatory and the requirements for them should be developed using a risk-based approach, using the catchment or the sub-catchment. They also stated FEPs should not be used as a tool to set limits for environmental performance in their own right, or to ensure regulatory compliance. They should only be used as a tool to assist farmers to comply with limits and regulations set by central and/or local government.

The Independent Advisory Panel (IAP) supports mandatory and enforceable FW-FPs. The IAP report gives considerable recognition to the benefits that tailored FW-FPs can deliver to improving water quality and ecosystem health, including encouraging farmer ownership of the plan and its objectives, and on-going commitment to improving environmental outcomes.

What other impacts is this approach likely to have?

A mandatory FW-FP regime has significant capacity and capability challenges with time needed to build up the workforce of individuals with skills in farm planning and auditing, and extension. This issue is discussed below.

Implementation

As identified above, a mandatory FW-FP regime has significant capacity and capability challenges. It will take time for new people to complete the relevant training and most importantly get the practical experience on the job before being fully competent and able to work independently. The other critical implementation challenge is ensuring that there is systematic oversight of the performance of the new FW-FP regime, including all those parties involved, so that any problems can be identified and addressed in a timely manner.

The proposed approach to implementation of mandatory FW-FPs is now to amend the RMA to enable the development of FW-farm planning regulations. As mentioned earlier, these regulations will include timeframes; governance and associated roles and responsibilities; agreed good practice outcomes, objectives and guidance; requirements for farm plan certifiers and auditors; and monitoring and reporting provisions. It is expected that these regulations will be developed over a period of 18 months to two years. Involvement of the regional sector, primary sector, iwi Māori and ENGOs in developing the regulations will be critical to building a robust farm plan regime that responds to the challenges above.

The number of qualified rural advisors / farm advisors able to provide good advice on FW-FP development are limited. In a 2018 NZ Institute of Primary Industry Management (NZIPIM)[286] survey of the rural profession, 26.2% of all respondents (from 370 responses received) identified themselves as farm consultants (Independent consultants; Consultancy firm). All consultants will not choose to work on FW-FPs. NZIPIM estimate that there are currently between 75-100 consultants that could develop Farm Environmental Plans, and over the next 2-3 years they expect this will increase to over 150. If we assume an FW-FP takes an average of 20 hours to develop then an individual farm environment planner working full time solely on farm environment planning could complete no more than two FW-FPs per week on average. If we assume 100 FW-FP planners work half their time on certifying/preparing FW-FPs for water quality, then around 4800 FW-FPs could be produced in a given year. A similar skill set would be needed for on-going auditing and related roles such as farmer extension.

The work to develop the farm planning regulations will enable further consideration of capacity issues, including the possible role of suitable industry assurance programmes (eg, Synlait's Lead with Pride and NZ GAP for horticulture) in delivering on elements of the new regime. It will be important that the timeframes for roll out of FW-FPs are reasonable so that quality FW-FPs can be delivered and the workforce has time to build up. A phased approach and prioritisation will be needed.

The 2019 Sustainable Land Use budget funding will assist the primary sector in transitioning to more sustainable and resilient land use practices. It is likely that a case will be made for further funding bids in future years to support this transition and the delivery of the Action for healthy waterways objectives, including those involving FW-FPs and measures to improve farm practices. These measures will be able to be targeted to the range of parties involved in successful deliver of FW-FPs including iwi Māori; councils, the primary sector and catchment groups. Guidance and supporting material will also be developed to support the effective implementation FW-FP regulations when they are promulgated.

[286] NZIPIM (NZ Institute of Primary Industry Management) is a voluntary membership organisation with approximately 1050 members. It believes approximately 70-80% of all full-time consultants practicing in the primary industry are members of NZIPIM.

Chapter 15: Reducing excessively high nitrogen leaching (nitrogen cap)

Introduction

This document replaces the interim Regulatory Impact Assessment for the proposal addressing excessively high nitrogen leaching.

Context

Nitrate has been an increasing problem in many New Zealand waterways during the last two decades. High nitrogen levels in rivers are associated with a range of adverse effects on the ecological health of waterways, with potential adverse impacts on the suitability of water for recreation and as a drinking water source for humans and livestock.[287]

Nitrate concentrations increased in 55 percent of monitored river sites (1994-2013) with the most significant increases in Waikato, Canterbury, Otago and Southland.[288] Livestock waste is the primary source, followed by fertiliser.[289]

Nitrogen losses to water (termed discharges) arise from both leaching and overland flow. Nitrogen losses are generally highest under intensive dairy farming, vegetable growing and some other intensive livestock and arable cropping systems. Use of nitrogen fertiliser has increased almost eight-fold over the period 1990 –2019[290].

Regulatory systems in place and expected changes over time

Many regional councils are already addressing high nitrogen discharges through their regional rules. Horizons, Hawkes Bay (Tukituki catchment), Waikato (Taupo catchment), Bay of Plenty (proposed for the Rotorua catchment in Plan Change 10), Otago and Canterbury have set per hectare nitrogen-discharge caps under an allocation regime, in order to meet water quality limits. In many cases, the nitrogen-discharge cap set by these councils is lower than current discharge rates, eg, in the Selwyn-Waihora zone, dairy farm discharges must fall by 30 percent by 2022.

A number of councils have introduced Farm Environment Plan rules that require farmers to prepare and implement plans that show how they will reduce discharges to meet a nitrogen-discharge cap (eg, Canterbury, Horizons, and Tukituki).

The problem/opportunity

All land use generates nitrogen losses, including native bush and urban land use. While some level of loss is inevitable, there is an opportunity to mitigate some losses cost-effectively in the short-run, to contribute to early improvements in water quality.

There are two underlying causes of high nitrogen losses from agricultural land:

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[287] http://www.ehinz.ac.nz/indicators/recreational-water/about-recreational-water-quality-and-health/

[288] Our Fresh Water 2017. Environment Aotearoa includes more recent trend data (2008-17) which indicates that in pastoral catchments, more river water quality monitoring sites had improving trends for nitrate and ammoniacal-nitrogen than deteriorating (Environment Aotearoa, Fig 10).

[289] Environment Aotearoa 2019, p. 58.

[290] Mfe, 2020. New Zealand's Greenhouse Gas Inventory 1990-2018. Online: https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/new-zealands-greenhouse-gas-inventory-1990-2018-vol-1.pdf

i. In some cases, intensive land uses have been established on very free-draining soils and/or in high rainfall zones, resulting in a high risk of leaching. In the longer term, land use change may be needed to achieve water quality limits in these catchments. The nature of the land use changes, and transition times, will be determined through regional plan processes, enabling community input to the decisions.

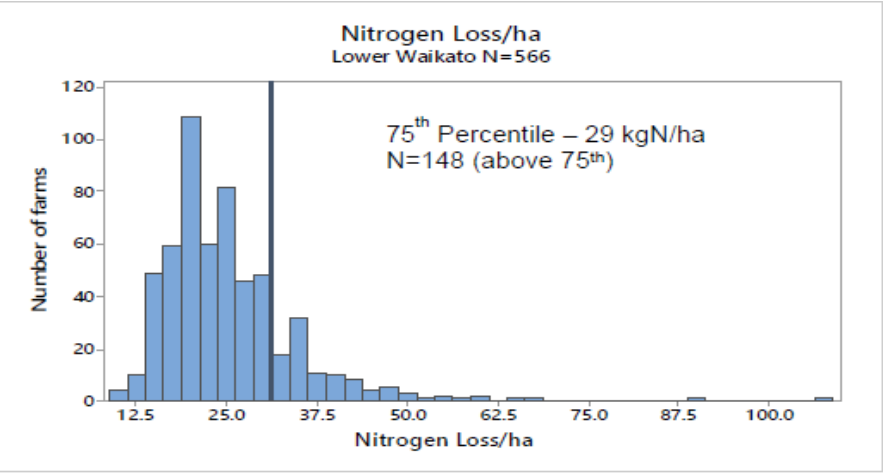
ii. In other cases, high nitrogen losses are the result of farm practices, which can be improved at relatively low cost (as outlined in the discussion below). Some farmers are not using these practices for a range of reasons eg, because they are unaware of them, or because of the cost of capital items or reduced production.

This interim policy is intended to address the latter, ie, high nitrogen losses caused by farm practice. The policy is *not* intended to achieve the larger, more widespread structural or land-use change that may be required to improve water quality, because these changes are dependent on the water quality limits set, and the allocation mechanism and transition times that regional councils will determine. Precipitating early structural and land-use change under an *interim* policy risks unnecessary and costly adjustment for farming families, community disruption and stranded assets, which may not be required under the council's final policies and rules.

The main longer-term policy proposal addressing nitrogen losses in the Action for healthy waterways Package is the new nitrogen bottom line in the National Policy Statement for Freshwater. Regional Councils would need to introduce new rules in their regional plans to achieve these lower bottom-lines. These rules may include allocation mechanisms, and may drive structural and land-use change. The options in this interim proposal will not achieve the same level of benefits as the longer term bottom-line proposals, because they do not include these structural and land-use change elements.

Farm practice

Not all farmers are managing nitrogen losses efficiently, with some generating much higher per hectare discharges per kg of output than neighbouring farms; resulting in a disproportionately high impact on water quality in receiving water bodies. For example, the graph below illustrates the range of dairy farm nitrogen discharges in a sub-catchment of the Waikato with similar soils and climate.[291]



[291] Source: Statement of evidence of James Kenneth Allen for Fonterra Co-operative Group Ltd, in the Hearing of submissions on Proposed Plan Change 1 and Variation 1 to the Waikato Regional Plan (Healthy Rivers), 3 May 2019.

Improving farm practices can reduce nitrogen losses

Recent research and modelling has illustrated that there is opportunity for some high-leaching dairy farms to reduce the amount of nitrogen lost,[292] with relatively low cost changes in farm practices.[293] In some very intensive dairy systems, reductions can be made while increasing profit.[294] For example, farmlet research trials and modelling indicate that nitrogen losses from dairy farms can be reduced by 5 to 40 percent, through changes in practice such as: reducing or eliminating autumn and winter nitrogen-fertiliser applications, eliminating winter feed crops, use of stand-off and feedpads especially in wet periods, and reducing stocking rates.[295] There is less evidence about the opportunities to reduce nitrogen losses from arable and vegetable growing systems, although research underway is testing lower fertiliser rates and precision application methods[296].

The root causes of high nitrogen losses arising from farm practice relate to farmer incentives and knowledge/skills. In most cases, reducing nitrogen losses imposes costs on the farmer, and creates benefits for the wider community. Potentially the affected community may be separated from the farmer in space and time, as nutrient-enriched water leaves the farm and moves to distant surface water bodies over time (up to 100 years in some catchments). This reduces the social imperatives for changes in farm practice. Farmers may also lack knowledge or skills to make the necessary changes. In addition, many farmers have a goal related to maximising production, which runs counter to some practice changes such as reducing nitrogen fertiliser rates, even though such changes may increase profit.[297] Some of these root causes can be addressed through interventions such as regulation and education, increasing uptake of improved farm practices that will reduce nitrogen losses to water.

Early intervention will bring forward the gains in water quality. The policy is targeted at reducing nitrogen losses in the period ahead of longer term provisions that will be developed through council limit and rule-setting processes and the Fair Allocation work programme. By including an interim measure of this nature, earlier gains can be made in water quality outcomes than if intervention is delayed until regional plans are in place.

It follows that the policy needs to be quick to implement and fast-acting, to succeed as an interim measure.

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[292] A comparison of the N budgets of five Canterbury monitor farms in the Forages for Reduced Nitrate Leaching programme (FRNL) showed their relatively high N fertiliser and supplement inputs resulted in high production, but also in relatively high N surplus. During the FRNL programme, these farms implemented changes to reduce N leaching, eg establishing plantain in pasture, reducing N fertiliser use and swapping high-N supplements (Palm Kernel Expeller or PKE, pasture silage) to low-N feeds (maize and fodder beet).

[293] For example in the Horizons region, dairy farms seeking land use consents worked with consultants to reduce nitrate discharges; modelled reductions of 5 to 20 percent were able to be achieved while retaining farm viability (Parminter, T., 2015: Selecting farm practices and preparing farm plans for land-use consents in the Manawatu- Wanganui region. In "Proceedings of the 77th Annual Grassland Conference".)

[294] MacDonald et al, 2001. Farm systems – Impact of stocking rate on dairy farm efficiency. Proceedings of the New Zealand Grassland Association 63: 223–227. More recently: Allen, J; 2019. Statement of evidence of James Kenneth Allen for Fonterra Cooperative Group Ltd (at the hearing of submissions on proposed Plan Change 1 and variation 1 to the Waikato Regional Plan (Healthy Rivers); summarised the impacts on 10 case study farms of reducing discharges to the 75th percentile as ranging from +$106 to -$541/ha.

[295] Clark et al, 2019. Production and profit of current and future dairy systems using differing nitrogen leaching mitigation methods: the Pastoral 21 experience in Waikato. NZ Journal of Agricultural Research; Parminter, T., 2015: Selecting farm practices and preparing farm plans for land-use consents in the Manawatu- Wanganui region. In "Proceedings of the 77th Annual Grassland Conference".

[296] "Future Proofing Vegetable Production", part-funded by the Sustainable Farming Fund.

[297] Parminter and Perkins, 1997 Applying an understanding of farmers' values and goals to their farming styles. Proceddings of the New Zealand Grassland Association 59: 107-111.

Objective

The proposal's objective is to contribute to water quality improvements in catchments where nitrogen pressures are high, by reducing nitrogen losses from farms that are caused by poor practice. The policy is to be effective in the interim period before councils give effect to the NPS-FM and/or a new nitrogen allocation management system is in place.

Constraints on the analysis

Scope of this component

This proposal was initiated in response to a recommendation by the Freshwater Leaders Group (FLG). The context of the nitrogen-cap (N-cap) discussion at FLG was neighbouring properties with similar land uses but vastly different nitrate discharges due to differences in management practices, although discussion also covered land uses in the "wrong place" eg nitrogen-intensive land uses on high leaching soils. As outlined in the preceding sections, this analysis addresses nitrogen losses caused by poor management practice. Consideration of land uses in the "wrong place" is outside scope, and will be considered as part of Regional Council limit-setting decisions, and through the *Fair Allocation* work stream of Action for healthy waterways.

Options for interim measures to address excessive nitrogen losses

The Interim Regulatory Impact Assessment considered six options. Three of these options were included in the Action for healthy waterways discussion document released in 2019:

- Option 1: A consent requirement for all low-slope pastoral farms with nitrogen discharges over a threshold value (we consulted on a range, from the 70th to 90th percentile) and are located in catchments that are highly impacted by nitrogen. This option would use the nutrient budget software OverseerFM to establish the threshold[298].
- Option 2: A national per hectare nitrogen fertiliser cap.
- Option 3: A requirement for all farms in catchments that are highly impacted by nitrogen to have a freshwater module of a farm plan (FW-FP)[299] in place by 2022.

Summary of submissions on topic

Public submissions covered the following:

1. Option 1 has caveated support across a range of sectors and submitters, subject to a range of disparate changes (see below).
2. Some ENGOs supported option 2 as straightforward and effective, but the primary sectors and councils opposed it as difficult to set, ineffective and unenforceable.
3. The farm plan approach (option 3) has support from some regional council and farming submitters, but ENGOs are concerned about effectiveness and enforceability, and sheep and beef farmers are concerned about loss of flexibility to respond to market and seasonal drivers.
4. Economic impacts at the farm-scale are a concern.

[298] Overseer estimates the nitrogen being lost from a farm (below the root zone, and therefore able to be transported into waterways; as well as gaseous losses) based on nitrogen inputs and outputs, management practices, soil and climate factors. Overseer, can be used to determine how efficiently nutrients are being used on a farm, as well as testing the impact of management changes on nutrient losses.

[299] The Freshwater Modules of Farm Plan proposals are outlined in a separate appendix.

For option 1, changes sought were:

- Simpler metrics that better identify farms at "poor practice" – some dairy sector and agribusiness submitters suggested use of nitrogen surplus (N-surplus)[300] in place of Overseer, but Beef+Lamb NZ and Horticulture NZ opposed its use. The Freshwater Leaders Group also opposed the use of N-surplus in their feedback to officials. The Independent Advisory Panel (IAP) suggested enabling use of any alternative approach to Overseer, so long as a consistent approach is used within any one catchment.
- Changes to proposed use of Overseer provisions to ensure enforceability and to reflect recent expert opinion on use of Overseer in regulation – in particular, consent conditions should not use the Overseer estimate as the point of compliance, rather each farm's proposed mitigation actions should be conditions of the consent
- Address capacity and capability constraints especially for Overseer modellers, especially the proposed timeframe of six months for the dairy farm Overseer budgets
- Target sectors or farms based on risk
- Changes to the set of target catchments (Schedule 1 in the draft National Environmental Standard Freshwater[301]) eg, because some catchments have too few dairy farms to enable a threshold to be set, or water quality is influenced by groundwater inflows from outside the catchment, or ecological health of the waterways is good despite the high nitrate levels, or the council's existing plans address excessive nitrogen discharges
- Setting the thresholds – submitter views varied from 70 to 90th percentile, while the IAP proposed use of the 80th percentile
- Retaining flexibility for low dischargers below the threshold to increase discharges (but some submitters sought less flexibility, fearing that gains in water quality achieved by reducing nitrogen losses on farms above the threshold would be whittled away by increases from those below the threshold)
- Changes to consent conditions or activity status.

After considering these submissions, the Independent Advisory Panel supported inclusion of interim measures to address excessive nitrogen losses in the regulations, through a combination of options 1 and 3. This approach is evaluated in the revised Option 1 in the following section. The discussion of the revised Option 1 also includes consideration of the changes sought in public submissions outlined above.

The IAP also sought two additional changes which we have evaluated, but have not included in the option evaluated here. In both cases the thresholds would not reflect discharge levels that can be achieved with good practice, and this is critical to the policy:

- Inclusion of arable and vegetable farms in option 1. We have considered two potential ways to implement this. Firstly a composite threshold could be developed using all pastoral, horticultural and arable farm discharges in a catchment. However this would not reflect the discharge levels able to be achieved through good practice in any of the individual sectors, which is the critical requirement for this policy. Alternatively separate thresholds could be

[300] Nitrogen surplus is the difference between nitrogen inputs and outputs from a farm

[301] For Option 1, the catchments consulted on were: Piako and Waihou (Waikato), Aparima, Mataura, Oreti, Waihopai, and Waimatuku (Southland), Parkvale sub-catchment of the Ruamahanga (Wellington), Waingongoro (Taranaki), Upper Rangitaiki (Bay of Plenty), Taharua (Hawkes Bay), and the Waipao sub-catchment of the Wairoa (Northland) and the Motupipi (Tasman). For Option 3 the same set of catchments were consulted on with 4 additions, the Waitangi and Whangamaire (Auckland) and the Waitohu and Mangaone (Wellington).

set for each sector. However this would not be feasible in the arable and horticulture sectors due to the wide variety of crops grown, and the small number of these farm types in most catchments. As a result we have retained the original proposed approach to setting the threshold outlined in option 1 below.

- Use of alternative models to Overseer to be enabled for option 1. The IAP considered that in catchments where Overseer budgets are not widely available, the use of nitrogen-surplus or other models should be enabled, so long as the model used is consistent in individual catchments. However, nitrogen-surplus would target a different set of farms compared with use of Overseer. Nitrogen-surplus targets the most intensive farms, regardless of whether they are at good practice or not. For example an intensive dairy farm will have a high nitrogen surplus, but may have lower discharges than a farm with a lower nitrogen-surplus because of good management practices such as wintering barns or stand-off pads with state-of-the-art effluent management. In addition, enabling different measures would mean inconsistencies between catchments, with different groups targeted depending on the model used.

Summary Assessment

The assessment reflects a comparison of benefits and costs, with judgment applied. Judgement is required because not all benefits and costs can be quantified.

Policies that reduce nitrogen pollution enhance ecosystem health. Among the many benefits generated, ecosystem health contributes to biodiversity and species protection, recreational opportunities (for example fishing and nature experiences), the realisation of cultural aspirations, human health and the commercial benefits for New Zealand businesses from a 'clean green' brand.

Some but not all of these benefits can be quantified in monetary terms. Willingness to pay surveys are an established method of quantifying some of these ecosystem services. The present value of the benefits generated by the longer term nitrogen-targeted policies outlined earlier is estimated to be approximately $1.9 billion, estimated over a 30 year period using a 3% discount rate.

The contribution the interim policy will make to reducing nitrogen pollution nationally cannot be estimated with any precision for the options considered below, because of lack of data on the distribution of nitrogen discharge levels (option 1), and the distribution of nitrogen fertiliser rates (option 2). This means the time-limited benefits directly attributable to the policy cannot be estimated either. Hence a key consideration in the assessment is the likely effectiveness of the option (not the level of benefit per se, as this follows automatically from the assessment of effectiveness).

The costs of the options are primarily on-farm compliance-related, and have the effect of potentially (but not always) reducing farm profit.

All three options are additional to the policy proposal for national roll-out of freshwater modules in farm plans (FW-FPs). FW-FPs involve a farm-by-farm assessment of practice by a suitably qualified and certified farm planner, and include an audit requirement, so provide a good method for targeting requirements for practice change (as outlined in the FW-FP appendix to this RIA). The proposed FW-FP regime will increase the enforceability of the plans compared with the status quo.

However, the FW-FP regime will take time to establish, with current estimates suggesting the first FW-FPs may be prepared in 2022, and rolled out progressively over the ensuing five years. The three options take different approaches to making this interim proposal effective within the five year

window, with option 3 the "base case" (early rollout of FW-FPs in targeted catchments) and options 1 and 2 taking different approaches to *additional* measures to obtain earlier gains in water quality:

- Option 1: Targeting dairy and low-slope beef/dairy support pastoral farmers with high nitrogen discharges for a consent requirement in highly nitrogen-impacted catchments – this option uses high discharges as a proxy for poor practice. In addition, FW-FPs would be rolled out early in these catchments. Consents will take just over two years to set in place, with FW-FPs in place within three years.
- Option 2: Targeting high nitrogen fertiliser users in the pastoral sector, requiring reductions to a cap. High fertiliser rates are being used as a proxy for poor practice in this option – while they are an inadequate proxy, they could be implemented within a year and would apply to pastoral farms everywhere in New Zealand. FW-FPs would provide farm-specific fertiliser management actions in the longer term, and would be rolled out early in highly nitrogen-impacted catchments.
- Option 3: Targeting high nitrogen-impacted catchments with an early FW-FP requirement. This option is similar to option 1 but excludes the consent requirement. It would avoid the costs of modelling discharges and consent fees imposed under option 1, but some actions are likely to be carried out later than in Option 1, on the 20 percent of high discharging farms in high nitrogen-impacted catchments. Similarly, in comparison with option 2, option 3 would avoid the costs of reporting fertiliser use and the potential perverse outcomes of a fertiliser cap (eg, increase in supplements, and animal welfare issues in the transition), but fertiliser reductions may happen later in this option.

The options are finely balanced. While FW-FPs are a good instrument for identifying and addressing poor practice, it will be three years before they are in place in highly nitrogen-impacted catchments. Options 1 and 2 provide ways to intervene slightly earlier (particularly Option 2), but have significant disadvantages. On balance we consider Option 3 to be the preferred policy, while recognising that Option 2 would send an early signal across all of New Zealand that excessive nitrogen fertiliser use is no longer acceptable, at relatively low cost.

Summary Table

Criterion	Revised Option 1: NES with targeted N discharge caps, plus FW-FPs	Option 2: NES with national nitrogen fertiliser cap implemented via FW-FPs	Option 3: NES requiring targeted early FW-FPs
Effectiveness	++	+	++
Timeliness	+	++	+
Fairness	+	+	++
Efficiency	+	+	++
Principles of the Treaty of Waitangi[302]	0	0	0

[302] Principles of the Treaty of Waitangi - the options can make a contribution to protecting the taonga of water quality to the degree to which they are effective in improving water quality. In terms of partnership and participation, none of the options provide a clear role for partnership with Māori in developing/enforcing the initiatives.

Te Mana o te Wai[303]	+	+	+
Overall Assessment	+	+	++

Status Quo

Over the five years 2020 to 2025, councils will progressively establish water quality limits, including nitrogen limits and regional rules for achieving them. Fair Allocation proposals may be phased in after 2025.

Impact on water quality

Under the status quo, in regions that do not yet have rules in place that manage nitrogen losses, excessive losses from farms can continue until new regional plans are operative. Water quality impacts from these excessive nitrogen losses will also continue.

Indicative Social Impact

Maintaining the status quo may negatively impact farmer wellbeing (anxiety/mental health) due to uncertainty about future requirements to reduce discharges. The status quo is also unlikely to markedly contribute to perceptions that the farming community are acting as stewards of the land/environment, potentially reducing their social licence to operate.[304] This will likely be associated with low levels of well-being and sense of self within the farming community.[305]

The status quo is likely to bring limited and slow/variable improvements to waterbodies in the interim period before limits are set, and with it, slow/variable improvements to human health, wellbeing and cultural identity.

Revised Option 1: Regulated catchment-based N-caps combined with farm plans in target catchments

As outlined earlier, the policy intent is to target farms with high discharges caused by poor practice. The underlying concept for this option is to distinguish such farms from those with high losses caused by soil and climate factors, using a "cohort of peers" approach ie, discharges from pastoral farms within sub-catchments that have similar soil and climate. The sub-catchments must be large enough to contain sufficient numbers of dairy farms to enable a threshold to be set. This option would identify farms with excessive nitrogen discharges using the nutrient budgeting model "Overseer" which estimates nitrogen losses, and would be implemented in high-nitrate catchments (as outlined in the following section). An example is illustrated in the graphs below, comparing two sub-catchments with different discharge profiles[306]. The regulation would identify the relevant sub-catchments.

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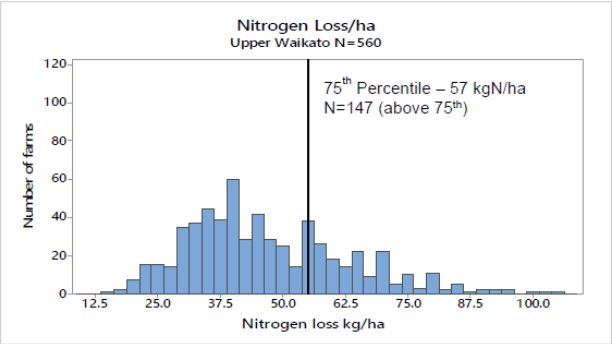
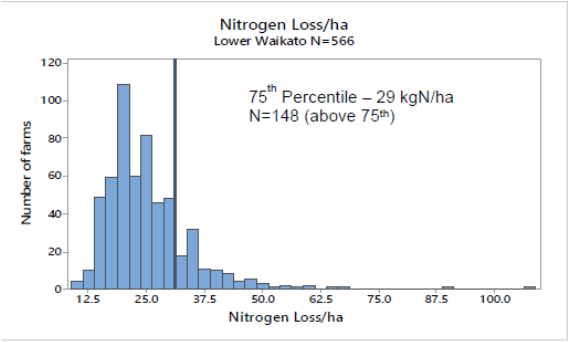
[303] Te Mana o Te Wai – the options can make a contribution to protecting the health and mauri of water to the degree to which they are effective in improving water quality.

[304] P Clark-Hall, 2018, *How to Earn a Social Licence to Operate*

[305] Farmers' mental health: A review of the literature (ACC Policy Team, 2014) https://www.mentalhealth.org.nz/assets/ResourceFinder/wpc134609.pdf; Botha N, Roth H and Brown M 2013. '*The Adaptation of Pastoral Farmers to Environmental Policy Changes: A New Zealand Case Study*.' South African Journal of Agricultural Extension, Vol. 41: 16-25; Kennedy A, Maple MJ, McKay K, Brumby SA. 2014. Suicide and accidental death in Australia's rural farming communities: a review of the literature Rural and Remote Health 14: 2517. http://dro.deakin.edu.au/eserv/DU:30062460/kennedy-suicideandaccidental-2014.pdf

[306] Source: Statement of evidence of James Kenneth Allen for Fonterra Co-operative Group Ltd, in the Hearing of submissions on Proposed Plan Change 1 and Variation 1 to the Waikato Regional Plan (Healthy Rivers), 3 May 2019.





Based on the distribution of Overseer discharge estimates on dairy farms in each sub-catchment, a threshold would be set by the council, over which discharges must be reduced on target farms (see below for a discussion on the targeted farms). Those farms over the threshold would be required to obtain a controlled consent and reduce the level of discharges back to the threshold within five years, or a discretionary consent and reduce discharges using best practicable options. The discretionary route is important because some farms are likely to be well over the threshold (as identified in the graphs above), and some farms will already be at good practice, but have unusually free-draining soils.

Based on the recommendation of the IAP, the percentile would be set at the 80th. This is in accord with a recent review of the literature which found that discharges can be reduced by up to 20 percent with improved farm practice[307].

Submitters identified a risk that land users under the threshold could increase discharges, eroding the gains achieved by reducing discharges from farms over the threshold. Not all these increases would be constrained by the Intensification proposals. The IAP recommendation that FW-FPs be required of all farmers and growers[308] in these catchments has been incorporated into this revised option, and would partially (but not fully) address this risk. Some farms may choose to intensify and increase discharges up to the threshold, for example by increasing stocking rate, while undertaking good practice as set out in their FW-FP. The FW-FP requirement would be implemented once the new FW-FP regime is in place.

Target catchments

This is an interim measure targeted at those catchments where a significant benefit can be gained through a quick-acting instrument – high nitrogen-Impacted catchments. We have considered two options: using data from water quality monitoring sites; and using an approach[309] that compares the actual load in the catchment with the acceptable load to meet NOF nitrogen concentration bottom-lines, and takes account of the sensitivity of the receiving environment (eg, residence times in estuaries). The latter approach was initially preferred as it would better target the proposed intervention where nitrate reductions matter the most for the health of waterbody, and takes account of the most up-to-date scientific knowledge available. However, the results of the modelling were tested with regional councils, and it proved insufficiently accurate at the catchment scale. The former approach was therefore used to establish an initial set of catchments, using a

[307] Howarth, S., Journeaux, P., 2016. Review of Nitrogen Mitigation Strategies for Dairy Farms - is the method of analysis and results consistent across studies? Online: http://flrc.massey.ac.nz/workshops/16/Manuscripts/Paper_Howarth_2016.pdf

[308] Above the de minimus area threshold specified in the FW-FP proposals

[309] Developed by the Our Land and Water Science Challenge in a project led by NIWA.

threshold value for total nitrogen concentrations in monitoring data. The set of target catchments was further refined by removing those where:

- council limits and rules are already in place or proposed to reduce high nitrogen discharges
- the major sources of nitrogen are not from pastoral farming activities
- too few dairy farms exist to carry out a robust percentile analysis).

The set of catchments (and their regions) consulted on were: Piako and Waihou (Waikato), Aparima, Mataura, Oreti, Waihopai, and Waimatuku (Southland), Parkvale sub-catchment of the Ruamahanga (Wellington), Waingongoro (Taranaki), Upper Rangitaiki (Bay of Plenty), Taharua (Hawkes Bay), and the Waipao sub-catchment of the Wairoa (Northland) and the Motupipi (Tasman). These catchments were included in Schedule 1 in the draft National Environmental Standard (Freshwater).

Further refinements to the set of target catchments have been made in response to submissions; in particular, removing the last four catchments listed above, on the basis of low numbers of dairy farms. The Parkvale also has less than a hundred dairy farms, and some submitters consider that inflows of groundwater from non-pastoral farming sources is influencing nitrate levels in the catchment. Taranaki Regional Council provided evidence that the Waingongoro has high ecological health.

Targeted farm types

Developing Overseer budgets and issuing consents takes time, so to ensure the policy is able to be implemented quickly, the regulation needs to apply to the highest risk farms. We considered two main options for targeting: firstly applying the requirement to all land uses known to have high nitrogen discharge rates on average (dairying, some intensive drystock farms, arable and vegetable crop growing), and secondly, targeting only the highest discharging pastoral sectors. The first approach would require separate thresholds to be developed for the vegetable and arable sectors. Due to the wide variety of crops grown (and discharge rates) in these land uses, it would not be possible to establish a good practice threshold. For example, measured losses at a range of New Zealand sites indicates that average discharges from vegetable growing properties can vary from 11 to 246 kg N/ha.[310] We conclude that these sectors do not suit the approach as a "cohort of peers" cannot be identified.

We consulted on the second approach that would target dairy farms, and low-slope[311] drystock farms. In this approach, low-slope is a proxy for livestock intensity. In response to submitter feedback we have refined this to low-slope beef and dairy support farms. These farms are likely to have the highest nitrogen discharges of the drystock sector[312] . This targeting avoids imposing unnecessary costs associated with the initial Overseer budget on low-discharging farms and land uses.

Recent recommendations on a similar approach proposed in the Waikato Region

This approach was based on a similar approach proposed as part of the Waikato Regional Council Plan Change 1 for the Waikato and Waipa catchments. The Commissioners have recently released

[310] Williams PH, Tregurtha CS 2003. Managing nitrogen during winter in organic and conventional vegetable cropping systems. Agronomy New Zealand 32: 61-67

[311] Low-slope land was defined and mapped at 5, 7 and 10 degrees for consultation. We propose to use 10 degrees as the definition of low-slope to maintain consistency with the stock exclusion proposals.

[312] Lilburne et al, 2010. Estimating nitrate-nitrogen leaching rates under rural land uses in Canterbury. Report R10/127 Environment Canterbury; Parminter and Grinter, 2016. Farm scale modelling report: Ruamahanga Whaitua Collaborative Modelling Project, MPI Information Report 2016/22

their report and have rejected the approach, concluding that soils even at the sub-catchment scale are too variable to develop a set of comparable farms[313]. They also considered that the proposed use of Overseer was inconsistent with the recent Environment Court recommendations on use of Overseer in regulation[314], and that attenuation should be accounted for in any threshold or cap-based approach. Attenuation is the process whereby nitrogen levels are reduced as groundwater moves from the root zone to the receiving water body, and is spatially very variable. The commissioners state "the 80th percentile leacher who is subject to the [75th percentile] rule and required to reduce their N leaching, could be having less effect on the river system than the 70th percentile N leacher, who is under no specific obligation to reduce their N leaching. This is inherently unsupportable". Their recommendation is to use Farm Environment Plans to achieve improvement in farming practice. The evidence presented to the Commissioners, and the Commissioners' assessment, have been taken into account in this evaluation of the option below.

Criterion	Option 1 – Regulated catchment-based N-caps using Overseer plus early FW-FPs
Effectiveness	++ High N-leachers over the threshold would be required to reduce discharges. Those under the threshold undertaking the specified land-uses would need to have a FW-FP.
Timeliness	+ Collection of Overseer returns and the catchment distribution would take considerable time and then the consents process would need to be completed before on-farm actions are implemented. FW-FPs would not be implemented until the FW-FP regime is in place. In both cases two years will have elapsed before practice change begins.
Fairness	+ All land users would be contributing to the effort to better manage nitrogen, and high N-leachers over the threshold in the pastoral sector would be required to make the most effort. However some may be incorrectly targeted (due to soil type) and already at good practice. The exclusion of vegetable and arable growers from the threshold/consent process may be seen as unfair, as they are also high leachers, however they will need to comply with their FW-FP.
Efficiency	+ There will be water quality benefits, but extra preparatory costs will be imposed before improved nitrogen management actions are undertaken (Overseer runs, consent processes). Farmers will be better prepared for any future water quality limits and nitrogen allocation regime. Risk of wasted investment eg, if land use change is required on farms that have invested capital to reach the threshold. The Overseer data could provide valuable groundwork for future allocation decisions by councils
Principles of the Treaty of Waitangi[315]	0

[313] Proposed Plan Change 1 Waikato and Waipa Catchments: the Hearing Panel's Recommendation Report. Online: https://www.waikatoregion.govt.nz/assets/Agenda-Extraordinary-Council-Meeting-18-March-2020.pdf

[314] Bay of Plenty Plan Change 10 decision

[315] Principles of the Treaty of Waitangi - the options can make a contribution to protecting the taonga of water quality to the degree to which they are effective in improving water quality. In terms of partnership and participation, none of the options provide a clear role for partnership with Māori in developing/enforcing the initiatives.

Te Mana o te Wai[316]	+ The approach increases the priority placed on water quality compared with the status quo
Overall Assessment	+ This policy would send a clear regulatory signal in affected catchments that nitrogen management must improve, using a well-understood consent process. However it is slow to initiate; and administratively cumbersome compared with a FW-FP based regime (option 3[317]). .

Effectiveness and costs

Improvements in water quality would be expected as pastoral farms over the threshold quickly reduce nitrogen discharges. Overall reductions depend on the nature of the distribution curve for existing dischargers. Modelling in the Ruamāhanga catchment found that "stringent" thresholds would reduce nitrogen loads by 7 percent, however the modelling was not able to determine whether the stringent cap approximates the 80th percentile.[318]

This option imposes an additional workload on affected councils, to collate the Overseer data and implement the consent regime. However, the burden is limited to high N-impacted catchments. Castalia estimated council costs at around $3.9 million although some of this will be cost-recovered through consent fees.[319]

Impacts on farmers include the financial, social and emotional costs of obtaining Overseer budgets, FW-FPs and/or consents, as well as implementing the actions required in the FW-FP or consent. We estimate around 3500 – 4000 farms would need to complete an Overseer return at an average cost of $3000 each, with around 800 farms needing to obtain a consent. Consent costs to farmers are estimated to cost around $1 million (as most will be relatively low cost controlled consents). These costs will have flow-on effects through the community eg, potentially reduced employment[320]. Costs to implement the actions required on farms over the threshold were modelled to cost less than 3 percent of operating profit on average, on ten case-study Waikato dairy farms if the 75th percentile was set (rather than the 80thas proposed).[321]

There would be increased demand for rural professionals with Overseer and FEP expertise, thus creating some job opportunities.[322]

The FW-FP and consent preparation processes provide an opportunity to address lack of knowledge and skills associated with improving nitrogen management.

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[316] Te Mana o Te Wai – these scores match those in the effectiveness row – the options can make a contribution to protecting the health and mauri of water to the degree to which they are effective in improving water quality.

[317] The proposed FW-FP regime would increase the enforceability of actions in a plan. Under current farm plans, actions are only enforceable when the farm plan is a condition of a consent.

[318] Daigneault et al, 2019. Modelling the impact of freshwater mitigation scenarios: results for the Ruamāhanga Catchment. Report prepared by Manaaki Whenua Landcare Research for MfE.

[319] Castalia, 2019, Administrative Costs of Proposed Essential Freshwater Package on Regional Councils. Draft report to MfE.

[320] Daigneault et al, 2019. Modelling the impact of freshwater mitigation scenarios: results for the Ruamāhanga Catchment. Report prepared by Manaaki Whenua Landcare Research for MfE.

[321] Ledgard et al; 2017. Understanding nutrient losses on Waikato case study farms and effectiveness of selected mitigation options. AgResearch report for Fonterra and Dairy NZ, cited in Allen, J; 2019. Statement of evidence of James Kenneth Allen for Fonterra Cooperative Group Ltd (at the hearing of submissions on proposed Plan Change 1 and variation 1 to the Waikato Regional Plan (Healthy Rivers).

[322] A 2018 report estimates that 45% of New Zealanders farms do not use Overseer. Andrew Barber1, Henry Stenning, James Allen, Phil Journeaux, Jeremy Hunt, Dave Lucock. 2018. "Overseer – Valuation of the Benefits" prepared for Overseer.

The consent process provides an additional and well-understood regulatory incentive for change when implementation costs are high, with greater compliance monitoring and enforcement action by regional councils.

Option 2: National nitrogen fertiliser cap implemented through FW-FPs

Under this option, the NES would set a national per hectare cap on total synthetic nitrogen applied to pastoral farms via fertiliser of 200 kg N/ha. In the long term, the cap would become increasingly redundant as FW-FPs set farm-specific fertiliser rates that are tailored to each farm's soils, climate, and land uses, with compliance monitored through FW-FP audits in the long-term. FW-FPs would be rolled out early in highly nitrogen-impacted catchments (these are specified in Option 3). Nitrogen fertiliser rates would be required to be less than the cap for pastoral farms, or a consent held to apply over the cap (non-complying activity status).

In the interim period before FW-FPs are in place, the NES would require annual reporting of fertiliser use to regional councils. To minimise the reporting burden, reporting would only be required of dairy farms, as drystock farms have low average fertiliser application rates[323].

Rationale for a fertiliser cap

The underlying concept for this option is to target a key nitrogen input to farming systems: nitrogen fertiliser. Nitrogen fertiliser contributes to nitrogen losses to water through two routes: directly (when fertiliser is directly leached) and indirectly, through increased pasture production and consequent higher stocking rates.[324] Stock urine patches (especially from large animals such as cattle) constitute very high nitrogen "application rates".

Since the 1980s, synthetic nitrogen fertiliser use has increased rapidly as a cost-effective way to increase pasture production, especially in spring, when clover growth is slow. Current average rates of nitrogen fertiliser use vary between the sectors and regions, ranging from 222 kg N/ha[325] on dairy farms in Canterbury, to 102 kg N/ha on dairy farms in Northland (2017/18 data), with rates of around 9-18 kg N/ha in the drystock sector.[326] In the horticulture and arable farming sectors, rates vary much more widely, with low rates applied to most fruit crops, and high rates recommended for many vegetable crops (in excess of 200 kg N/ha in some cases)[327].

Reducing nitrogen fertiliser rates has been shown to reduce nitrogen discharges in farmlet trials[328]. However other factors can also influence the impact of nitrogen fertiliser on discharges: timing (winter applications leach more than summer applications), split dressings (little and often leaches less than applying the fertiliser in a single dressing), and fertiliser application methods such as fertigation and Spikey®. A cap on synthetic fertiliser use also takes no account of nitrogen applied in farm dairy effluent or as organic forms such as compost. A simple cap on rates is an inadequate proxy for good management of fertiliser, as it would not address these timing and application

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[323] Journeaux et al, 2019. The Value of Nitrogen fertiliser to the New Zealand economy.

[324] Shepherd and Lucci, 2011. Fertiliser advice – what progress can we make? Paper presented to the Fertiliser and Lime Conference. https://www.massey.ac.nz/~flrc/workshops/11/Manuscripts/Shepherd_2_2011.pdf

[325] In all cases these rates are expressed as kilograms of nitrogen, not kilograms of fertiliser, because the nitrogen content varies between different nitrogen fertilisers such as urea and diammonium phosphate.

[326] Journeaux et al, 2019. The Value of Nitrogen fertiliser to the New Zealand economy

[327] Reid and Morton, 2019. Nutrient management for vegetable crops in new zealand

[328] Clark, 2019. The Opportunities and Challenges of De-Intensifying Your Dairy System https://www.smallerherds.co.nz/knowledge-hub/feed/the-opportunities-and-challenges-of-de-intensifying-your-dairy-system/

management factors. It also does not cover the other aspects of farm management that are important for nitrogen losses.

There are risks associated with a fertiliser cap, as follows:

- some farmers may substitute bought-in feed for fertiliser enabling stocking rates to be maintained, with no reduction in nitrogen discharges. This would particularly be the case if farmers have a goal of maximising production per hectare rather than profit. This could be partially mitigated through a well-designed information campaign that highlights the economic trade-offs of bought-in feed against profits.
- some farmers below the cap may see the cap as a "government-sanctioned" amount to apply, and increase fertiliser applications. This risk would be partially mitigated through a well-designed information campaign, and in the longer term, through the FW-FP regime.
- animal welfare issues may arise in the transition as farms with high fertiliser and stocking rates reduce cow numbers to match reduced feed production. If this transition coincides with a drought, there may be insufficient alternative feed supplies and meat processing works may have insufficient capacity to kill culled cows. This risk is minimised by setting the cap high initially and signalling future reductions.

Some farmers may under-report their fertiliser use. This could be reduced by requiring councils to conduct random audits of farms.

On the other hand, a nitrogen fertiliser cap would signal to farmers that excessive use has high risks to water quality. If accompanied by an information campaign, including the economics of reducing nitrogen fertiliser rates, and the likelihood of a reducing cap and increased scrutiny through FW-FPs, there is likely to be a reduction in fertiliser use from the top end of the distribution curve.

Sectors to which the cap would apply.

We have considered whether the cap should apply to all farms including arable and horticultural properties. Setting a single high cap to cover all land uses would be ineffective as only a few vegetable properties would be above the cap. Setting separate caps for arable and vegetable crops, would be infeasible to develop and administer given the range of crops grown across New Zealand and on individual farms.

However setting a cap for the pastoral sectors is feasible, with good evidence to support setting a cap at 200 kg N/ha, since DairyNZ data indicates that rates above this are not able to be justified economically, as the pasture response curve flattens out beyond 200 kg[329]. A cap set at this level would not affect most drystock farms.

Criterion	Option 2 - NES setting fertiliser caps
Effectiveness	+ Reducing nitrogen fertiliser use would reduce nitrogen losses. Some farmers may substitute other inputs for fertiliser, and some may continue to apply rates over the cap. Only addresses one of the aspects of farm management that impacts nitrogen discharges and water quality
Timeliness	++ this option would come into effect within a year
Fairness	+ Applies to all pastoral farmers but does not reflect good practice such as split dressings or precision fertiliser application in the short term (until FW-FPs in place).

[329] Pinxterhuis, 2019. Tactical use of nitrogen fertiliser Online: https://www.dairynz.co.nz/media/5792474/tactical-use-of-nitrogen-fertiliser-pinxterhuis-2019-tech-series.pdf

	Does not apply to horticulture and arable farms (although in the long term FW-FPs will address fertiliser rates on all rural land). Potential for fraudulent reporting, which will likely only occasionally be uncovered, penalises the honest.
Efficiency	+ Possible perverse outcomes eg, substitution of other inputs for fertiliser at extra cost. Some incentive for more efficient use of fertiliser.
Principles of the Treaty of Waitangi[330]	0
Te Mana o te Wai[331]	+ would result in some improvement in water quality
Overall Assessment	0/+ This is likely to result in some reductions in nitrogen fertiliser use which in turn could lead to reductions in stocking/intensive grazing and nitrogen outputs from these sources.

Effectiveness and costs:

The cost of a nitrogen fertiliser cap of 200 kg N/ha at the farm level varies depending on the farm's current level. Average rates in New Zealand are of the order of 150 kg N/ha, with highest rates in the South Island. Trial results indicate that on a farmlet applying 300 kg N/ha, profits would fall if rates fell to 200 kg N/ha – operating profit would fall by 3 percent at a milk-solids price of $6/kg, and 4 percent at a milk-solids price of $7.50/kg[332]. The Ministry for Primary Industries forecasts a milk-solids price of $7.00/kg for 2020-21. Most farmers would be applying considerably less than 300 kg N/ha so the average effects would be less than these figures on farmers applying over the cap. More than half of all New Zealand dairy farmers would be unaffected by the cap, and very few drystock farmers.[333]

The number of farms affected is unknown, but impacts would be greatest in the South Island, with more than half of Canterbury dairy farmers likely to need to reduce nitrogen-fertiliser rates (the average rate in 2017/18 was 222 kg N/ha).

The economic impact would be highest amongst farmers relying on high fertiliser and stocking rates to drive production levels and profit, in order to service debt. This high-intensity farming approach is more profitable at current relatively high milk solids prices[334]. The reduction in stock numbers would have flow-on employment effects. For example reducing from 300 to 200 kg N/ha has been estimated to require a reduction in herd size of 16 percent.[335] On a 1000 cow herd, this represents 160 cows, reducing labour requirements by one full-time equivalent (in 2018/19, the average number of cows per full-time equivalent was 146)[336].

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[330] Principles of the Treaty of Waitangi - the options can make a contribution to protecting the taonga of water quality to the degree to which they are effective in improving water quality. In terms of partnership and participation, none of the options provide a clear role for partnership with Māori in developing/enforcing the initiatives.

[331] Te Mana o Te Wai – these scores match those in the effectiveness row – the options can make a contribution to protecting the health and mauri of water to the degree to which they are effective in improving water quality.

[332] Clark, 2019. The Opportunities and Challenges of De-intensifying your dairy system. Paper presented at the Small Milk and Herd Supply Conference. Online

[333] Journeaux etal, 2019.

[334] Clark, 2019, ibid

[335] Clark, 2019. ibid

[336] DairyNZ. Online: https://www.dairynz.co.nz/business/dairybase/benchmarking/latest-dairybase-benchmarks/

The impact on nitrogen losses (and subsequently on water quality) will vary between regions, with the Lincoln University Dairy Farm finding that reducing nitrogen fertiliser from 313 kg N/ha to 178 kg N/ha (and associated stocking rate changes) reduced nitrogen leaching by over 30 percent, as well as greenhouse gas emissions by 20 percent[337]. A farmlet trial in the Waikato found that reducing fertiliser from 60 to 35 kg N/ha reduced nitrogen discharges by 37 percent when combined with other good practice actions.

The proposed policy may be seen as fair by some, especially non-farmers, as all catchments are being targeted by the proposed policy.[338] However the exclusion of the arable and horticulture sectors, the lack of recognition for good fertiliser practice, and the tenuous link to nitrogen discharges, would undermine that perception amongst farmers.

This option is likely to negatively impact on farmer wellbeing (anxiety/mental health), especially producers relying on large amounts of fertiliser (eg, some intensive farming systems) as the changes are likely to affect farm viability, and require new pasture management skills. Farmers may feel that their good management of fertiliser (albeit at high application rates) is not recognised by the proposal.

Option 3: Early Freshwater Modules of Farm Plans (FW-FPs) in high nitrogen catchments

Under this option, all farms and horticultural properties in specific highly nitrogen-impacted catchments would be required to have an early FW-FP (within a year of the new FW-FP regime being established, likely within three years of gazetting the NES). The FW-FP would be required to have a focus on identifying and addressing nitrogen-related risks.

Rationale for a FW-FP based approach

As outlined in the RIA Appendix for the proposed FW-FP regime, FW-FPs are tailored to the farm and catchment. They provide the best approach to determining whether a farm is at good practice across the range of farm management activities that affect nitrogen discharges.

One of the disadvantages of farm plans as they currently exist, is lack of enforceability, unless the farm plan is a condition of a consent. The preferred option outlined in the FW-FP appendix to this RIA would address this through legislative change.

While some aspects of farm management change will be implemented immediately in an FW-FP, eg, a tailored fertiliser rate), other changes will be scheduled over time in the plan. This means that some changes may be slower than option 1, amongst farms that are in the top 20 percent of discharges in the catchment. This is particularly likely for changes that require capital investment.

Which catchments would the early FW-FPs be required in?

The same process was used as for Option 1, but fewer filters were applied as the option is not dependent on a minimum number of dairy farms (required in Option 1 to set the threshold). The catchments would therefore be the same as that consulted on ie, the full set of catchments included in Schedule 1 in the draft NES, with the addition of four catchments with more diverse land uses: Waitangi and Whangamaire (Auckland Region), and the Waitohu and Mangaone catchments (Wellington).

[337] Lincoln University Dairy Farm, 2018. Online: http://www.siddc.org.nz/assets/LUDF-Focus-Days/LUDF-July-2018-Handout.pdf

[338] P Clark-Hall, 2018, *How to Earn a Social Licence to Operate*

Criterion	Option 5 – Baseline data option (NES with Overseer and FEPs, no thresholds set)
Effectiveness (including whether the policy would be implemented by 2022)	++ Farm plans provide an effective way to identify and address poor practice leading to excessive nitrogen discharges.
Timeliness	+ FW-FPs would likely be delayed three years until the new regime is in place (two years) and FW-FPs developed in the target catchments (one year). Some changes in farm practice requiring capital investment may be slower than in option 1 on farms with the highest discharges.
Fairness	++ All farmers would be expected to reduce nitrogen losses, however the FEP process would identify more actions on farms with higher nitrogen losses due to poor practice.
Efficiency	++ The FW-FP process is likely to identify the most cost-effective ways to reduce nitrogen discharges, given the tailoring of actions to each farm.
Principles of the Treaty of Waitangi[339]	0
Te Mana o te Wai[340]	+ Provides increased emphasis on the needs of the water compared with the status quo
Overall Assessment	++ This option is well-targeted at high discharges caused by poor practice. It is slightly slower than option 1 but avoids the additional costs and administration associated with setting a threshold and obtaining a consent, while still being enforceable.

Effectiveness and costs:

The impacts of this option at the national scale are drawn from the FW-FP appendix to the RIA, and outlined in the Table outlining costs and benefits below. The costs and benefits, as well as the social and cultural impacts, of FW-FPs would occur earlier in the target catchments than in other areas.

Options ruled out of scope, or not considered

We did not consult on some options considered in the interim RIA, and they are therefore not included in this final analysis:

1. A uniform national nitrogen cap (interim RIA indicated this to be unfair and inefficient)
2. Voluntary measures (interim RIA indicated this to be not sufficiently different to the status quo, likely to be slow to take effect, and unfair as only willing farmers would change practice)
3. Nitrogen-surplus[341] caps, with farm environment plans required of farms over the threshold (not consulted on, based on the views of the Freshwater Leaders Group).

[339] Principles of the Treaty of Waitangi - the options can make a contribution to protecting the taonga of water quality to the degree to which they are effective in improving water quality. In terms of partnership and participation, none of the options provide a clear role for partnership with Māori in developing/enforcing the initiatives.

[340] Te Mana o Te Wai – these scores match those in the effectiveness row – the options can make a contribution to protecting the health and mauri of water to the degree to which they are effective in improving water quality.

[341] Nitrogen surplus is the difference between nitrogen inputs and outputs from a farm.

We also considered use of nitrogen surplus as an alternative to Overseer in a consent-based regime, in response to submitter feedback. While nitrogen surplus is a faster and cheaper alternative to Overseer, it would tend to target more intensive farms (regardless of whether they are at good practice or not) rather than farms that have high nitrogen discharges caused by poor practice.

We did not include consideration of amending the NPS-FM to set nitrogen caps in place. The reason for this is that the policy needs to be quickly implemented to address the regulatory gap while councils set limits and make plan changes; and is therefore better suited to an NES.

A section 360 regulation would be quick to implement but there is currently no suitable provision in the section to base a regulation on.

Recommendation

The options are finely balanced. While FW-FPs are the best instrument for identifying and addressing poor practice (as outlined in the FW-FP RIA), it will be three years before they are in place in highly nitrogen-impacted catchments. Options 1 and 2 provide ways to intervene slightly earlier (particularly Option 2), but have significant disadvantages. On balance we consider Option 3 to be the preferred policy, while recognising that Option 2 would send an early signal across all of New Zealand that excessive nitrogen fertiliser use is no longer acceptable, at relatively low cost.

Summary table of costs and benefits of option 1

Note: as outlined earlier, all the options include early roll-out of FW-FPs in targeted high-nitrate catchments. The costs in the Table below *do not* include the costs and benefits of early roll-out of FW-FPs as these are outlined in the Summary Table for option 3. This table outlines the marginal costs and benefits of Option 1 over and above those for Option 3.

Affected parties	Comment:	Impact	Evidence certainty
Additional costs of proposed approach, compared to taking no action			
Regulated parties	Impact will be restricted to the selected high N-impacted catchments and only for the 5 years from 2020 to 2025. • Initial Overseer budgets required of affected farms (all dairy and low-slope beef/dairy support farms in Schedule 1 catchments): $2000 – 3000 per farm, or more if the farm is complex[342]. • Follow-up Overseer budget and documentation for 20% of affected farms, to accompany consent application: $5000-8000 per farm (higher cost due to the need for scenario testing) • Consent fees for same 20%: ~$3000 • An ongoing reduction in profitability for farms over the threshold is likely on average, although some may improve profitability[343]. However, the policy is short-term (5 years) until regional rules kick in; so the policy analysis assumes that the costs imposed are the same as those that would be imposed by council rules, but brings them forward by up to 5 years[344]. • A further Overseer budget for farms under the threshold after 3 years • Social costs are also likely, including potential falls in employment as a	• Initial Overseer cost (@$3000/farm): ~$11 million • Second Overseer cost @$6500/farm: ~$5 million • Consent fees: ~$2 million • Impact on profit: Medium (on average) for affected farmers, although a small proportion may increase profit through greater nitrogen use efficiency. These profit reductions would be brought forward by up to 5 years from status quo. • Second Overseer budget for affected farms under the threshold: ~$9 million	Low (with respect to the size of the impact), medium (with respect to the direction)

[342] Fonterra submission on Waikato Regional Council's Plan Change 1.

[343] MacDonald et al, 2001. Farm systems – Impact of stocking rate on dairy farm efficiency. Proceedings of the New Zealand Grassland Association 63: 223–227. Allen, J; 2019. Statement of evidence of James Kenneth Allen for Fonterra Cooperative Group Ltd (at the hearing of submissions on proposed Plan Change 1 and variation 1 to the Waikato Regional Plan (Healthy Rivers); summarised the impacts on 10 case study farms of reducing discharges to the 75th percentile as ranging from +$106 to -$541/ha.

[344] Supported by modelling for Southland provided by LGNZ

	result of reduced profitability; and farmers' whose goals include high production per hectare may have achievement of these goals constrained by the policy. *Number of catchments and farms affected including revised Schedule 1 and targeting high-risk pastoral land uses:* • *Revised Schedule 1 has 7-9 catchments*. • *Number of dairy and low slope beef/dairy support farms required to complete initial Overseer budget*: 3500-3900 farms[345] • *Number of dairy and low slope beef/dairy support required to do follow up Overseer budget and consent (20%): 700 -780 farms* • Plus all farms in the target catchments face earlier FW-FPs than would otherwise be the case		
Regulators	Castalia estimate – some of this will be cost-recovered from farmers[346].	~$4million.	Med
Wider government	Support for councils in assessing thresholds	Low	Medium
Other parties	The Ruamahanga catchment modelling (Appendix 1) modelled that if the threshold is set at 30 kg N/ha, 10 percent of the catchment would be affected, regional output would fall by 7 percent, and employment by over 5 percent	Medium	Low (with respect to the size of the impact, medium with respect to the direction)
Total Monetised Cost	Not able to be calculated as the distribution of nitrogen discharges (and therefore the reductions required by those over the 80th percentile) is unknown in the target catchments		
Non-monetised costs	*Costs fall mainly on affected farmers*	Medium	Low

[345] From Agribase data

[346] Castalia, 2020. *Administrative Costs of Proposed Essential Freshwater Package on Regional Councils*. Draft Report to Ministry for the Environment

Expected benefits of proposed approach, compared to taking no action			
Regulated parties	A proportion of farms will be able to reduce nitrogen discharges and increase profits Provides a strong signal that grandparenting of high leaching activities will not be part of future allocation regimes. This should help avoid very "hard landings" for high nitrogen dischargers under any future nitrogen allocation scheme.	Low	Medium
Regulators	The data generated from the N-cap calculations will assist with catchment accounting, limit setting and development of regional rules. Affected regional councils are likely to face lower planning costs as they set limits and regional rules in place, because high nitrogen dischargers are already reducing their discharges	Low-Medium	High
Wider government	Information on the current distribution of discharges in target catchments may assist with future policy development eg, allocation policy	Low	High
Other parties	Improving farm practices will reduce nitrogen discharges to water but the benefits will take some time to be expressed in water quality outcomes, due to long lag times in some catchments.[347] The Ruamahanga modelling indicated that the reductions in nitrogen discharges depend on the stringency of the cap, with less stringent caps having very little impact on nitrogen leaching across the catchment, and the most stringent cap resulted in a 7 percent drop in nitrogen leaching. The main beneficiary will be the waterways themselves (Te Mana o te Wai). Ecological health of water ways will increase. In high N-impact catchments, recreational water users such as swimmers will benefit	Medium in high N-impacted catchments (brought forward 1-5 years)	Medium

[347] Wilcock et al, 2013. Trends in water quality of five dairy farming streams in response to adoption of best practice and benefits of long-term monitoring at the catchment scale. *Marine and Freshwater Research*, 64, 401–412

	over the long term due to reduced periphyton. Note that at least some of these benefits would have been achieved without intervention, but delayed 1-5 years, as a result of regional plan measures		
Total Monetised Benefit			
Non-monetised benefits	A small proportion of the benefits to water quality from the longer term nitrogen bottom-lines (PV of $1.9 billion) will occur earlier than would otherwise be the case. The proportion is small because only farm-practice related reductions in nitrogen discharges will occur early, these reductions will occur only on farms over the threshold, and only a small proportion of New Zealand's land area is covered by the proposal	Low-Medium in target catchments	Medium

Summary table of costs and benefits of Option 2

Note: as outlined earlier, all the options include early roll-out of FW-FPs in targeted high-nitrate catchments. The costs in the Table below *do not* include the costs and benefits of early roll-out of FW-FPs as these are outlined in the Summary Table for option 3. This table outlines the marginal costs and benefits of Option 2 over and above those for Option 3.

Affected parties	Comment:	Impact	Evidence certainty
Additional costs of proposed approach, compared to taking no action			
Regulated parties	*Number of catchments and farms affected* All catchments and all pastoral farms (above a de minimus threshold). Additional costs: For those farmers over the nitrogen fertiliser cap, a reduction in fertiliser rates will be required – the economic impacts depend on the size of the reduction required, milk prices (at low milk prices, farms can be more profitable with lower nitrogen fertiliser rates[348]) and whether stocking rates are reduced or feed is purchased to meet stock requirements. The latter is the more	0-4 percent reduction in operating profit on affected farms, depending on current fertiliser rates and assuming that farmers reduce stock numbers rather than buying in feed. Estimated less than 20% of	Low

[348] Shepherd, M., and D. Selbie. 2017. Nitrogen fertiliser use: the right amount, in the right place, at the right time. DairyNZ Technical Series (December 2017):1-6.

	expensive route in most cases[349]. Analysis of research trials found that on the research farmlet, reducing from 300 to 200 kg N/ha resulted in a 3 or 4 percent drop in operating profit at milk prices of $6 and $7.50 respectively[350], with MPI forecasting a milk price of $7 for the upcoming season[351]. The number of farmers affected is unknown. Nationwide less than half of all dairy farmers will be affected, (assuming a normal distribution) as average rates were 155 kg N/ha in 2017/18. More South Island farmers will be affected than North Island, with average rates of 222 kg, 185 and 175 kg N/ha in Canterbury, Southland and the West Coast respectively in 2017/18.[352]. Based on existing data we estimate that less than 20% of dairy farms would need to reduce nitrogen fertiliser rates[353] All dairy farmers (11,590 herds in 2018[354]) will need to report fertiliser use annually to councils	dairy farmers affected. Cost of reporting will be relatively low per farm, if electronic – estimated $1-2 million total at 2 hours per return and $50-100/hour opportunity cost of farmers' time. .	
Regulators	Costs to monitor and enforce fertiliser cap. There will be 11,590 fertiliser reports received electronically (dairy farms only), with compliance action initiated for those over 200 kg N/ha. Processing of non-complying consents (also likely to be few in number). Random checks of farmer reporting of fertiliser use – likely to require consultants or staff with good knowledge of farm systems – assuming councils check around 1 percent of reports, around 1200 farms would be checked – assume 4 hours per visit to check invoices and $1000/day charge-out rate.	Compliance checks estimated at $600,000 per year – 1200 farms at $500 per farm	Low

[349] Journeaux et al, 2019.

[350] Clark, 2019.

[351] MPI, 2019, Situation and Outlook for Primary Industries.

[352] Journeaux et al, 2019.

[353] Based on data in Journeaux et al, 2019, few (if any) sheep and beef farmers would need to reduce nitrogen fertiliser use, with average rates less than 20 kg N/ha.

[354] DairyNZ, 2019. Quick stats about dairying. Online https://www.dairynz.co.nz/media/5791052/quickstats-about-dairying-new-zealand-2019.pdf

Wider government	Cost to set up an electronic reporting system (or support for councils to support a reporting system).	Medium	medium
Other parties	Fertiliser companies will have reduced sales and profits	Low	Medium
Total Monetised Cost	Unable to be fully assessed as the distribution of fertiliser rates is unknown		
Non-monetised costs	Costs fall mainly on affected farmers	Low-medium (0-4% of operating profit on affected farms)	Low

Expected benefits of proposed approach, compared to taking no action			
Regulated parties	Saving in fertiliser costs (and potentially more resilient farms if milk prices fall).	Proportionate to the reduction required	Low
Regulators	Data on nitrogen fertiliser use may be useful in understanding current farm practice in relation to fertiliser rates	Low	Medium
Wider government	Data on nitrogen fertiliser use may assist with future policy development for water and climate change	Low	Medium
Other parties	Improvement in water quality likely to flow as fertiliser and stocking rates fall. Improvements would be catchment specific. Improvements highest in Canterbury, West Coast and Southland, as these regions have the highest average N fertiliser rates	Low-medium	Low
Total Monetised Benefit			
Non-monetised benefits	A small proportion of the benefits to water quality from the longer term nitrogen bottom-lines (PV of $1.9 billion) will occur earlier than would otherwise be the case. The proportion is small because only fertiliser-related reductions in nitrogen discharges will occur early, these reductions will occur only on dairy farms using in excess of 200 kg N/ha, and some farms may choose to substitute bought-in feed for fertiliser.	Low-medium.	Low

Summary table of costs and benefits of Option 3

Affected parties	Comment:	Impact	Evidence certainty
Additional costs of proposed approach, compared to taking no action			
Regulated parties	All farmers in affected catchments prepare and implement an early FW-FP, cost per farm as follows:[355] FW-FP preparation cost per farm: estimated at $4000/farm, 7700 farms[356] Audit fees: $1500/audit required every two years Implementing the FW-FP: $15,000 per farm per year	All costs below would be faced by farms in high-nitrogen impacted catchments earlier than would otherwise have been the case (under the FW-FP proposals): Farm plan preparation (one-off cost): $31 million Audit: $6 million p.a. Implementing farm plan: $115 million p.a.	Medium
Regulators	Costs to regional councils to administer the FW-FP regime will be brought forward in the target catchments. Resources will likely be stretched with the range of other freshwater obligations to meet (eg, setting catchment limits in plans) and other pending government policy initiatives. There are significant costs associated with administration, data management, farmer extension, education, reporting, compliance monitoring and enforcement; and primary industry and central government liaison.	medium	Medium-High
Wider government	Support for affected councils will be required in the first catchments wherever FW-FPs are rolled out (ie, the additional costs on central government cannot be assigned to this particular policy).	Low	High

[355] all cost data from the FW-FP RIA

[356] Farm numbers sourced from Agribase

Other parties	Potential negative effects on some business owners and their staff if the farming workforce has less disposable income.	Medium-low	Medium-low
Total Monetised Cost	Costs fall mainly on affected farmers	Earlier requirement for FW-FPs: Farm plan preparation (one-off cost): $31 million Audit: $6 million p.a. Implementing farm plan: $115 million p.a.	Medium
Non-monetised costs			

Expected benefits of proposed approach, compared to taking no action			
Regulated parties	Benefits will accrue earlier in the target catchments than would otherwise have been the case as FW-FPs are roiled out early: A good FW-FP process (with commitment to adequate extension programmes) should help farmers be more resilient and able to tackle other environmental challenges and opportunities. In some cases FW-FP process may identify farm system changes that may improve profitability and provide environmental benefits (eg, soil testing could suggest less fertiliser is needed). Demonstrating improved environmental performance is important for building the social licence of the primary sector. A robust mandatory FW-FP regime has the ability to show how FW-FPs and targeted good practice requirements can help deliver on achieving catchment priorities and associated community values Potential for market access or market premium benefits by linking FW-FP to an assurance programme. Limited evidence of widespread consumer willingness to pay premium. Synlait and Miraka do offer small premium for high	Medium	Medium

	environmental performance and brands like Taupo Beef show there can be a premium. Good environmental performance is increasingly what consumers expect as standard practice. FW-FPs could help demonstrate this performance and help farmers be more effective in responding to emerging market demands of this type. Evidence from Canterbury is that good farm plan audit results can make it easier to borrow money and impact positively on property values (converse for poor audit grades), providing motivation to improve performance. Additional motivation for improved performance may also come through peer pressure where farmers are part of an industry scheme that has to transparently report on audit grades of its members.		
Regulators	FW-FPs should help deliver on council RMA obligations and contribute to better environmental outcomes in region and enhanced ability to provide for cultural and recreational values of citizens More information on farming activities in their region will be valuable to councils. There is also the potential to improve relationships with farmers and help better target council and/or industry farmer extension programmes and catchment initiatives to where they can have biggest impact.	Medium-high	Medium
Wider government	FW-FP framework has potential to be used for other priority environmental areas (eg GHG, biodiversity) promoting co-benefits (integrated farm planning). Tailored 1-1 approach of farm planning with follow up/auditing (as workforce capacity builds up), should help improve farmer capability building on an on-going basis. FW-FP process and associated capability building may help catalyse improved farm business planning and more sustainable and resilient farm businesses.	Medium-High	Medium

Other parties	Benefits will accrue earlier in target catchments: The positive social benefits associated with improved water quality that FW-FPs can help deliver are substantial. They include reduced risk to human health (through improved drinking water quality); improvements to environmental amenity; and an increase access to valued natural resources, including for recreational activities, and cultural practices (eg, mahinga kai). These positive impacts are likely to be felt by New Zealanders at large, including Māori and the farming community. There may also be a Brand NZ contribution – tourism, market access benefits as well as a contribution to New Zealanders' cultural identify and values associated with high quality natural environment though all this is hard to quantify and depends on other environmental management provisions. There will be increased opportunities for suitably qualified rural advisors to help prepare, approve and/or audit FW-FPs and undertake allied advisory roles and new/expanded opportunities for agricultural training providers to deliver appropriate FW-FP courses	High	Medium-High
Total Monetised Benefit	As the policy would affect around 30% of New Zealand's farms, the total benefits would be of the order of 30% of the benefits of the national FW-FP proposal (yet to be assessed).		
Non-monetised benefits	If FW-FP delivery is well-resourced the policy has potential to provide significant benefits not only in contributing to improved water quality and associated values, but also building a more sustainable and resilient primary sector and farm advisor workforce.	High	Medium

Chapter 16: Stock Holding Areas and Feedlots

Context

One of the causes of water quality degradation is high-risk land use activities, which can increase effluent, nutrient and sediment discharge and if not controlled, lead to poor water quality and soil degradation.

Three of the high-risk land uses identified are intensive stock holding areas, feedlots, and sacrifice paddocks. This paper provides analysis on regulation options for stock holding areas, feedlots and sacrifice paddocks that are longer term and are part of the "hold the line" measures in the Action for healthy waterways Package.

Stock holding areas is an umbrella term referring to a group of intensive farming practices commonly used on beef, dairy, sheep and other livestock farms for farm pasture management and supplementary feeding of livestock. The definition in the regulation is limited to only cattle over a certain age and weight. Stock holding practices included in this definition are feed pads, wintering pads, standoff pads, loafing pads and wintering barns. Stock handling areas such as stockyards, milking sheds, shearing sheds and woolsheds are not included in the stock holding definition.

Approximately 9 per cent of New Zealand's dairy farms in the country have a wintering barn on their property, with Southland region having the highest percentage (18 per cent). On average, of those who built a wintering barn, only 18 per cent had applied for a resource consent to create the facility. Approximately, one-third of dairy farms in New Zealand have a feed pad or a standoff pad. The prevalence of these facilities is much higher in the North Island, and much less common in the South Island. Nearly one-fifth (18 per cent) of dairy farmers are planning to build a wintering barn, a feed pad, or a standoff pad in the next five years.[357]

Feedlots are farming system where stock are held for an extensive period of time and fed almost exclusively on feedlots. This intensive livestock farming could be considered a type of more intensive stock holding area. As with stock holding areas, the regulation is limited to only cattle over a certain age and weight. Feedlots are uncommon in New Zealand. Using the NES definition of a feedlot, it is estimated that there could be up to 40 beef feedlots in New Zealand. These feedlots are predominantly located in the Hawke's Bay, Manawatu-Whanganui, and Canterbury regions. It is estimated there are approximately 45,000 - 50,000 animals housed within these 40 feedlots.[358]

There may also be a number of dairy operations that may be captured by the NES definition of a feedlot. This could include at least one dairy cow farm, 2-3 dairy sheep farms, and 80-90 dairy goat farms.[359]

Council approaches to compliance, monitoring and enforcement of these areas

Currently, whilst a feedlot may require a consent, a wintering barn, feed pad or standoff area is often not a consented activity in itself, and as such there is limited compliance monitoring undertaken by the majority of the councils. However, most councils have a monitoring, compliance and enforcement programme for monitoring resource consents relating to effluent discharge to land. These discharge related monitoring programmes would likely overlap with future consents related to these areas.

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[357] Report on the prevalence, regional extent and other information on feedlots and other stock holding areas in New Zealand, AgFirst, February 2020 (draft report, numbers listed yet to be confirmed)

[358] Ibid.

[359] Ibid.

Where a feedlot was a consented activity (eg, Canterbury, Hawke's Bay), and council records available, the compliance, monitoring and enforcement (CME) process varied between regions. In Canterbury, the council uses a risk analysis to drive all compliance activity, and feedlots are considered high risk. The consents have an annual reporting requirement, documenting the contaminants being discharged to confirm that they are within acceptable limits. Monitoring visits are planned by the councils' resource management officers and include an assessment of the holder's compliance with each condition of the relevant resource consent. Such visits can be pre-arranged or sometimes are unannounced.[360]

The Problems/Opportunities

Stock holding areas are a commonly used farming practice in the dairy and red meat sectors that can economically benefit farms by improving productivity, but present a high-risk to water quality degradation if inappropriately designed and/or managed. Feedlots are much less common but involve increased risks due to holding stock for longer periods of time and at higher stocking rates.

The environmental issues caused by feedlots and stock holding areas largely result from the volume and intensity of effluent accumulating from holding animals in a confined space, resulting in point source pollution to water from contaminant discharges if badly designed, managed and/or inappropriately sited. Additionally, confinement of animals at high densities can result in soil damage, leading to soil compaction and erosion.

There are a number of measures that can be implemented by the operators of stock holding areas and feedlots to reduce the risks of water quality degradation. Industry groups have developed guidance for farmers to help them implement such measures voluntarily. However, as the cost to water quality is external to the operator, there may be little incentive for operators to invest in these measures.

When risks are managed appropriately, stock holding areas can also be a useful tool for reducing farm-scale contaminant discharges to water, as contaminant discharges can be reduced to a lower level than other high-risk farming land use practices (eg, intensive winter grazing on forage crops). However, reducing the water quality impacts of stock holding areas could have perverse incentives if the cost of risk management discourages their use, driving farmers to engage in intensive on paddock practices to manage stock that actually pose a higher risk to water quality.

While some regional councils have regulated the use of land for, or the contaminant discharge from, these activities under the Resource Management Act 1991 (RMA). There are significant gaps. Only two out of 16 regional councils (Environment Canterbury and Hawkes Bay) directly regulate the use of land for stock holding areas/ feedlots. There is also a lack of consistency in definitions and approaches, and significant gaps exist in ensuring that nationally these activities are operated in a way that pose a low risk to water quality degradation.

Constraints on the analysis

Proposed regulations for stock holding areas and feedlots are part of the provisions to address water degradation in the Action for healthy waterways Package with strong links to the proposed

[360] Ibid.

Freshwater Farm Plans (FW-FPs)[361] and regulations for addressing intensive winter grazing on forage crops.[362]

Wider negative environmental impacts such as noise, odour and aesthetic values have also been associated with stock holding areas and feedlots. The scope of this work is limited to water quality impacts. However, any policy intervention should consider wider environmental issues to ensure policy alignment.

Animal welfare issues have also been raised as an area of concern in relation to these activities. The Ministry for Primary Industries and the Royal New Zealand Society for the Prevention of Cruelty to Animals (the RNZSPCA) jointly enforce the Animal Welfare Act and Biosecurity Act, which specify the obligations of people in charge of animals. The proposed policy intervention is unable to manage these concerns directly, as it is not a matter for Resource Management Act controls. However, as there is a linkage between animal grazing, feed systems and animal health, we propose that this connection is made explicit through regulation guidance.

Options for managing stock holding areas and feedlots

Most submitters favour regulating feedlots.[363] Some submitters, (often ENGOs) favour total prohibition of feedlots. Primary sector groups or local government submitters often support the proposals, but seek changes to address the key issues outlined below.

On stock holding areas other than feedlots, views vary on the type of control submitters believe would best achieve the freshwater objectives. Some submitters favour regulation through a consent regime, either as proposed or with amendments. Primary sector groups, as well as some local government submitters, tend to favour managing these areas solely through farm plans. Others, often ENGOs, prefer that all intensive stock holding be prohibited.

A number of submitters, particularly primary sector submitters as well as some local government groups, suggested that making these areas subject to a consent is not the best way to regulate these stock holding areas. These submitters tend to prefer that stock holding areas are classed as a permitted activity or managed through Freshwater Farm Plans (FW-FPs).

Option 1: Status Quo

Under the status quo option it is likely that where regional council rules do not already exist, stock holding areas and feedlots will continue to be operated in a manner that presents a high risk to water quality until regional councils develop rules that give full effect to the NPS-FM. This will potentially result in patchy adoption of good practice and will not accelerate the adoption of practices to the extent needed to halt degradation and deliver improved water quality impacts in five years.

This would likely increase contaminant discharges to waterways, worsening degradation of water quality. Which will also negatively impact human, animal and ecosystem health, and cultural and recreational values of water.

[361] Refer to Improving water quality through better farm practice (Freshwater Farm Plans) RIS

[362] Refer to Intensive Winter Grazing on Forage Crops RIS

[363] In different parts of New Zealand the term 'feedlot' can refer to both 'conventional' feedlots (as covered in cl 27) and more short term stock holding areas (the areas covered in cl 29). This led some submitters to question which activity cl 27 was regulating or object to cl 27 on the grounds that 'feedlots' were more commonplace than the consultation material suggested.

The use of stock holding areas and feedlots does however enable intensification of farming, which increases productive gains and profit on farms.

The status quo option would not give effect to Te Mana o te Wai, as private economic gain would continue to take precedence over the health and wellbeing of the water.

Option 2: National Environmental Standard with consent requirements) and technical standards for land use, supported by the adoption of Freshwater Farm Plans

Under this option, NES regulations would set consent requirements and permitted activity standards for land use. In addition to support implementation and compliance, it is proposed that to meet the requirement or standards of practice the assessment and actions are incorporated into the proposed freshwater modules in farm plans.

This option would also specify definitions, which is a necessary first step in regulating these activities, as the current variability in definitions contributes to difficulties in determining the extent and impact of them.

We have worked with government agencies and industry bodies (including Ministry for Primary Industry, Environment Canterbury, and Beef and Lamb) to develop definitions that reflect the activities we are trying to capture with this regulation. These are as follows:

Stock Holding Area: An area of land in which the construction of the holding area or stocking density precludes maintenance of pasture or vegetative groundcover, and livestock are confined for more than 30, 24-hour cumulative days in any 12-month period, or for more than 10 consecutive 24-hour days at any time. These can be covered or uncovered areas.

To assist interpretation of NES, stock holding currently includes management practices such as feed pads, wintering pads, standoff pads, loafing pads and sacrifice paddocks. It does not include stock handling areas such as stockyards, milking sheds, shearing sheds or woolsheds.

Feedlot: An area of land in which the construction of the holding area or stocking density precludes maintenance of pasture or vegetative groundcover, and livestock are confined for more than 80 days in a six-month period, and are completely hand fed or mechanically-fed. This includes both covered and uncovered areas.

A National Environmental Standard (NES) can set standards, rules, activity status and other requirements for land use. The NES could specify definitions for these activities, establish permitted activity standards, resource consent requirements, classes and conditions for the activity. A NES can establish consent requirements that enable site-specific constraints and opportunities to be addressed in conditions of the consent, whilst still enabling the activity for the benefit of farmers.

The high level of risk associated with these activities means both monitoring and compliance of stock holding areas and feedlots is enabled by clear and specific permitted activity standards or consent requirement rather than relying on voluntary adoption of mitigation measures, or through a less prescriptive approach.

The consent requirement for stock holding areas and feedlots will impose restrictions on the use of land. Addressing land use would allow for up-front reductions in contaminant discharges, without the cost and complexity of having to develop national standards for contaminant discharges. Design and management measures for land use are available and relatively easy to implement, and consent conditions could be designed to ensure that these measures are implemented.

The NES would be prescriptive in setting activity classes and consent conditions. This would provide clarity to regional councils and stakeholders as it does not rely on council interpretation. The prescribed permitted activity and consent conditions should codify proven good design/management practices to reduce the risk of undertaking these activities, so that risks are mitigated as a matter of course.

Stock holding areas would be designated as a permitted activity provided minimum standards are met and require consent as a restricted discretionary activity if the minimum standards are not met. If a consent is granted, the applicant must comply with minimum standards set in the NES and any conditions imposed by the resource consent. The NES would set matters for restricting discretion.

Feedlots would be designated as a discretionary activity and if granted, must comply with minimum standards set in the NES.

The minimum standards should be as follows:

a. The base of the area must be sealed to a permeability standard of 1 millimetre per day.
b. The area must be sited at least 50m away from water bodies, water abstraction bores, drains, and/or costal marine areas.
c. All animal effluent or water containing animal effluent or bedding material containing effluent must be collected, stored and removed under an authorisation in accordance with section 15 of the Resource Management Act 1991.

The NES would specify that regional councils could recover costs for compliance, monitoring and enforcement of permitted activities. Costs of consenting are imposed on the applicant. Implementation of the NES would likely increase the workload for councils as greater resource will be needed to process resource consents and management of permitted activities

Implementation of this option would be supported by initiatives such as:

a. Working with industry and councils to progress good practice guidelines for meeting minimum standard requirements;
b. Providing guidance to councils on streamlining and bundling farm consent applications; and
c. Freshwater Farm Plans (FW-FPs)[364] which can provide a useful tool for farmers to plan for improvement, align their activity to the proposed regulatory limits, and meet consent requirements for stock holding areas and feedlots.

	Option 2 (National Environmental Standard, classifying stock holding areas as permitted activities with technical standards for land use, supported by the adoption of Farm Environment Plans)
Effectiveness	+ Will require that risks to water quality are mitigated up front by reducing contaminant discharges as a matter of course by requiring minimum standards for design and operation are met. Targeted at specified activities with measurable and enforceable performance measures. Effectiveness will depend on compliance, monitoring and enforcement by regional councils. Farm Environment Plans will assist this. NES could be too inflexible to account for differences in local circumstances. This would be mitigated by taking a 'minimum standards approach', working on the presumption that there are risk mitigation measures that are applicable regardless of location. This would

[364] Refer to Chapter on Freshwater Modules in Farm Environment Plans.

	be reflected in the permitted activity standards for stock holding areas and by (a) consent conditions where consent is required and (b) allowing regional councils to be more stringent in regional rules than the NES regulations for stock holding areas and Feedlots.
Timeliness	++ Rules will come into force on NES gazettal. This option would assist councils to address the effects of these activities and allow more time for regional planning processes to enable consideration of more stringent rules to be put in place to meet local and regional requirements.
Fairness	++ The costs of reducing risks to water quality sits with those undertaking the activities and receiving direct economic benefit from them. Enables the continued use within appropriate constraints. It allows community value-setting processes under the NPS-FM to supersede the rules once in place. Provides certainty and clarity to farmers and councils. Builds on the existing work of industry and councils in developing good practice.
Efficiency	+ Imposing land-use controls on the operators of the activities is efficient as it requires that risks are mitigated by those undertaking the activities. Monitoring permitted activities and consenting regime requires time and resource investments by regional councils. This adds a layer of bureaucracy and additional cost to anyone carrying out the activity. Efficiencies will be achieved with standardisation of definitions and regulation of high risk activities, removing costly litigation through schedule 1 processes and providing certainty and clarity to councils, industry, farmers and communities.
Principles of the Treaty of Waitangi	+ Protection: Improvements in water quality will have a positive impact on Māori cultural values associated with water. Partnership: the development of the NES has been developed with input by the Kāhui Wai Māori and consultation feedback from Iwi and Māori . Participation: This option could provide for participation in developing further standards (beyond the minimum). However, this would be achieved through regional council processes to implement the NPS-FM, as it would need to be conducted at the local level tangata whenua (rather than national).
Te Mana o te Wai	++ Restrictions on land use puts water quality impacts ahead of economic development.
Overall Assessment	++ Provides effective, timely and targeted regulation of high risk land activities to hold the line on freshwater quality degradation. The need for a resource consent for such activities may lead to some increased costs for farmers and Councils.

Option 3: Manage stock holding areas through certified freshwater plans, National Environmental Standard (with consent requirements for land use) for feedlots.

Proposes that stock holding areas be managed through a FW-FP. This approach would enable regulation to take a flexible, farm-specific approach. It would also help to reduce resource consent costs for stock holding areas. It also may, over time, manage potential adverse environmental effects associated with these activity. This option relies on agreed industry standards and regional plan rules. Which will enable a bespoke approach to mitigate any environmental issues.

Importantly, there would be a time delay until certified FW-FP are ready to be implemented. This longer transition would enable councils to set up systems to manage monitoring. However, given that certified FW-FP would take several years to implement, it is unlikely that such an approach would halt freshwater degradation quickly. Additionally, Industry set standards have yet to demonstrate effectiveness to halt water degradation.

As with option 2, feedlots would be designated as a discretionary activity and if granted, must comply with minimum standards set in the NES.

The minimum standards should be as follows:

a. The base of the area must be sealed to a permeability standard of 1 millimetre per day.
b. The area must be sited at least 50m away from water bodies, water abstraction bores, drains, and/or costal marine areas.
c. All animal effluent or water containing animal effluent or bedding material containing effluent must be collected, stored and removed under an authorisation in accordance with section 15 of the Resource Management Act 1991.

	Option 3 - Manage stock holding areas through certified freshwater plans, manage feedlots through a National Environmental Standard (with consent requirements for land use)
Effectiveness	+ The management of stock holding areas through guidance and FW-FOs will likely effective in the longer term, but unlikely to be effective at holding the line on water quality immediately. The regulation of feedlots will require that risks to water quality are mitigated up front by reducing contaminant discharges as a matter of course by requiring minimum standards for design and operation are met. Effectiveness will depend on compliance, monitoring and enforcement by regional councils.
Timeliness	- FW-FP relating to stock holding areas would take time to put in place and difficult to meet 2025 halt water degradation timeframe. However, NES regulation of feedlots can take effect much sooner
Fairness	+ Bespoke approach will ensure that mitigations are tailored to farm environmental issues and farm practice. Low cost option as saves on consent. Builds on the existing work of industry and councils in developing good practice.
Efficiency	**0** Longer timeframe of FW-FPs would require robust guidance to inform mitigations
Principles of the Treaty of Waitangi	+ Implementing measures to improve water quality and manage adverse effects of stock holding areas broadly consistent with the Treaty principles. That part of this option will take time to come into effect may lessen alignment of this with the protection principle.
Te Mana o te Wai	**0** Meeting Te Mana o te Wai values in the regulation of stock holding areas may be delayed until FW-FP in place

Overall Assessment	+ Timeframe for implementing FW-FP option won't halt water degradation associated with stock holding areas immediately. Would allow a bespoke approach to managing stock holding areas, while also controlling feedlots. .

Recommendation on feedlots and stock holding areas

We recommend option 2 National Environmental Standard with, consent requirements and permitted activity standards for land use, supported by the adoption of FW-FPs.

We consider this option provides clear direction and a pathway for farmers and councils, to manage water quality risks from stock holding areas and feed lots. It builds on the existing good work of councils and industry in developing minimum standards. This means that where good practice is already adopted, there will not be an undue burden to the farmer.

An NES can be applied nationally and has an immediate effect on resource management decision-making, allowing the water quality impacts to be addressed in a timely manner.

The NES allows for the establishment of permitted activity standards and consent requirements so that site-specific constraint and opportunities can be addressed through conditions of consent where permitted activity standards cannot be met.

In contrast, the status quo relies on individual farmer, community and council commitment to manage water quality risks from stock holding areas and feed lots. This option is a low cost approach but will not meet our expectation for a timely, effective and consistent approach. Only two regional councils directly regulate the use of land for stock holding areas/feedlots. There is also a lack of consistency in definitions and approaches, and significant gaps exist in ensuring that nationally, these activities are operated in a way that pose a low risk to water quality degradation.

While option three, NES with consent requirements and technical standards for contaminant discharges, provides a similar pathway to option 2, it is limited by the lack of baseline data for contaminant discharges and the need for all relevant farms to adopt monitoring systems that provide the information at an attribution level. Overseer has potential to do this but is not adopted by all farmers, and ongoing monitoring would place an additional burden on farmers and councils. This makes option three extremely costly and difficult to set appropriately at a national scale. It would also require more time to implement and technical support to navigate the complexity of this option.

General options ruled out of scope, or not considered

Guidance and direct support to councils

Guidance and direct support as a standalone intervention was ruled out of scope, as the focus of this proposal is to achieve better management in a timely manner. We consider the outcome of guidance (which is voluntary) or support (eg, by helping councils through planning process) will rely strongly on influencing and uptake of better management can't be guaranteed. A regulatory approach is required to achieve the desired outcomes quickly.

Note this does not rule out direct support to councils as part of the wider implementation support package for Action for healthy waterways initiatives.

National Environmental Standard with consent requirements and technical standards for contaminant discharges

This option is similar in approach to option 2, however the focus is on consent requirements for discharge of contaminants from stock holding areas and feedlots, rather than land use.

Requiring a mandatory resource consent and specifying activity classes would establish controls over the amount and management of contaminant that can be discharged from these activities.

This option would require baseline data about the nature of the discharges to both groundwater and to surface water, and establishing minimum quality standards. Baseline data is difficult to obtain for a number of farms as we don't have a monitoring system that provides the information at an attribution level. Overseer has potential but is not adopted by all farmers and ongoing monitoring would place an additional burden on farmers and councils. Overseer is also considered more reliable for estimating discharges for dairy farms, and to a lesser extent sheep and beef operations. Therefore, effectiveness will be limited by the lack of baseline data for contaminant discharges and the need for all relevant farms to adopt a monitoring system such as Overseer.

Discharge controls are difficult to set appropriately at a national scale, and are better addressed through regional planning processes. Direct measurement of contaminant discharges would be inefficient making the option impracticable.

Regulatory options for sacrifice paddocks

During consultation, we explored an option to potentially regulate sacrifice paddocks through a National Environmental Standard with consent requirements.

Sacrifice paddocks means a paddock used temporarily to hold stock in such a way that the pasture is likely to be severely damaged and will require pasture renovation.

It is estimated that roughly one-third of dairy farms in New Zealand use a sacrifice paddock. The prevalence of the use of sacrifice pads is higher in the South Island than the North Island, particularly in the Southland region.[365] At this time, it prevalence of sacrifice paddocks on sheep and beef, deer, pig, and goat farms is unknown.

Public consultation suggests that support for the above proposal on sacrifice paddocks is limited. Some submitters feel that a consent regime is an inappropriate tool to regulate a temporary management practice. In contrast, others consider that sacrifice paddocks lead to poor environmental outcomes and so should not be allowed at all.

Options on sacrifice paddocks

Option 1: Manage this practice through guidance and certified FW-FPs

This approach would afford a flexible and risk based approach appropriate to the temporary, movable, and farm-specific nature of the activity. It would also avoid a number of practical issues around the difficulty of evaluating resource consent applications monitoring consents related to a temporary and movable practice (that is sometimes an unplanned response to adverse weather events). However, as FW-FPs would take time to roll out, this approach would not affect this activity immediately.

[365] Report on the prevalence, regional extent and other information on feedlots and other stock holding areas in New Zealand, AgFirst, February 2020 (draft report, numbers listed yet to be confirmed)

Option 2: Regulate these areas through a National Environmental Standard

This approach would send a signal that this practice is not desirable and provides incentives to not carry it out (ie, to avoid the need for a resource consent). As FW-FPs will take time to roll out, this option would also allow management of this activity to be put in place to manage this immediately.

Submissions raised significant practical issues with approach, particularly on how to measure and monitor compliance with consents related to this acidity. Many submitters suggested that instead their management would be better incorporated into FW-FPs. This approach would also require farmers to consider good management practices and plan accordingly for adverse weather events to manage risk.

Recommendation on sacrifice paddocks

We recommend option one. This option removes sacrifice paddock as a regulated activity requiring a consent and instead manages this activity through guidance now, FW-FPs later. This approach answers submitters practicality concerns, reduces consenting burden and allows a more tailored approach to managing the activity. However, the FW-FP component of the option would not allow immediate regulation of the activity.

What do stakeholders think?

Broadly speaking, stakeholders agree there is a need to address the water degradation consequences of stock holding areas and feedlots. However, there are differing views about the best way to achieve this.

Kāhui Wai Māori support taking a more regulative and active approach due to the potential of these activities detrimental impact on water quality. The preferred proposal, although it includes a regulatory approach, is not as stringent as the proposed Kāhui Wai Māori recommendation.

The Freshwater Leaders' Group have proposed that implementation of any policy is risk-based and use a farm systems approach. They also consider that it should not apply to areas with rules already in place. The preferred option takes a risk-based approach by setting minimum standards and consenting processes where rules are not in place. The farm system approach, though, is outside our mandate and lead by Ministry for Primary Industries.

Some industry groups recommend a more guidance-based approach, while environmental non-government organisations (ENGOs) tended to prefer stronger regulation and regulatory 'teeth' to manage high-risk land use activities. We have taken both approaches into consideration with regulation as the basis for our approach and guidance to support councils.

The Regional Sector has highlighted that policy intervention under the RMA could create significant burdens for regional councils in terms of consenting, compliance, monitoring and enforcement. We note this concern and will work with the regional sector to identify solutions that support implementation of the preferred option.

Both regional sector and industry groups support the importance of clear and unambiguous definitions. This has been included as a critical part of the work to develop a NES.

During public consultation, most submitters favour regulating feedlots. Some (often environmental NGOs) favour total prohibition of feedlots. Primary sector groups or local government submitters often support the proposals, but seek changes to address the key themes below.

On stockholding areas other than feedlots, views vary on the type of control submitters believe would best achieve the freshwater objectives. Some favour regulation through a consent regime,

either as proposed or with amendments. Primary sector groups, as well as some local government submitters, tend to favour managing these areas solely through farm plans. Others, often environmental NGOs, prefer prohibiting all intensive stockholding.

Support for the proposals on sacrifice paddocks is more limited. Some believe a consent regime is an inappropriate tool to regulate a temporary management practice. Others say sacrifice paddocks lead to poor environmental outcomes and so should not be allowed.

Summary table of costs and benefits of the preferred approach

Affected parties	Comment	Impact	Evidence certainty
Additional costs of proposed approach, compared to taking no action			
Regulated parties	Cost to obtain a resource consent from any operator requiring consent. There are up to estimated 40 beef feedlots in New Zealand. We estimate that there are 3700 dairy stock holding areas. We don't know how many need a consent but we assume most won't	Approximately $3000 per consent $90000 for about 25 feedlot consents. We assume about a third already have a consent. This will mostly affect the Hawkes Bay, Manawatu-Wanganui, and Canterbury regions who have the most feedlots If 1000 need a consent then the cost will be about $3 million. This could affect the Waikato and Taranaki regions the most.	High Medium Low
	Infrastructure costs to those not already meeting minimum standards.	Approximately $72 per cow per year[366] 20-30000 cattle in 25 feedlots could be affected. This comes to about $1.4 - 2.3 million Unknown how many stock holding areas do not meet the standards.	Low-medium Medium
	The complexities for farmers (especially dairy farmers) in deciding on	Medium	Medium

[366] Ruamahunga impact analysis used costings based on costs in this. Estimate $72 per cow: http://www.massey.ac.nz/~flrc/workshops/16/Manuscripts/Paper_Chrystal_1_2016.pdf

	appropriate farm systems that account for production and economic aims, particularly where debt is a key issue, environmental objectives, animal welfare, biosecurity and other drivers and the prospect of new regulations addressing climate change will be significant and may impact on, on-going commitment to farming.		
	Burden of complex decision-making could have consequences for social health and wellbeing or farmers, whanau and communities.	Medium	Medium
	Landowners will over-invest in infrastructure that becomes a stranded asset if a subsequent regional plan, or other legislation, requires land-use change in order to meet water quality, or other environmental objectives.	low	low
	Compliance costs may result in farmers choosing lowest cost option, rather than one that delivers the better environmental outcome.	Medium	Medium
	Increased costs may result in intensification in the farming system in order to offset these costs. This could result in increased contaminant discharges to water quality.	Low	low
	Risks of perverse outcomes where increased costs of compliance result in farmers undertaking more risky practices in order to avoid costs.	Medium	low
	Increased need for technical support	High	Medium
Regulators	Increased compliance, monitoring and enforcement burden to regional councils.	Medium	Medium
	There are wider environmental implications and negative public perceptions about feedlots and stock holding areas that go beyond water quality (eg, adverse noise, odour and amenity or landscape issues). By prescribing minimum, rather than comprehensive standards, we leave these issues to be addressed by regional councils.	Medium	Medium

Wider government	Development of implementation support and interpretation guidance.	Medium	Medium
Other parties	Primary industry extension services require support and development.	Low	low
Total Monetised Cost	*Costs will be dependent on requirement for consenting application and any requirements to meet minimum standards for both permitted activities and consent conditions.*	$3,000 per consent $90,000 for about 25 feedlot consents. We assume about a third already have a consent. If 1,000 need a consent then the cost will be about $3 million $72 per animal proxy estimate 32,000 cattle in 25 feedlots could be affected. This comes to about $2.3 million	Medium
Non-monetised costs	Most significant cost will be to councils to monitor compliance with regulations.	High	Medium

Affected parties	**Comment***:*	**Impact**	**Evidence certainty**
Expected benefits of proposed approach, compared to taking no action			
Regulated parties	Standards provide clarity and certainty about obligations to reduce contaminant loss risks.	High	Medium
	Wider farm-scale improvements to productivity and discharge rates due to good quality stock holding areas.	Medium	Medium
Regulators	It allows community value-setting processes under the NPS-FM to supersede the rules in place **only if** they are more stringent than those set out in NES.	High	Medium
	Bottom line performance standards enable better compliance responses by councils where plans do not yet address the risks form these activities.	Medium	low
	Providing national specification and definitions reduces inconsistencies between councils, reduce risk of litigation as regional plans are produced and	Medium	Medium

	reinforce the need to follow industry good practice.		
	Will help deliver on RMA obligations – better environmental outcomes in region and ability to improve cultural and recreational values.	Medium	Medium
Wider government	Sends a strong signal around government expectations for high-risk land use activities.	Medium	High
	Contributes to government objectives to improving water quality.	Medium	High
Other parties	Contribution to halting water quality degradation, and possibly improving water quality.	low	Medium
	Economic benefits could be realised by industries that support farmers to meet minimum standards.	Medium	Medium
	Increased demand for a higher-skilled and larger rural professional workforce to support farmers to meet minimum standards.	Medium	Medium
	Places greater protection on water quality with benefits for human health, animal health, ecosystem health, cultural values, recreational values, and long term economic values.	low	Medium
	Internalises external costs – more equitable.	low	low
Total Monetised Benefit	*To be determined as scope and scale of intensive Stock Holding Areas is somewhat unknown.* *It is estimated that about one third of bovine dairy farms may use some form of stock holding area.* *Currently, it is estimated that there may be up to 40 beef feedlots.* *Costs to meet minimum requirements may not translate into economic benefits in the short term for farmers.*		
Non-monetised benefits	Contributes to holding the line on water quality degradation and improved water quality for future generations. Proposal Is in line with aspirations to support Iwi whānau Māori kaitaiaki responsibilities.	*Medium*	low

	Provides a pathway for farmers and councils to demonstrate they are collectively looking after water and the environment.		

What other impacts is this approach likely to have?

Imposing restrictions on the operation of feedlots and stock holding areas will likely increase costs to farmers to meet the minimum standards (where those standards are not already being met), and the cost of obtaining a resource consent. Implementation of minimum standards may also require up-skilling and additional time spent on management of these activities. Increased costs may impact on farm profitability and impact the ability to sustain jobs. Flow on effects from this may be increased difficulty for sustaining rural communities and services.

These factors could result in stress, financial hardship for farmers and their communities. However, increased demand for experts in order to advise/implement minimum standards could lead to increased job growth in support industries, with flow on positive effects for communities.

Improved management of environmental effects could result in improved social licence for farmers, particularly where current practice results in visually unpleasant impacts (eg, stock in mud, visible sedimentation in rivers). This increase support from communities could enhance community cohesion, and increase feelings of environmental stewardship and responsibility.

The magnitude of these effects will depend on the amount of transitional time allowed and support provided to meet the minimum standards / obtaining a consent.

Chapter 17: Intensive Winter Grazing on Forage Crops

Context

Intensive winter grazing on forage crops contributes to water quality degradation. Intensive winter grazing (IWG) describes a farming practice where animals are farmed in intensive numbers of stock and confined to a small feeding area. This can result in the paddock being churned to deep mud. This farming practice can increase the discharge of nutrients, sediment and microbial pathogens ('contaminants') into surface water and groundwater, by stripping the land of its vegetative cover. This results in bare ground and potential damage to soil integrity in wet weather, particularly on sloped hills where sedimentary loss from soil erosion is worsened. This is due to the combined effect of having no vegetation to filter overland flow, and grazing related soil damage reducing the soils ability to absorb water.

Intensive winter grazing on forage crops in this context is defined as on paddock grazing by farm animals, between May to September (inclusive), on an annual forage crop where supplementary feed may also be fed to stock. Annual forage crops include brassicas, beets, and root crops and excludes perennial pasture and cereal crops.

Compared to pasture grazing, intensive winter grazing has significantly higher contaminant loss to water as the higher feed value of forage crops means that more stock can be grazed per hectare, and the types of plants grazed mean the soil is sometimes exposed for long periods.

The prevalence of this activity has increased in the last ten years with significant agricultural intensification resulting in increased stock feed demands. Technical solutions, such as helicopter spraying, have made the planting of winter forage crops a possibility on steeper sloped land.

The Problems/Opportunities

Winter forage crops are an important part of the pastoral farm production system and profitability. Not only do they provide feed when there is no or low pasture growth, they contribute to pasture renewal rotations for improved production and provide weed and pest control. Meeting feed demands from increased stock numbers (both dairy and beef), has meant stock grazing systems are increasingly intensive and reliant on forage crops in both summer and winter.

Research from Waikato found that dairy farmers make decisions about on-farm grazing and forage crops, infrastructure for feeding and holding stock in severe weather and for feed production according to proneness to treading damage ('pugging'), stock density and available feed supplies.[367] The main drivers do not expressly include environmental outcomes unless there is a specific nitrogen loss limit imposed through a council plan.

Table one illustrated below shows Otago, Southland and Canterbury were the most active brassica forage planting regions, making up about 80 percent of the winter grazing in 2018. While winter grazing of forage crops is a relatively recent farming practice, trends nationally show that it is increasingly being used when farms are intensifying.

[367] Kaine G (2013) Farm context and winter grazing practices in the Waikato dairy industry.

Table One: Forage Brassica hectares planted in year ending June 2018[368]

Region	Forage brassicas (Hectares during the year ended 30 June 2018)	Region	Forage brassicas (Hectares during the year ended 30 June 2018)
Northland Region	2225	Wellington Region	6357
Auckland Region	724	West Coast Region	3480
Waikato Region	15368	Canterbury Region	77133
Bay of Plenty Region	2850	Otago Region	52860
Gisborne Region	1458	Southland Region	43658
Hawke's Bay Region	10716	Tasman Region	1379
Taranaki Region	3923	Nelson Region	3
Manawatu-Wanganui Region	16168	Marlborough Region	1574
Total New Zealand			**239,875**

Central government intervention is needed as IWG is a highly environmentally risky practice that is expanding in scope, frequency, and into riskier areas (e.g. steeper slopes, etc.). Intervention will prevent further contamination of freshwater bodies. A lack of intervention or remaining with the status quo around winter grazing will make it harder to meet the Government's freshwater objectives. While the NPS is implemented, central government needs to intervene as IGW has not been captured by many plans (other than Southland, Canterbury, and maybe some others). Plans will take up to 5 years to become operative, and in the meantime the practice may spread which will increase contaminants and make meeting NPS-FM requirements harder later down the track.

Environmental consequences for water quality

IWG on forage crops is a high profile activity; there is a lot of media coverage around the environmental consequences of IWG, which are discussed below.

Contaminant losses from leaching to groundwater

On a per hectare basis, nitrogen losses to ground water from grazed winter forage crops are approximately two to five times greater than losses measured under pasture on equivalent soil types and landscapes[369]. These losses make a disproportionately large contribution to total farm system losses relative to the area occupied by winter forage crops**.**

Contaminant losses of sediment, phosphorous and pathogens to surface water and estuaries via overland run-off.

In general, the literature shows that sediment loads increase markedly past a 20 percent bare ground threshold. Bare ground is the main risk driver for soil loss, but is exacerbated by high rainfall, steep and long slopes, and poorly drained soils. Monaghan et al.[370] reported sediment and Phosphorus losses from grazed forage crop paddocks in South Otago that were 37 and 14-times

[368] Data from Agricultural Production Survey June 2018 (Statistics NZ 2019); https://tepuna.mfe.govt.nz/otcs/cs.dll?func=ll&objaction=overview&objid=12109939

[369] Laurenson, S., Wall, A., Monaghan, R.M. and Orchiston, T.S. 2018. Sediment losses from intensively grazed forage crops in New Zealand. AgResearch Client Report RE450/2018/044 to Environment Canterbury. 60p.

[370] Monaghan, R. M.; Laurenson, S; Dalley, D. E. & Orchiston, T. S. (2017) Grazing strategies for reducing contaminant losses to water from forage crop fields grazed by cattle during winter, New Zealand Journal of Agricultural Research, 60:3, 333-348, DOI: 10.1080/00288233.2017.1345763

greater, respectively, than estimated losses from sheep-grazed pasture. In the Manawatu, a study[371] found sediment losses were 5 to 11 times higher than pasture grazing in the previous winter.

Erosion from the bare paddocks following intensive winter grazing

Erosion modelling indicates that winter forage cropping leads to erosion equivalent to 2.6 – 3.5 percent of predicted winter sediment loads in rivers in South Island regions where this activity is most prevalent[372]. While not a significant amount in total, it can be significant at a local or smaller catchment scale.

Soil compaction and impacts on run off

IWG of forage crops is linked to pugging of the soil. In wet weather, soil compaction from pugging has high potential to cause soil damage, and when frequent and severe, impacts on subsequent land production. It also increases the likelihood of overland flow where there are high levels of soil compaction.

While there is minimal research about the connection between the level of pugging damage and how it changes levels of contamination in run-off, there is a link between winter grazing with increased losses of contaminants, especially from hill slopes, where soil is compacted as a result of pugging damage and when there is bare ground.

Development of regulatory controls

While many councils are progressing plans to give effect to the current 2017 NPS-FM, some are making better progress than others.[373] To date, only a handful of catchments have developed objectives, limits and rules. Others have developed interim regimes that at least partly address water quality issues (including intensive winter grazing on forage crops) while they carry out the full process. Implementation of the NPS-FM will be years away. A new and fairer allocation system is also at least 5 years away. Without objectives, limits and rules in place, intensive winter grazing will continue to contribute to further water quality degradation.

Limited national and regional level regulation

The use of winter forage crops has occurred in the absence of national regulation or consistent regional controls that would have managed both localised impacts of winter grazing and the more insidious contribution of winter grazing to catchment nutrient loads. At a regional level, significant variation exists in current and developing regulations for winter grazing and hill country cropping in terms of definitions, land use or discharge rules and minimum standards for management. This is likely to be partly in relation to the scale of winter forage cropping and hill country pasture renewal currently being carried out in the different regions.

While rules imposing constraints on ground-based cultivation are common across all council plans, hardly any plans have controls over hill country cropping where no-tillage aerial methods are used. In addition, only four recent plans (Gisborne, Southland, Canterbury and Wellington) regulate winter forage grazing during winter in a targeted way.

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[371] Burkitt, L., Bretherton, M., Singh, R., Hedley, M., 2016. Comparing nutrient loss predictions using Overseer® and stream water quality in a hill country sub-catchment. In: Integrated nutrient and water management for sustainable farming. (Eds L.D. Currie and R.Singh). http://flrc.massey.ac.nz/publications.html. Occasional Report No. 29. Fertilizer and Lime Research Centre, Massey University, Palmerston North, New Zealand. 9 pages.

[372] Identification of high-risk agricultural activities: national mapping of the location, scale and extent of winter forage cropping and intensive grazing on hill country land; Landcare Research 2019

[373] For information on council progress see National Policy Statement for Freshwater Management implementation review.

The Benefits of Better Management

There are a range of benefits associated with better management of grazing winter forage crops.

These include:

- better public acceptance of high profile farming practices carried out with good practice[374]
- protection for farmers and the farming industry where good practice is well articulated and widely adopted
- adopting a flexible and responsive approach to development of good industry practice that responds to changing technology and;
- adopting targeted and consistent regulatory approaches and reduce litigation.

Adoption of good practice measures can result in improved water quality. Monaghan et al. (2017) concluded that overland flow was the most important pathway of loss for contaminants, and that when critical source areas of paddocks are protected during grazing, this could decrease total estimated fluxes of phosphorous in overland flow and subsurface drainage by 67 percent, and sediment by 80 percent.[375] Where treading damage increases overland flow it can be reasonably concluded that reduction in pugging damage will also reduce contaminant loss.

Any decision to establish forage crops for grazing in situ (either as a pasture renewal system or simply to provide additional winter feed) must be done with the knowledge and understanding of the risks involved, both at establishment and during and after subsequent grazing. This information is only now being collated and research underway to determine effective mitigation measures with the development of better decision support tools.[376]

Constraints on the Analysis

There are some inter-dependencies between different elements of the NES regulatory proposals which this analysis does not take in account, such as:

- stock holding areas regulation: avoiding non-compliance with permitted activity standards for winter grazing may mean more reliance on off-paddock grazing and increase stock holding area activities (proposed new regulations and standards will ensure that where this occurs these activities are undertaken to a suitable standards of practice);
- land use change and intensification regulation: The intensification control sets a baseline for winter grazing based on crop areas from 2013-2018. The permitted level of winter grazing is currently proposed for up to 30ha. This impacts consent burdens for both councils and landowners
- stock exclusion regulation: proposals include 3m setback requirement in lowland and intensively farmed non-lowland areas. The 5m setback proposed for winter grazing takes precedence when intensive winter grazing intersects with stock exclusion activity. Timing for the winter forage crop regulations and stock exclusion may vary for the same property –

[374] Described in Good Farming Practice Governance Group (2018) The Good Farming Practice: Action Plan for Water Quality 2018 as an evolving suite of practical measures that can be put in place at a land use, sector and industry level to assist in achieving community agreed outcomes. Important to note that what is good practice will continually evolve, in tandem with new technologies and changing societal expectations.

[375] R. M. Monaghan, S. Laurenson, D. E. Dalley & T. S. Orchiston (2017) Grazing strategies for reducing contaminant losses to water from forage crop fields grazed by cattle during winter, New Zealand Journal of Agricultural Research, 60:3, 333-348, DOI: 10.1080/00288233.2017.1345763

[376] AgResearch noted that a 'ready reckoner' guide is being developed to help guide how risk practices can be identified and appropriate mitigations implemented.

where there is an overlap in the area that these regulations apply to, the shortest timeframe will apply;

- Fresh Water Farm Plans (FW-FP) regulation: and how they provide for risk assessment and identification of mitigation measures for winter forage cropping;
- the nitrogen threshold regulation proposal could also result in changes to winter grazing management in order to reduce nitrogen loss, though if relevant this would likely result in a reduction in the grazing of winter forage crops rather than an increase.

Not in Scope

The analysis does not consider:

- winter grazing of perennial crops as they are not as damaging to the soil when grazed;
- animal welfare; where stock are compelled to stand for long periods in mud or water it causes significant animal welfare problems. Animal welfare is managed under separate legislation, but improving practices for intensive grazing regimes that lead to better environmental outcomes are expected to result in better animal welfare outcomes and farm profitability.

Option assessment

Objective

This proposal's objective is to help stop further degradation and loss by constraining further contaminant discharges to waterways caused by soil erosion of intensive winter grazing in the period before councils give effect to the NPS-FM is in place.

Summary assessment

Table 2 summaries the options assessments. Each option is assessed relative to the status quo. Option 1 (status quo) is not included in the table.

Table 2: Intensive Winter Grazing– summary assessment of options

Criterion	2: Certified FW-FP	3: Minimum regulation supported by good practice	Option 4: NES with stringent 'core' standards
Effectiveness	**0**	**0**	**++**
Timeliness	**--**	**0**	**++**
Fairness	**+**	**0**	**+**
Efficiency	**0**	**-**	**+**
Principles of the Treaty of Waitangi	**0**	**0**	**+**
Te Mana o te Wai	**0**	**0**	**++**
Overall Assessment	**0**	**0**	**++**

Option 1: Status Quo

Status quo is keeping this activity unregulated over much of New Zealand until regional plans are developed to address it by 2025. Without a national intervention, this will take up to 5 years to complete. All plans may not develop targeted rules for this activity and even where they do, without

national technical standards and definitions provided through regulation, there is increased likelihood of continuing debate and associated costs of determining acceptable minimum standards. Councils may address this activity in an ad hoc and inconsistent fashion and plan processes are generally lengthy resulting in delays before this activity is consistently managed regionally and nationally.

It is also likely that the farming community will take longer to address adverse effects of intensive winter grazing as each council tackles this issue progressively. In the interim, some councils will not be able to take timely enforcement action where a landowner is not following good practice.

Option 2: Using Freshwater Farm Plans, supported by national guidance

Under this approach, IWG would be managed through a freshwater farm plan (FWFP) regime. Requirements for IWG would be determined by a farm planner, and actions to mitigate the risks of IWG would be specified in the farm plan. There would be no regulatory requirements, outside of the requirement to comply with actions in a farm plan. Using certified Freshwater Farm Plans (FW-FP) to manage IWG, supported by guidance on pugging and grazing practice would allow flexible management and support farmer-led approach to the identification and management of IWG environment risks.

Importantly, there would be a time delay until certified FWFP are ready to be implemented. This longer transition would enable councils to set up systems to manage monitoring. However, given that certified FW-FP would take several years to implement, it is unlikely that such an approach would halt freshwater degradation quickly. Additionally, Industry set standards have yet to demonstrate effectiveness to halt water degradation.

Table 3: Option 2 assessment against Action for healthy waterways criteria

Criterion	Option 2: Certified FW-FP
Effectiveness	**0-** likely effective in longer term, but unlikely to be effective at holding the line on water quality immediately
Timeliness	--Will Take time to put in place and difficult to meet 2025 halt water degradation timeframe
Fairness	+ Bespoke approach will ensure that mitigations are tailored to farm environmental issues and farm practice. Low cost option as saves on consent. Extent of cost impact will be site and farm dependent.
Efficiency	**0** Longer timeframe Relies on robust standards to inform mitigations.
Principles of the Treaty of Waitangi	**0** Delay in implementing measures to improve water quality and manage adverse effects is consistent with Treaty, if included in development and audit of the FWFP.
Te Mana o te Wai	**0** Meeting TMOTW values will be delayed until FWFP in place
Overall Assessment	**0** Time frame for implementing FWFP option won't halt water degradation. Issues with ensuring consistent compliance. Bespoke approach.

Option 3: Minimum (slope, setback and pugging) regulation in National Environmental Standard, supported by industry set good management practice standards managed through the freshwater farm plan.

This approach offers a mix of regulation and good practice. Winter grazing would be permitted if the following conditions were met:

- Slope no more than 20 degrees;
- Setback from waterways 5 meters;
- Pugging standard no more than fetlock[377].

Supplemented by good management practice standard guidance for strip grazing, protecting critical source areas, and crop cover. As part of FW-FP Consent would be required if intensive winter grazing doesn't meet the permitted activity conditions.

This option partially relies on regional plans having rules to support good practice. Good practice in this context is an evolving suite of practical measures that can be put in place at a land use, sector and industry level to assist in achieving community agreed outcomes.[378] It would see farmers encouraged or incentivised to adopt good practice by the government and national industry sector groups. It could include monitoring, auditing and reporting on performance of the good practice actions by either Council or sector organisations.

Table 4: Option 3 assessment against Action for healthy waterways criteria

Criterion	Option 3: Minimum regulation supported by good practice
Effectiveness	**0** Unlikely to have significant additional effect than status quo on how winter grazing is managed. Minimum standards for slope and setback from water will control some activity on the slope. But not enough to halt water degradation. Enforcement of voluntary measures is problematic and ensuring compliance virtually impossible where there is resistance to the good practice measures. Without regulation, there are few incentives for landowners to comply with this approach, particularly where it means costs are imposed or changes to farm practice are required.
Timeliness	**0** Unlikely to hold the line any more effectively than option 1
Fairness	**0** Some councils and landowners affected more than others. Reduced consent requirements Two of proposed regulations measurable. Pugging regulation will be challenging . Costs of such an approach are likely to fall largely on Councils
Efficiency	- Low cost option as it saves consent and (some) planning costs, but reliance on voluntary methods likely to lead to uneven management. Some farmers may have costs associated with adopting good practice. Industry sector groups are already developing good practice information about winter forage cropping but currently do not have tools to enforce compliance with minimum standards.

[377] A fetlock refers to the joint of the horse's (or other large animal) leg below the knee or hock and above the hoof. Otherwise called an ankle.

[378] Described in Good Farming Practice Governance Group (2018) The Good Farming Practice: Action Plan for Water Quality 2018 as an evolving suite of practical measures that can be put in place at a land use, sector and industry level.

Principles of the Treaty of Waitangi	**0** Need for measures to improve water quality consistent with Treaty
Te Mana o te Wai	**0** Progress towards meeting freshwater objectives and improving ecosystem health, including mauri likely to be slow. There is no evidence about levels of agricultural practice by Māori land owners for high risk activities
Overall Assessment	**0** Slow and uneven progress will be made in the management of these activities.

Option 4: National Environmental Standard (NES) (recommended option)

Under this option, national regulations would permit intensive winter grazing on forage crops subject to conditions that are based on level of risk. If the conditions cannot be met, the activity will be subject to enforcement action by councils or a consent may be required to be applied for.

A national regulation will enable the activity to continue to be carried out, but ensure it is carried out according to specified and enforceable minimum good practice[379] as permitted activity standards. These permitted activity standards look at the scale and location of the activity and have been selected as interventions that will hold the line on water degradation as they limit contaminant loss from grazing on winter forage crops and include:

a) A slope threshold (no greater than 10 degrees) impacts on the integrity of the soil;
b) A threshold for the permitted scale/size of the activity (no more than 30 hectares (ha) or 5 % of a property);
c) Setbacks from waterways (5m);
d) No stock are grazed in critical source areas;
e) The area is re-sown as soon as practicable.

Slope, setback and grazing management have been selected as the most important elements to target in comparison with other possible factors (such as restricting IWG on vulnerable soils). This is due to a need to manage erosion risk and impact mitigation. Slope and grazing management exacerbates erosion risk, while setback impacts mitigation via sediment and contaminant interception. In other words, slope, setbacks and grazing management sufficiently address freshwater polluting practices in a way which has the greatest impact and is best monitored.

These are discussed more fully in the section below.

Permitted activity Standard Conditions

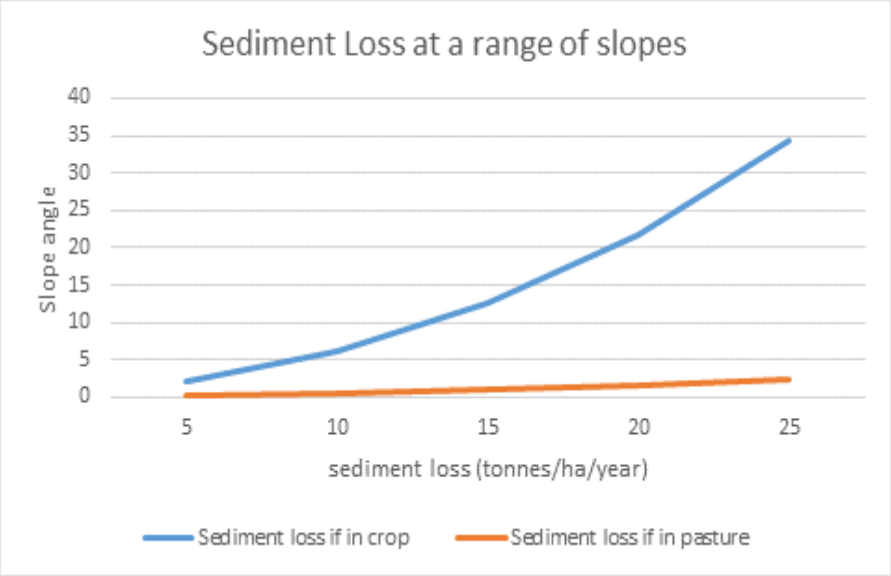
The intensive winter grazing on forage crops activity will be permitted subject to a number of permitted activity standard conditions which are described in more detail below.

a) **Slope:** The proposal requires any part of the paddock that is over the slope specified to be subject to a consent oversight because of the additional risks of contaminant loss. **As the steeper the slope the more risk of contaminant loss, especially during rain events.** Sediment losses increase at an increasing rate with slope. For example on an imperfectly drained loam soil in South Canterbury, a square 1 hectare site would lose 6 tonnes of sediment, if the slope is 10 degrees, 13 tonnes if the slope is 15 degrees and 22 tonnes if the slope is 20 degrees. Longer

[379] Good practice is an evolving suite of practical measures that can be put in place at a land use, sector and industry level to assist in achieving community agreed outcome. The standards/conditions for winter grazing are intended to be suitable for national application and are informed by industry good practice advice such as those developed by Beef+Lamb NZ. Eg https://beeflambnz.com/wintergrazing

slopes lose proportionately more sediment than short slopes, so increases in losses also tend to increase at an increasing rate as the area in crop increases. Graph One illustrates the sediment loss from a square one hectare block of winter crop in South Canterbury.[380]

Graph One: Sediment loss at a range of slopes



The regulation would have a 10 degree slope threshold as the sediment loss increases dramatically to double at 15 degrees and triple at 20 degrees. If the activity is carried out on slopes above this, a consent would be required.

Most councils have a slope or contour limit or have an erosion prone area limitation for ground-based cultivation (13 out of 16 councils). Where there are slope limits they range from 15 degrees to 25 degrees. The number of paddocks by slope for land over seven degrees is set out in Table Five.

Table 5; Number of paddocks by slope class for land over 7 degrees winter 2018[381]

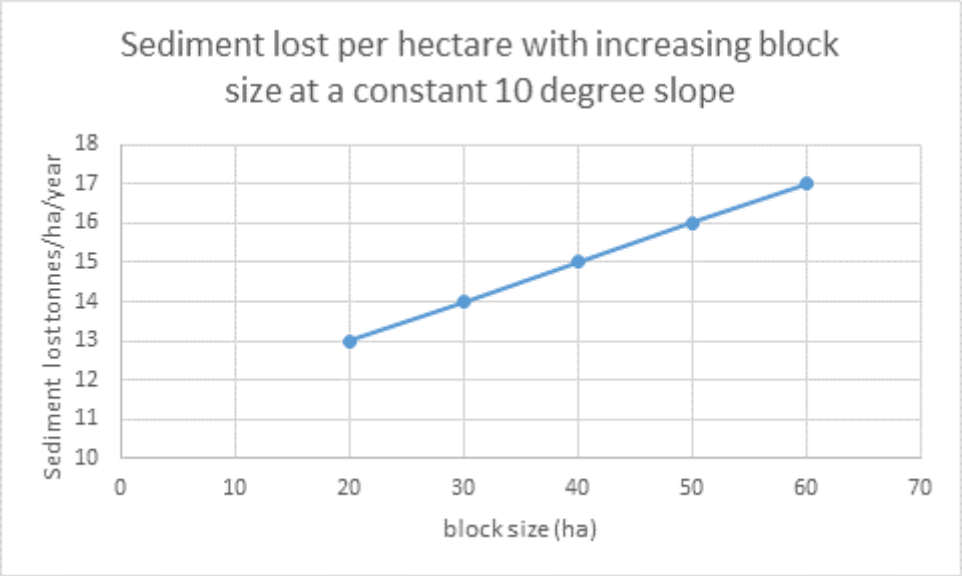
Slope class	Hectares	Number of Paddocks
7 - 10 degrees	19312	3882
10 to 15 degrees	11673	2592
15-20 degrees	1320	399
> 20 degrees	88	37
Total	42,081	9,044

[380] Universal Soil Loss Equation as the source of the estimates of sediment lost. See, Renard, K G et al (1997) Predicting Soil Erosion by Water: A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE) U.S. Department of Agriculture, Agricultural Research Service

[381] Sourced from mapping data supplied by Manaaki Whenua:Landcare 2019 on winter forage cropping 2018.

b) **Scale:** regulating the scale of the activity will limit the potential impact on soil and containment loss. Graph Two illustrates that the larger the area the greater the sedimentation loss. (Using the same illustrative site as graph one South Canterbury, loam soil, imperfectly drained, and is a square block in each case and holding the slope at 10 degrees. Increasing block size results in increasing the per hectare losses of soil and containment loss.

Graph Two: Sediment lost per hectare with increasing block size



The regulation would have a threshold of 30ha or a maximum of 5 percent per property. Table Six shows the number of properties where winter grazing is over 50ha on land over 7 degree slope is 11 with a total area of 717ha. In contrast this increases to 44 properties with a total area of 1882ha when the scale is reduced to 30ha and over.

Table 6: Number of paddocks by total area per property for land over 7degrees winter 2018[382]

Paddock Size Class	Hectares	Number of Paddocks
<10 hectares	22283	6309
10 to 25 hectares	7463	528
25 – 30 hectares	799	29
30 – 50 hectares	1165	33
50 – 100 hectares-	717	11
Total	32383	6910

[382] Sourced from mapping data supplied by Manaaki Whenua: Landcare 2019 on winter forage cropping 2018.

Further New Zealand data for brassica crops is provided in Table Seven below.[383] These totals include brassica crops grown outside the winter risk period being addressed in this proposal so numbers may be an over estimate for winter forage cropping.

Table 7: Number of properties by area of winter crop (2018 Agriculture Production Survey)

Region	Less than 5 hectares	5 to < 20 hectares	20 to <50 hectares	50 to <100 hectares	100 and over hectares	Total
Northland	63	102	21	3	3	192
Auckland	45	24	15	0	0	84
Waikato	315	471	117	33	18	954
Bay of Plenty	30	54	24	3	3	114
Gisborne	12	33	9	0	3	57
Hawke's Bay	39	165	141	30	18	393
Taranaki	276	246	18	9	0	549
Manawatu-Wanganui	261	567	165	39	15	1,047
Wellington	54	123	90	30	3	300
West Coast	30	105	33	18	3	189
Canterbury	273	834	723	366	102	2,298
Otago	141	510	408	180	99	1,338
Southland	270	747	432	84	78	1,611
Tasman	42	48	12	6	0	108
Nelson	3	0	0	0	0	3
Marlborough	12	78	12	6	0	108
Total New Zealand	**1,866**	**4,107**	**2,220**	**807**	**345**	**9,345**

All regions will require consents but the greatest consenting requirements will be in Southland, Otago and Canterbury. The maximum area on a property of 30 or 50 hectares being proposed is smaller than that included in recent Southland and Canterbury plan change processes of 100 hectares. Winter crop limit as a percentage of the property has been included in the Southland (15 percent) and Canterbury (10 percent) regional plans. The percentage area is largely based

[383] Data from Agricultural Production Survey June 2018 (Statistics NZ 2019); https://tepuna.mfe.govt.nz/otcs/cs.dll?func=ll&objaction=overview&objid=12109939

on the sheep beef sector forage crop requirements for on-farm feed production, not including dairy support and is relevant to Southland conditions.[384]

The impacts of the combination of slope and area thresholds on consenting burdens and the extent to which winter grazing varies between councils. About 80 percent of winter forage crop grazing over 7 degrees occurs in Southland, Otago and Canterbury. In addition Statistics NZ Agriculture Production Survey indicates a total of about 56 percent of winter grazing is carried out in these three regions. However, there are some indications are that winter forage cropping is also increasing in areas such as Waikato and Hawkes Bay.

c) **Setback from water bodies**: A 5m setback is supported by data that shows this distance is an effective buffer between stock and water bodies. In some cases (especially on more sloping land) a wider buffer could be more appropriate and will be assessed against regional council rules and or in the development of FW FP. The necessity for a wider setback can be considered through a resource consent where intensive winter grazing exceeds the slope threshold of 10 degrees.

This proposal does not require permanent stock exclusion, but the stock exclusion proposal overlaps in lowland areas and the more stringent requirement will apply. Depending on farm type, stock exclusion may not be required for some years. The setback required for this activity would apply immediately.

d) **Grazing management** restriction includes the protection of critical source areas from stock access and resewing bare ground as soon as practical. Costs associated with these good practice measures are expected to be low.

Good grazing management practice such as following a grazed fodder crop, with a winter-sown catch crop of oats substantially reduces soil mineral nitrogen and nitrate leaching from simulated urine patches. One research trial in Canterbury showed sequence cropping with kale/oats reduced nitrogen leaching loss by 25 – 30 percent compared with a kale only system.

Other standards conditions considered

There is currently no specific **sediment control standard**. As currently proposed, the combination of the slope and area thresholds will capture a significant proportion of all winter grazing, especially on hill slopes and will allow site specific sediment controls to be imposed via consent conditions where that is necessary.

Exclusion for **vulnerable soils.** The potential to restrict intensive winter grazing on vulnerable soils such as free draining gravelly soils or soils where tile drainage is used was considered but discounted because of the lack of robust information to map land where tile drains are used. Both poorly drained and well drained soils have contaminant loss risks associated with them. A regulation targeting either one may have the effect of pushing the activity to other potentially vulnerable areas.

Pugging has implications for both animal welfare and environmental concerns. During consultation**,** we proposed mechanisms for controlling pugging. The extent of bare land is a key risk factor in

[384] The Southland Economic Project; Agriculture and Forestry. https://contentapi.datacomsphere.com.au/v1/h:es/repository/libraries/id:1tkqd22dp17q9stkk8gh/hierarchy/Scientific%20reports/Agriculture%20and%20Forestry%20Report.pdf

relation to sediment loss. Bare land is more at risk of pugging during winter months. The number of hectares and paddocks affected in 2018 is set out in Table Eight illustrating that 4792 hectares have more than 50 percent bare land in contrast to 14,638 hectares with more than 25 percent bare land.

Submissions for the most part rejected the proposed pugging rule, on the basis that it would be impractical to monitor and enforce. Although calls for more stringency from some submitters are noted.

Table 8: Distribution of bare land for winter forage crops over 7 degrees for winter 2018[385]

Bare class	Hectares	Paddocks
< 25% bare	17,781	3580
25 to 50% bare	9810	2162
50 to 75% bare	4,051	926
75 to 100% bare	777	242
Total	32382	6910

National regulation to manage pugging damage is untested and not currently included in any council rules. There is minimal research about the connection between levels of treading damage and how it changes levels of contamination in run-off.

There is, however, evidence linking winter grazing with increased losses of contaminants (especially from hill slopes, where soil is compacted and when there is bare ground). The connection between compaction and risk of resulting run-off and the increasing risks of runoff from bare land support the introduction of some type of management for pugging damage to soil.

Controlling pugging through regulations may also drive changes to grazing management as currently there are no regulations relating to this aspect of winter forage crop grazing. This is likely to change stock management and grazing systems for some farmers as current practice can include using a forage crop paddock while protecting other pasture from treading damage and 'saving' grass for spring feed.

Based on current evidence and feedback from submissions and the consultation meetings, removing the pugging standard and managing the environmental risk related to severe pugging through the proposed standards for slope control and resewing bare ground through NES standards addresses both risk for overland water flow from slopes and manages the pugging risk at a bespoke farm level.

This approach is pragmatic and aligns with the overall recommendation to manage IWG.

Timing

The national regulation can be gazetted and take effect rapidly –and could apply as soon as winter grazing in 2020. However, as planning for winter (including seed purchase and contracting services) commences well in advance of the winter season, it is recommended that farmers be given a year (ie

[385] Sourced from mapping data supplied by Manaaki Whenua:Landcare 2019 on winter forage cropping 2018

implementation in 2021) to become familiar with the new regulations to enable them to plan ahead to meet them.

To comply with regulations, a farmer would need to:

1. Decide where they are going to carry out their winter cropping
2. Determine whether their plans meet the permitted activity threshold or not
3. Decide to adjust their plans (if possible) to comply with the threshold
4. If they do not comply, obtain a resource consent before they begin grazing stock in the area.

Council implications

Councils are able to be more stringent than the NES or develop additional discharge activity rules that might be more stringent. This approach means councils will be able to recover costs of monitoring the activity (a National Environmental Standard may empower local authorities to charge for monitoring any specified permitted activities in the standard). Compliance will be by regional councils and enforcement action may be taken or consents required.

Direct support to councils as part of the wider implementation support package for Action for healthy waterways initiatives would support this option.

Table 9: Option 4 assessment against Action for healthy waterways criteria

Criterion	Option 4: NES with stringent 'core' standards
Effectiveness	++ Likely to be effective as it is targeted to specified activities with measurable and enforceable performance measures.
Timeliness	++ Will assist in managing contaminant losses from the high risk activities and holding line against further degradation of water quality. An NES for intensive winter forage cropping allows rapid control to be developed for a high risk land use activity as it can take effect much sooner than a regional plan provision.
Fairness	+ Some councils and landowners affected more than others. Reflects pattern of winter forage cropping across NZ standards and rules for similar activities reduces inequity between and within industries. Additional consenting, enforcement and compliance costs are higher for some councils. Could be immediate impact on landowners adopting winter forage crop grazing systems Transition is part of council discretion through resource consent conditions where there are significant mitigation costs.. Extent of cost impact will be site and farm dependent.
Efficiency	+Very targeted and specific activity control through NES so likely to be efficient.
Principles of the Treaty of Waitangi	+ Development of measures to improve water quality and manage adverse effects is consistent with Treaty. Winter forage crops still able to be undertaken on Māori land, but are subject to good practice management measures to reduce contaminant losses.
Te Mana o te Wai	++ Progress towards meeting needs of values of water and improving ecosystem health, including mauri likely to be fast as regulations take effect immediately.
Overall Assessment	++ Closes regulatory gap in managing adverse effects of high risk activities including until councils set robust attribute limits. Potentially high cost for councils and some landowners offset by potential reduction in plan preparation costs and faster progress towards adoption of good land management practice. Consenting and compliance requirements may divert council action from other priority programmes or require greater resourcing. May require Councils to incorporate NES requirements into Plan rules.

Recommendation on regulatory standards for Intensive Winter Grazing

We recommend Option 4: an NES with permitted activity standards. We consider this option provides the most practical, enforceable and timely way to prevent further degradation to surface and ground water bodies from intensive winter grazing of forage crops.

Regulating intensive winter grazing now will reduce the long-term cost of complying with the NPS-FM now. It can quickly prevent uncontrolled expansion of this activity and allow councils to control the area and extent of intensive winter grazing, which will prevent further contaminant discharges from this activity.

Reducing further contaminant discharges will ensure water quality is at least maintained, and will prevent contaminant concentrations in waterways from exceeding bottom-lines. If these concentrations increase, it will impose a cost on communities to bring them back down.

Control of the adverse effects of grazing hill country forage crops may be achieved by addressing risks related to slope rather than by controlling hill country cropping *per se*. Circumstances where hill country pasture renewal does not include a forage crop in the rotation would not be captured by this approach.

In summary, the proposed regulation:

a. can be applied nationally and has an immediate effect on resource management decision making, allowing high risk activities to be addressed in a timely manner
b. provides clear direction to councils and farmers about environmentally acceptable management practices for intensive winter grazing
c. provides minimum standards, rules and activity statuses, but can allow for councils to be more stringent if the local situation requires it, reflecting local decision making where plans are already in place, including where limits are established at a local scale
d. establishes a consent requirement for high risk situations so that site specific constraints and opportunities can be addressed through conditions of the consent
e. can be monitored through mapping and satellite imagery
f. provides interim rules while councils fully implement the NPS-FM
g. will support councils and farmer with guidelines.

Options ruled out of scope, or not considered.

National Planning Standards

National Planning Standards (planning standards) are a new RMA tool that aims to standardise the structure and format of RMA plans and provide some standard content. We have ruled these out of scope as the first set of standards focus mostly on plan structure and definitions (rather than plan content), and will take up to 6 years to implement.

Central government sets interim discharge limits

In its third report in 2012 the Land and Water Forum (LAWF) recommended regional councils set interim discharge limits and targets to help manage water quality prior to the full, community-focused objective and limit setting process required by the NPS-FM.

In its May 2018 report, LAWF decided that in the current freshwater planning context, setting interim limits would be impractical when full limits are required by 2025, and that councils are better investing in the full limit setting process.

LAWF also ruled out recommending central government set national discharge limits for similar reasons. For this reason we have ruled out setting national limits (eg, via an NES).

What do stakeholders think?

Prior to consultation, we engaged with a range of stakeholder groups, including the Minister-appointed advisory groups.

Broadly speaking, these advisory groups agree there is a need to manage the contaminant generated by intensive winter grazing. However, there is some debate about the thresholds for consent and the detail of the permitted activity standards that ought to be imposed. The advisory group's commentary will be included in the consultation process.

While Kāhui Wai Māori have not commented specifically on this part of the package, this proposal does assist in protecting waterbodies from further degradation and establishes consistent and effective good practice with industry groups.

The recommended approach broadly aligns with the Freshwater Leaders Group (the FLG) recommendations for targeted management of high risk activities, though there is some debate about the optimal stringency of these standards. The FLG has supported early implementation of regulations to limit the practice of high risk land use activities. There is some debate about whether the regulations should apply as either a regional or national regulation and will be included in the discussion documents for consultation.

The FLG also sought further regulations for management of irrigation and winter grazing in some vulnerable locations. They noted that despite development of industry good practice by industry bodies, muddy paddocks during winter are seen as a normal part of farming, particularly of cattle. A change to how stock are managed on muddy paddocks will be a significant change for some farmers and stakeholder organisations.

The regional sector have concerns about the consenting burden and cost implications for ensuring compliance with the proposed permitted activity standards. They are concerned about enforceability and the clarity of definitions. They are also concerned about the information limitations in respect of the 2013-2018 baseline that will support the proposal for managing land use change and intensification. This is noted in the recommendations section where we acknowledge monitoring the level of forage cropping through regular satellite imagery.

Key themes raised in submissions on the proposals

- Regulatory standards for IWG
- Pugging standard

Managing IWG through FW-FPs is strongly supported by the rural sector and councils as a way forward and considered as an option under the theme regulatory standards for IWG. However the effectiveness of FWFP and compliance concerns are queried. This is addressed in the FWFP RIS analysis.

Drafting and definition concerns involve the wording of the draft NES, this has been considered in the review and assessment of which standards will be regulated and which are better managed as good management practice. Some submitters propose including grazing in the definition.

Implementation concerns common across the agriculture package including alignment to council plans, council capacity, consenting burden, costs to farms to make the changes and unintentional consequences have been considered at a high level in the assessment of the options for regulatory

standards for IWG. Further work is being undertaken to address these concerns in the development of the implementation work programme and cross agency work with MPI.

Submissions which highlighted the impacts on social and economic wellbeing has resulted in consideration of a longer time frame to implement the controls on this activity and development of two further options in the regulatory standards theme. Work has been commissioned to consider cultural social and economic impacts of the freshwater package and will be available March 2020.

Theme 1 Regulatory standards for Intensive Winter Grazing

Views on the proposed regulations for IWG are mixed. For some the proposed regulations are too strict (primarily beef and sheep farmers). Those submitters suggest minimum regulation for setback from water ways and the other proposed conditions be guided by good management practice. For others (primarily from the dairy sector) there is support for some level of national regulations alongside good management practice. Councils tend to support regulation as permitted activity to reduce consenting burden. Others believe that the regulations are not strict enough and will not control this practice, they suggest the need to be stricter, reduce this practice and some say prohibit this practice (ENGO and individual submitters).

Theme 2 Freshwater Farm Environment Plans

The beef and sheep sector strongly support farm plans as a tool to manage rather than regulate this practice. Most councils view the FW-FP as a tool to manage some of the permitted activity conditions.

> We consider that some of the permitted activity conditions (ie, those in 30(1) d-f.) would be more appropriately addressed through the FW-FP. – LGNZ

Theme 3 Drafting

Submitters recommend drafting changes for the proposed NES focus more on good management practice – conditions including removing pugging standard and tidy up of the timeframe for re-sowing of bare ground. LGNZ and other councils note the way the regulations are drafted, compliance will be difficult for farmers, resulting in a large number of consents.

> We are also concerned that the way the regulations are currently drafted will require a significant number of consent applications on an annual basis. For example, Regulation 30 requires crop paddocks to have consents if they cannot meet any one of the conditions for a permitted activity. Crop paddocks tend to change every year. Therefore, annual consents would be required. – LGNZ

Theme 4 Definition of intensive winter grazing on forage crops

A few query why the definition does not include all grazing in winter. An individual says all winter grazing is risky, and a territorial local authority asks for clarity.

> Many of the issues we see in Southland are a result of break-feeding on pasture, this is why 'pasture' must be included in the definition. The intensive winter grazing rules are absolutely inadequate. – Submission 193

Theme 5 Impact of regulations

Submitters comment the proposed regulations will affect farming communities' social and economic wellbeing if compliance means farming is no longer an economic proposition. Change in farming practice is also compounding the change fatigue experienced by farmers and the potential overload on farmers for consents to farm. The impact of the required changes on farmers' mental wellbeing is also noted by three submitters.

> Please remember and respect our farms are our family, life, passion, income and love for animals and nature or we wouldn't be doing this 24-7. Thank you for your time!

Theme 6 Implementation

Councils have implementation concerns, noting capacity issues to issue and manage consents, and to monitor and enforce conditions for IWG alongside other new regulations. They say the timeframe to implement the new regulations is too short and seek more time to transition. They make recommendations for tools, guidance, training, water science, mapping and datasets.

Councils also comment on enforceability and the difficulty of measuring the regulation standards.

> Some of the conditions proposed under Clause 30 for intensive winter grazing will be difficult to monitor and enforce e.g., re-sowing timeframe and the amount of pugging which will be subjective. – Greater Wellington Regional Council

Theme 7 Pugging standard

Most primary sectors and councils reject a pugging standard as impractical and unenforceable. The primary sector and some councils favour industry setting standards.

Pugging depth limits will be very difficult to assess, monitor and enforce. It is more efficient to approach this through good practice guidelines in a Farm Plan. – Greater Wellington Regional Council. Support for strict pugging standards to address animal welfare issues is voiced by environmental NGOs and some iwi.

Theme 8 Alignment with regional plans

Some councils comment on the impact on the current regional planning process to implement the NPS by 2025. This theme is common across the agriculture package.

Theme 9 Funding the change

A few submitters are concerned about the cost of compliance. Some recommend the Government provide council funding and resources to address capacity and capability. The Government should also pay farmers who give up productive land to meet setback rules. The tax payer could meet the costs, through central government. The Government needs to financially support regional councils to improve water quality otherwise this process will not work.

Theme 10 Unintended consequences

Some primary sectors believe the proposed slope regulations would reduce land available for forage cropping and inadvertently result in intensified crop grazing. This could also put farmers in feed deficit, resulting in potential animal welfare issues for farmers and additional costs to buy feed.

> [The regulations would be] indirectly encouraging farmers to grow higher yielding crops, importing more supplements and running a higher stocking rate then they normally would to stay under the proposed 10%. – Beef and sheep farmer 406

Summary table of costs and benefits of the preferred approach (Option 4)

Affected parties	Comment	Impact	Evidence certainty
Additional costs of proposed approach, compared to taking no action			
Regulated parties Consenting requirements	Approximately $3000 per consent application.	Medium (it is possible that properties just over the thresholds will reduce areas to avoid triggering consent requirements).	High

	Approximately 44 properties above to the 30ha scale threshold.[386] Approximately 3028 paddocks in 1420 properties on slopes over 10 degrees.[387]		
Regulated parties Mitigation measures	Variable mitigation costs per farm: • 5 m setback[388] and critical source areas[389] • Changes to paddock grazing management • Changes to stock feeding supplementary feed, silage etc.) • Consequential need for run-off/lease land • infrastructure construction Costs of mitigation may result in less winter forage crop grown and fewer stock (meat and milk production potential affected). Costs of mitigation may result in further intensification (higher stock numbers) to pay for mitigations. There may be additional monitoring costs.	Variable impacts low to high: • $/m^2 loss area grazed (low) • Low • Variable • Medium • High (where required) Unknown level of impact. Unknown level of impact.	• Low / medium • High • Low • Low • Low • Low • Low
Regulated parties Other costs	Increased need for permitted activity support to manage complex stock grazing and feeding and stock holding options. Consultant costs.	High impact for some farmer's Medium/low for most farmers.	Medium Medium
Regulators	Processing and staffing costs[390] for new consent requirements (much of it recoverable from applicants). Compliance and monitoring activity standards - cost recovery included current proposal.	Medium to high impact on Southland Otago and Canterbury Councils, medium/ low elsewhere. Medium to high impact.	High Medium
Wider government	Development of implementation support and interpretation materials.	Medium impact	High
Other parties	Primary industry extension services require support and development. Impacts on processing companies if meat and milk production decreases.	Medium impact Unknown impact	Medium Low
Total Monetised Cost		Medium	Medium
Non-monetised costs		Medium	Medium

Expected benefits of proposed approach, compared to taking no action

[386] Based on Statistics NZ Agricultural Survey 2018

[387] From the Landcare Satellite data Winter 2018

[388] Refer to stock exclusion RIS for details and costings

[389] The impact of this opportunity cost was not tested. One recent study (SFF Heli-cropping study) for hill country cropping estimated the value (based on live weight gains in cattle) at $3.12/m^2.

[390] Can we get additional FTE estimates as part of consultation? (costs would be recovered from industry)

Regulated parties	Associated farm production and animal health benefits. Supports good stewardship decision making and supports social licence.	Medium Medium	Medium Medium
Regulators	Less costs and litigation involved in plan preparation to manage specific activity. Consistent approach to management of activity common across NZ.	Medium Low/Medium	Low/medium Medium
Wider government	Targeted regulation to address high profile activity that support objectives for clean water.	Medium	Medium/high
Other parties	Confidence that adverse effects of targeted activities properly managed. Contribution to meeting water quality objectives supported.	High Medium	High High
Total Monetised Benefit		Medium	Medium
Non-monetised benefits		Medium	Medium

What other impacts is this approach likely to have?

The extent to which the regulations will cause increases in stock numbers, and any relationship between increases in contaminant losses from wider impacts on farm systems to off-set costs of mitigation measures is unknown (there may be stock number increases to off-set costs of infrastructure for example).

There is a relationship between winter forage crop grazing and grazing of pasture during winter (except where councils have specific winter grazing controls). The effect of intensively grazed animals on pasture may in some cases be similar to that of winter forage crop grazing, particularly if supplementary feed is being fed out in the grazed area. Some farmers choose to use a winter crop area to save pasture from pugging damage for later grazing and reduce overall pasture or soil damage.

Imposing restrictions on intensive winter grazing on forage crops will likely increase costs to farmers to meet the permitted activity standards (where those standards are not already being met), and the cost of obtaining a resource consent. Increased costs may impact on farm profitability and impact the ability to sustain jobs.

These factors could result in stress, financial hardship for farmers and their communities. However, increased demand for experts in order to advise/implement permitted activity standards could lead to increased job growth in support industries, with flow on positive effects for communities.

Improved management of environmental effects could result in improved social licence for farmers, particularly where current practice results in visually unpleasant impacts (e.g., stock in mud, visible sedimentation in rivers). This increase support from communities could enhance community cohesion, and increase feelings of environmental stewardship and responsibility.

The magnitude of these effects will likely depend on the amount of transitional time allowed for meeting the permitted activity standards and obtaining a consent.

Chapter 18: Agricultural Intensification – Update on Interim Analysis

Please note that this section should be read as an update to the corresponding section found at page 344 of the Interim Regulatory Impact Analysis (available here: https://www.mfe.govt.nz/consultation/action-for-healthy-waterways*).*

Summary of policy issue

Intensification of agricultural land-use is one factor contributing to water quality degradation. Agricultural intensification can increase the discharge of nutrients, sediment and microbial pathogens into surface water and groundwater.

In recent decades, New Zealand has experienced significant agricultural intensification. Catchments with a high proportion of agriculture and associated contaminant discharges will require some restrictions on land-use intensity to give effect to the NPS-FM and meet community-set freshwater objectives and limits. Councils are currently expected to complete this process and meet other requirements by 31 December 2025 or 2030 if they cannot complete the process to sufficient quality.

While many councils are progressing plans to give effect to the NPS-FM, some are making better progress than others, many do not yet have freshwater objectives, limits and rules in place to manage intensification. Full implementation of the NPS-FM will be 6 years away if changes to the RMA to introduce a new freshwater planning process are passed. Without objectives, limits and rules in place, intensification may continue over this period, leading to further freshwater quality degradation and ecosystem loss.

Summary of submissions on topic

The main themes from submissions are:

- Of submitters who state a preference for 'option 1' (resource consent requiring demonstration of no increases in contaminant losses)[391] or 'option 2' (resource consent requiring applicant to be above good management practice)[392] for the commercial vegetable production regulation (see table 1 in appendix 18) the majority supported 'option 2'
- The proposals do not go far enough to achieve material improvement in freshwater quality in five years – there should be a moratorium or prohibition on intensification, or rules or restrictions to reverse past intensification.
- The proposals are a form of grandparenting that rewards higher-discharging farms and unfairly restricts lower-discharging farms and underdeveloped/undeveloped land.
- The 'irrigated farming' regulation unnecessarily restricts low-discharging forms of horticulture.
- Resource consent applications will be too challenging to assess, or it will be too difficult to monitor compliance with the regulations.
- The proposals should apply to more or fewer parts of the country.

In addition, the Independent Advisory Panel (IAP) recommend:

1. Amend the irrigated farming regulation to apply only to pastoral and arable production.
2. Include clause 36, covering land use change to commercial vegetable production – go with option 1

[391] Labelled option 1 in interim RIA

[392] Labelled option 2 in interim RIA

3. Do not reduce these provisions to only apply to high-risk or highly-degraded catchments, as called-for by some submitters.
4. Add 'as relevant' to consent requirements to target only contaminants of concern
5. Do not enact a full moratorium on intensification, as called-for by some submitters.
6. Do not add a sunset clause as called-for by some submitters, as the date of regional plans coming into effect is sufficient sunset.
7. Reframe the provisions for consent conditions through this part to criteria for granting consents.
8. Allow for the use of reports rather than monitoring when complying with the criteria for granting consents.
9. Delay the enactment of the intensive winter grazing intensification provisions by 6 months to allow sufficient time for farmers to plan for the new provisions.
10. If an activity cannot meet the discretionary activity requirements it should be non-complying
11. Change the baseline period (currently farm year 2017/18) from one year to three years.

Changes incorporated as a result of public submissions

The key policy changes/decisions we propose for the intensification regulations are to:

- **Change how resource consents are issued** so that resource consents are issued only when the council considers the activity is not contrary to the NPS-FM requirement to 'maintain or improve' water quality, and will not lead to over-allocation as defined in the NPS-FM. This provides greater flexibility for catchment-level off-setting, to help reduce concerns over grandparenting.
- **Set the same resource consenting requirements for expansion of commercial vegetable production as for other activities** so that the commercial vegetable production regulation is consistent with the recommendation above. We asked for submissions on two options in the Action for healthy waterways discussion document and consider the recommended approach best meets the Government's freshwater objectives.
- **Remove horticulture from the irrigation regulation** so that these lower-impact activities are not required to get a resource consent, in line with submitter concerns that the regulations apply to too many low-discharging activities.

In addition, we propose to make some more minor drafting changes to the final NES as a result of consultation and further analysis. These include:

- Remove the requirement to have a freshwater farm plan (FW-FP) as part of a resource consent application - changes to our proposed approach to FW-FPs will mean a Government requirements for FW-FPs will not be set when the NES is gazetted.
- Extend the baseline period for changes to intensive winter-grazing from one year (2017/18) to five years (2014/15 – 2018/19), whichever is the highest extent – farm systems vary from year to year and a longer reference period will better capture this.
- Provide greater specificity around when the regulations do and do not apply to an FMU – this will maintain the current approach of applying the regulations until an FMU complies with the NPS-FM, but will be more specific about what compliance means.
- Introduce a definition for 'woody vegetation' – this will clarify that pest species are not included.

As these are minor, only substantive policy changes are considered in detail below.

Requirements for applying for and issuing resource consents

Many submissions argue the proposed approach for applying for and issuing resource consents (requiring the applicant to demonstrate that the intensification activity does not increase nitrogen, phosphorus, sediment and microbial pathogen discharges of the existing activity) is unfair and a form of 'grandparenting' that both rewards high discharging activities and locks in low-discharging activities.

In addition, many submitters argue that the proposed consenting requirements are too difficult to meet and that the impacts of existing and new activities cannot be quantified to make these assessments.

The IAP recommend changing consent conditions to include the words 'where relevant' so that councils would only need to consider the effects of an activity on contaminants that are a particular issue (eg, over-allocated) in the catchment where the proposed activity is taking place.

Below we analyse three options for consenting decisions in the intensification regulations:

- **Option 1:** *No increases in four contaminant discharges* – the consent applicant must demonstrate no increases in nitrogen, phosphorus, sediment and microbial pathogen discharges (proposed in consultation).
- **Option 2:** *Consistency with NPS-FM requirements* – it will be explicit that councils can only issue consents if the activity is consistent with the NPS-FM requirement to 'maintain or improve' water quality, and does not lead to over-allocation as defined by the NPS-FM.
- **Option 3:** *Focus only on 'relevant' contaminants* – councils would only issue consents if they are satisfied the activity will not increase discharges of contaminants that are a 'problem' in the catchment (eg, if it is over-allocated for that contaminant) (proposed by IAP).

The table below provides an analysis of each option against interim RIS criteria.

Criterion	1: No increases in four contaminant discharges (proposed in Action for Healthy waterways)	2: Align with NPS-FM requirements	3: Focus only on 'relevant' contaminants (IAP recommended)
Effectiveness	++	++	+
Timeliness	0	0	0
Fairness	-	+	0
Efficiency	-	0	-
Principles of the Treaty of Waitangi	-	+	0
Te Mana o te Wai	0	0	-
Overall Assessment	+	+	0

We recommend option 2: align with NPS-FM requirements. We consider option 2 marginally better than option 1 as it allows for more flexibility for intensification activities to go ahead if capacity to do so has been created in the catchment. This is because it takes into account changes in contaminant loads in a catchment from de-intensification.

In contrast, option 1 does not account for other activities in a catchment, and only considers the new activity relative to the existing activity on the land, meaning many land uses could be locked into their existing use until regional freshwater plans are in place. For this reason, option 2 scores better for fairness and Treaty of Waitangi principles.

We do not consider option 3 would adequately meet the Government's objectives relative to option 1 or 2. In addition, focusing only on 'relevant' contaminants is inconsistent with the NPS-FM requirements to 'maintain or improve' water quality, and therefore could send mixed signals to councils.

Commercial vegetable production

Page 65 of the *Action for healthy waterways* proposed two options for clause 36 of the NES (land-use change to commercial vegetable production):

- **Option 1:** *Operating above good management practice* – the applicant must have a freshwater module in a farm plan and must operate above good management practice.
- **Option 2:** *No increase in contaminant discharges* – the applicant must have a freshwater module in a farm plan and cannot increase nitrogen, phosphorus, sediment or microbial pathogen discharges above the enterprise's 2013–18 baseline (average for this period).[393]

Question 52 on page 80 asked which of the two options submitters prefer. The majority of submitters expressing a preference prefer option 1.

The IAP recommend adopting option 2, with modification for resource consent assessments it proposed above, on the basis that it best holds the line on water quality degradation.

We also consider two further options:

- **Option 3**: *Consistency with NPS-FM requirements* – in the section above, we recommend an alternative option for resource consent requirements. We have included this option in the assessment.
- **Option 4:** *No regulation* – a number of submitters express concern that regulating commercial vegetable production will severely impact food security and therefore it should not be centrally regulated. We have also included the status quo.

[393] These were labelled the other way around in the *Actions for Healthy Waterways* discussion document and IAP document. We are using labelling that is consistent with the interim RIA.

The table below provides an analysis of each option against interim RIS criteria.

Criterion	1: Operating above good management practice (consulted on)	2: No increase in contaminant discharges (farm scale) (consulted on, IAP recommendation)	3: Align with NPS-FM requirements	4: no national regulation of commercial vegetable production (status quo)
Effectiveness	+	++	++	0
Timeliness	0	0	0	0
Fairness	-	+	+	0
Efficiency	+	-	0	0
Principles of the Treaty of Waitangi	0	0	0	0
Te Mana o te Wai	0	+	+	0
Overall Assessment	0	+	+	0

We recommend option 3: align with NPS-FM requirements.

Under the status quo, contaminant increases from expanding commercial vegetable production will not be controlled nationally, but may be controlled by some regional councils in the future, on top of those already controlling it.[394]

Without national controls, it is likely that vegetable production will expand into areas without regionally-set controls and suitable land. Horticulture New Zealand estimate that roughly 12,000 additional hectares of outdoor vegetable growing is required to meet population growth by 2030.[395]

Options 2 and 3 come out better than options 1 and 4, largely due to scoring better on:

- **Fairness** – options 2 and 3 would impose costs on the polluter (ie, a resource consent), and is consistent with other proposed intensification regulations.
- **Effectiveness** – options 2 and 3 will provide more stringent control on new contaminants entering waterways from increased vegetable production. Option 1 still allows for some of this contamination to occur, while the status quo (option 4) will allow it to go unchecked unless regional councils choose to regulate.

We consider option 3 more desirable than option 1, for the reasons set out in the *Requirements for issuing resource consents* section above.

In selecting option 3 we acknowledge that this may come at the cost of increased vegetable prices, and that we need a longer term solution to managing the effects of commercial vegetable

[394] Waikato Regional Council, has proposed controls on expansion of commercial vegetable production in its Plan Change 1. Horizons Regional Council also has controls on nitrogen loss from commercial vegetable production.

[395] See Horticulture New Zealand's submission on Action for healthy waterways: https://www.hortnz.co.nz/assets/Uploads/HortNZ-submission-NES2.pdf

production on freshwater in order to resolve the tension between meeting freshwater objectives and ensuring on-going supply of fresh vegetables to New Zealand consumers.

Analysis indicates that there is some existing capacity to expand domestic vegetable supply at the expense of export vegetables in the short term. We estimate that about half of the land used to grow vegetables is used to grow vegetables for export. However, this is not evenly distributed across all crop types. For example, in 2018 the following crops are mostly exported:

- Squash (95%)
- Beans (79%)
- Onions (76%)
- Sweetcorn (60%)
- Potatoes (50%)

While other popular vegetables such as brassicas, carrots, kumara, lettuce and tomatoes have almost no exports, and therefore no capacity to increase domestic supply without substituting land from other crops.[396]

In order for domestic vegetable supply to continue to meet demand under option 3, it would need to substitute exports for domestic supply. For many crops, we would need to assume that land used for one crop can easily be substituted for another (eg, reduce potato production to grow more brassicas) – but this assumption is unlikely to hold as growers tend to rotate different crops in an out of areas to preserve soil health. In addition, this policy is not accompanied by any further incentives for growers to sell domestically rather than export their products, and so we cannot guarantee that substitution will happen.

Amending the irrigation regulation

Many submissions raise concerns that Clause 34 of the proposed NES (irrigated farming) is unnecessarily stringent as it applies to all irrigation, regardless of what the irrigation will be used for. They suggest the regulation be adjusted to only require resource consent for new irrigation tied to higher-discharging land uses.

The IAP recommend removing horticulture from the irrigated farming regulation by applying it only to arable and pastoral irrigation.

We consider three options.

- **Option 1:** *Retain horticulture in irrigation regulation* – this would leave the regulation as proposed. Any new irrigation would require a discretionary resource consent.
- **Option 2:** *Remove Horticulture from irrigation regulation* – this would see only new irrigation for arable and pastoral production require a resource consent.
- **Option 3:** *Apply irrigation regulation only to dairy farming* – this would see only new irrigation for dairy farming require a resource consent.

The table below provides an analysis of each option against interim RIS criteria.

[396] 2018 Fresh Facts, Horticulture New Zealand, and Plant & Food Research, https://www.freshfacts.co.nz/files/freshfacts-2018.pdf

Criterion	1: Retain horticulture in irrigation regulation (Proposed in Action for Healthy waterways)	2: Remove Horticulture from irrigation regulation (apply only to arable and pastoral, IAP recommendation)	3: Apply irrigation regulation only to dairy farming
Effectiveness	++	+	+
Timeliness	0	0	0
Fairness	-	+	--
Efficiency	-	+	+
Principles of the Treaty of Waitangi	-	+	+
Te Mana o te Wai	0	0	0
Overall Assessment	-	+	+

We recommend option 2 in line with the IAP recommendation.

While option 1 will provide greater environmental safeguards, we consider it will create economic inefficiencies by requiring resource consent for low-risk activities. In addition, we do not consider it consistent with the fairness criteria adopted for this RIA, and we consider the proposed commercial vegetable production regulation will sufficiently capture the environmental impacts of high discharging forms of horticulture.

Removing horticulture from the irrigation regulation will mean low-impact horticulture won't be impacted by the intensification regulations. It will remove a potentially overly-stringent requirement from the suite of intensification regulations. We consider this critical for ensuring the regulations target only high risk intensification activities.

We undertook a stocktake of a number of studies that assess nitrogen discharges from various types of horticulture. Information is both variable and incomplete. However, we consider there is sufficient evidence to suggest that perennial crops (particular viticulture and berry growing) have consistently lower contaminant discharges than annual crops.

Options 2 and 3 come out with similar overall scores. However, we recommend option 2 over option 3, as it scores better for fairness than option 3. The main reason for this is that option 3 would apply to sheep and beef farms as well as dairy, whereas option 3 applies only to dairy. Information on nitrogen leaching rates[397] suggest that nitrogen leaching is similar for both dairy and 100% beef farms under irrigation, so there is not a strong case to regulate only irrigation on dairy farms while not also regulating beef farms.

[397] For example, see Lilburne et. All (2010) *Estimating nitrate-nitrogen leaching rates under rural land uses in Canterbury* accessible from https://researcharchive.lincoln.ac.nz/handle/10182/3547

Chapter 19: Updating the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 to require real-time reporting of water use – Update on Interim Analysis

Please note that this section should be read as an update to the corresponding section found at page 361 of the Interim Regulatory Impact Analysis (available here: https://www.mfe.govt.nz/consultation/action-for-healthy-waterways*).*

Summary of policy issue

The preferred option in this regulatory impact analysis addresses issues around the quality and timeliness of metered water use data. Our first, main recommendation is for the increased use of telemetry. The preferred option will also help the Ministry and regional councils to improve timeliness and completeness of water use records. Improved use of these records for compliance monitoring, and evaluating how water use is influenced by metering.

The Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 established a nationally consistent regime for measuring water use. Since the introduction of the regulations data quality and timeliness has been a key issue. Missing water use records, suspicious looking totals (eg, the same amount of water reported taken every day) and tardiness of reporting from some users have all been identified as issues. These issues reduce the ability to use this data effectively for compliance, monitoring and enforcement work and for the effective management of flows in rivers and groundwater levels affected by water use. At a national level, these quality and timeliness issues compound, making it impossible so far to report on actual water use across New Zealand to date.

In its May 2018 report *Monitoring how water is used for irrigation*, the Office of the Auditor-General made four recommendations, the first of which refers directly to the data quality and timeliness issues identified above.

The Ministry agrees with the assessment of the Auditor-General and considers that the preferred option will remedy these quality and timeliness issues. The proposed option would mandate electronic transmission of data (telemetry) for all water take consents captured by the current Regulations.

Specifically, it would require that the Regulations be amended to mandate that:

- measurements of water takes must occur every fifteen minutes (or daily via written council approval);
- water take records be kept in a form suitable for electronic transmission and storage;
- consent holders must provide daily electronic continuous records to the council that granted the consent; and
- daily electronic continuos records must be provided to the council no later than one day after the end of the day in which the water was taken.

In addition, the requirement for daily electronic record transmission would be staggered, being required for consents of 20 l/s or more two years after the Regulations come into force; required for

consents of 10 l/s up to 20 l/s four years after the Regulations come into force; and required for consents of 5 l/s up to 10 l/s six years after the regulations come into force.

Summary of submissions on topic

Submissions raised the following issues and themes:

1. **Overall support, in full or in part, for the proposed changes**
   There is a general theme of support for the changes, with very few submissions opposing the changes in principle. Some support was emphatic, while partial support was due to the costs or logistical challenges of implementing telemetry.
2. **Cellular coverage to enable telemetry is patchy across New Zealand**
   A significant range of submitters, particularly individuals, expressed concern about a lack of suitable cellular coverage in their area making detailed telemetry difficult or impossible
3. **Cost of implementation**
   A wide range of submitters were concerned about the cost of implementation, especially for farms with a number of water takes, those with older metering equipment that would be difficult to retrofit with telemetry, and those with unreliable cellular coverage meaning other options (such as Satellite Internet) would be required.
4. **Exemptions from telemetry requirements**
   A small number of submitters, because of concerns about the cost and/or the logistics of installing and maintaining telemetry, requested exemptions from the proposed requirements. In particular, submitters would like this to be at the discretion of Regional Councils.
5. **Telemetry alone not solving the data quality issues presented**
   A subset of submissions pointed out that without good council systems, quality control and goods system design, telemetry can still produce low-quality data.

Changes incorporated as a result of public submissions

Submitters noted that telemetered meters cost approximately $1,700 per unit, this is at the upper end of our data which currently puts the cost of telemetry installation and calibration at between $600 and $1800 per telemetry unit for users with current 3G/4G cellular access. Monthly data charges are $20 -$30 on average. We estimate that 8,000 to 9,500 users with cellular coverage will need to install units.

We estimate costs of approximately $1350 per user for an upper-quartile cost telemetry unit, or $270 per year over 5 years this is approximately $300/year per user. The upper bound estimate is $570 per annum for 8750 users which gives annual costs of approximately $5 million for telemetry using cellular technology.

There are an estimated 2,000 – 3,500 users with insufficient cellular coverage who will need to install a satellite internet based system. With almost guaranteed coverage satellite internet represents the upper end of costs for water users. Currently satellite internet costing $1499 to install and $99 monthly for data. The conservative assumption is that this only applies to the meter, though this is unlikely. We estimate the cost per user to be approximately $1350 per user for an upper-quartile cost telemetry unit, or $270 per year over the 5 year life of a unit. The upper bound estimated cost of $1758 per unit for 2,750 users equals approximately $4.8 million in costs annually.

These figures give a conservative upper bound estimated total cost to water users of $14.3 million annually. This equates to approximately $300 per year per unit per user.

Analysis to date shows there is a clear trend that the costs of meters, telemetry units, data transmission and storage are falling, often quite rapidly. Uptake of telemetry also appears to be increasingly driven by councils at consent renewal, but it is not clear if the quality of this telemetry would meet the requirements of the preferred option. This dynamic operating marginal costs to users and councils are unclear. As a result, this analysis adopts conservative estimates based on all consents, instead of those not already telemetered. In addition, our estimate of the number of users not currently covered by cellular network (and so requiring more expensive options like wireless or satellite internet to meet the proposed option) is particularly cautious.

Experience from councils show that data quality and timeliness is a key issue. Missing water use records, suspicious looking totals (e.g. exactly the same amount of water being taken every day) and tardiness of reporting from some users have all been identified as issues. These issues reduce the ability of councils to use this data effectively for compliance, monitoring and enforcement (CME) work and for the management of minimum flows in rivers and groundwater levels affected by water use.

Telemetered data has the ability to be queried and checked for errors in near real-time. These data are able to audited in a way that manual records are unable to be. In addition, telemetered data is by nature more timely than manual reporting. The metered data is sent automatically, rather than requiring a water user to physically check the meter, then send the record of the amount metered. We estimate telemetry will save water users on average 30 minutes a week in checking and sending water use records to their council.

This improved quality and timeliness increases the confidence in the data, which in turn means it can be used for a much wider range of purposes. For councils and central government, it can be used for increased compliance monitoring, improved resource limit setting, environmental policy setting, and state of the environment reporting. Regional councils already incur significant costs in compliance visits to water meters and management of water use data. The provision of real time data will allow councils to focus on breaches of consents in real time rather than using past data. It is understood from regional councils with extensive use of telemetry that this option provides the most benefits in terms of:

- water use efficiency
- setting allocation and low flow restriction policies and operational practices.
- efficient use of council resources, particularly regarding compliance, monitoring and enforcement.
- greater ability for integrated surface and groundwater management.

For water users, applications like enhanced irrigation scheduling can occur when used in conjunction with real-time soil moisture probes. This can reduce electricity costs from pumping water, prevent over-irrigation of land (and so reduce nutrient leaching), and save the water user from using their allocation up when not required. This last point is especially important for irrigators with weekly or monthly consented water use limits, as it may enable them to irrigate on days where they would have normally run out of water, having met their limit earlier in the week or month.

We are recommending the mandatory daily electronic transmission of data for all water take consents captured by the current regulations (that is consented water takes over 5 litres a second). As these requirements bed in and better data becomes available we are open to investigating whether or not the requirement for telemetered metering should be applied to smaller consented water takes.

Chapter 20: Excluding stock from water bodies

This section replaces the corresponding section on pages 378-404 of the Interim Regulatory Impact Analysis: Part II, detailed analysis (available here: https://www.mfe.govt.nz/more/briefings-cabinet-papers-and-related-material-search/regulatory-impact-statements/interim*).*

Context for the policy issue

In November 2015, the Land and Water Forum responded to the then Government's request to provide recommendations on the design of a stock exclusion regulation.[398] The Government consulted on proposed regulations for stock exclusion in early 2017.[399] Ultimately, the regulations were not progressed because of concerns from the primary sector about the workability of the regulation, mainly in respect of the three slope categories, how they were assessed, and how they applied to various stock and waterbodies.

In 2018, the current Government announced its freshwater reform programme, Essential Freshwater, and signalled that stock exclusion would again be considered as a core mechanism to improve fresh water.

In 2019, the Waitangi Tribunal released its stage 2 report on the National Freshwater and Geothermal Resource Claims (WAI2358) in which it recommended that "National stock exclusion regulations should be promulgated urgently".[400]

The problem

The poor and degrading state of water bodies in terms of sediment, nutrients and *E. coli* (an indicator for the likely presence of pathogens) is described on pages 6 to 9 of the Interim Regulatory Impact Analysis: Part I Summary and Overview.[401]

Livestock entering water bodies contaminate the water directly, and damage the banks of the water body. This is particularly serious with heavy livestock (cattle and deer) and pigs (see photo 1 below).

Stock excreta contains disease-causing organisms that can present health risks to people in contact with the water, and nutrients that promote weed growth and decrease the waterbody's ability to support a healthy ecosystem. Stock also trample and pug the banks and beds of water bodies increasing streambank erosion and sediment runoff and adversely affecting habitat including for fish spawning.

These environmental effects have significant social, cultural and economic impacts. New Zealanders value being able to use water bodies for recreation and mahinga kai (food gathering), and stock access to water bodies compromises the mauri of those water bodies. Declining water quality in dairy catchments and stock in rivers has created a negative perception of the primary sector industry among the New Zealand public, and it spurred the development of the Dairying and Clean Stream Accord launched in 2003.[402] Some of New Zealand's international markets for primary produce are now demanding higher environmental standards.

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[398] Land and Water Forum (2015). The Fourth Report of the Land and Water Forum

[399] Ministry for the Environment (2017). Clean water: 90% of rivers and lakes swimmable by 2040. (www.mfe.govt.nz/publications/fresh-water/clean-water-90-of-rivers-and-lakes-swimmable-2040)

[400] Waitangi Tribunal (2019). Stage 2 report on the National Freshwater and Geothermal Resource Claims. (section 7.7.6, page 562)

[401] Available here: www.mfe.govt.nz/more/briefings-cabinet-papers-and-related-material-search/regulatory-impact-statements/interim-0

[402] Holland, Phil. The dirty dairy campaign and the clean streams accord. Lincoln planning review 6(1-2) (2014) 63-69.

Photo 1: Example of stock damage to a river bank in the Kaipara catchment, Northland, August 2016 (photo: Millan Ruka)

The status quo

Regional rules

Regional plans have stock exclusion requirements but these are highly variable in scope and effectiveness (see Table 2). Of the sixteen regional councils, 12 have current or proposed stock exclusion rules that require resource consent for stock access. Where councils do have these types of rules, they often only apply in certain places or situations (e.g. priority water bodies only).

Some councils take an effects-based approach whereby stock access is a permitted activity subject to conditions that specified adverse effects on water bodies do not occur. For example, in Otago this includes a noticeable change in the clarity or colour of the water. Some councils, for example Canterbury, use both rules requiring consents and effects-based rules depending on the values/priority of the water body.

Relying on compliance with permitted activity conditions requires the council to have a comprehensive monitoring programme. Council costs of enforcing breaches of regional rules can be recovered from the stock owner.

Table 1 Regional breakdown existing regional rules and proportion of major streams fenced

Region	% of major streams fenced	Regional rules applying
Auckland	64.2	Intensive stock excluded by 2021 for lakes, wetlands and permanently flowing rivers/streams, and 2026 for intermittent rivers/streams (operative).
Bay of Plenty	83.3	Priority water bodies (operative)
Canterbury	62.2	Intensively farmed stock and priority areas (operative)
Gisborne	28.7	Winter intensive grazing by 2017 (riparian setbacks also required) (proposed)
Hawke's Bay	45.1	Stock access is a permitted activity subject to performance conditions (except for Tukituki catchment where stock must be excluded by 2020) (operative)
Manawatu-Whanganui	62.2	New intensive farming or existing intensive farming in priority areas (operative)
Marlborough	33.5	Intensively farmed stock, by 2022 (proposed)
Nelson	--	Stock access is a permitted activity subject to performance conditions (operative)
Northland	71.4	Dairy cows and pigs from streams >1m (from stream <1m by 2023). Beef cattle, dairy support and deer from lowland rivers and wetlands from 2025 (from streams <1m by 2023). From lakes >1ha now (proposed)
Otago	47.5	Stock access is a permitted activity subject to performance conditions (operative)
Southland	75.9	Current rules: Winter intensive grazing and priority water bodies (in force) Dairy cattle (on milking platforms) and pigs from rivers >1m by 2017 (<1m by 2020). Dairy support, beef cattle and deer by later dates varying by land slope and stocking rate (proposed)
Taranaki	77.3	Intensively farmed stock, by 2020 (riparian planting also required) (draft)
Tasman	59.0	Stock access is a permitted activity subject to performance conditions (except at Te Waikoropupū Springs where stock access is a non-complying activity) (operative)
Waikato	79.8	Priority water bodies (in force) Cattle, horse, deer and pigs from all rivers and drains that continually contain water (various commencement dates). Setbacks 1m to 3m depending on slope
Greater Wellington	51.6	Cattle, deer and pigs excluded from rivers >1m wide (containing water) from 2022 (proposed)
West Coast	64.6	Stock access is a permitted activity subject to performance conditions (except for Lake Brunner catchment or scheduled wetland). Stock exclusion is required in association with some land development practices) (operative)

Industry agreements

A significant amount of the impact stock have on water bodies is on the smaller streams, which are not generally addressed by industry agreements, but which flow into the larger streams and convey the majority of contaminants overall.[403] Stock exclusion requirements are also in some primary sector agreements (see Table 2 below).

[403] Mcdowell et al 2017. Assessing the yield and load of contaminants with stream order: would policy requiring livestock to be fenced out of high-order streams decrease catchment contaminant loads? Journal of Environmental Quality, 46(5) 1038-1047.

Table 2 Summary of key industry initiatives

Industry/initiative	Commitment	Progress
Dairy - Sustainable Dairy Water Accord **Most New Zealand dairy companies are signatories to the Accord meaning it applies to over 90 percent of dairy farms.**	Exclude 100 percent of dairy cattle (on milking platforms) from permanent waterways over 1 metre wide and 30 centimetres deep, and regionally significant wetlands, by 2017.[404] Applies to dairy cattle grazing on all land owned or leased by the dairy farmer (include land beyond the milking platform) but land of a third party used for dairy grazing remains excluded.	DairyNZ reports that by 2017 97.2 percent of 'Accord' water bodies (24,744km) had been fenced. In addition, Fonterra reports that at least 10,900kms of 'non Accord' streams and drains (waterways smaller than captured by the Accord) on its supplier dairy farms have been fenced.
Drystock and Deer	*Stock exclusion promoted through Land environment plans*	The *Survey of Rural Decision Makers* (Brown, 2015; SRDM) reported approximately 52 percent of sheep and beef farmers (of the respondents) had fenced all streams over 1 metre wide in 2015, with 77 percent having installed some fencing. Of deer farmers responding to the survey, around 54 percent had fenced all streams over 1 metre wide, with 89 per cent having fenced some streams over 1 metre wide. The 2019 SRDM (Brown et al 2020, forthcoming) highlights increased uptake from 2015, with 665 respondents indicating they have fenced on average 85% of large streams on their properties and 73% of small streams. These values are self-reported and not independently verified.

Farmers' practice

Achieving a high uptake of stock exclusion voluntarily is difficult because the costs and benefits are borne by different parties; farmers bear the costs (installing fences, bridging streams, and providing alternative drinking water supplies) while the benefits are mostly public goods (that is, benefit all water users and the wider public).

In areas where there are no stock exclusion rules, or rules do not apply to their farm, many farmers are choosing not to exclude stock. The 2015 Survey of Rural Decision-makers included information on the reasons farmers do not exclude stock from waterways. Common reasons included lack of finances, perceptions that there are not significant environmental benefits, and perceptions that costs are greater than the benefits. However, more farmers who fenced their streams reported a positive effect on farm performance than the expected effects estimated by those who had not fenced their streams.[405]

For individual farmers, the status quo presents some costs and lost opportunities, which can affect the farm's profitability. Stock prefer to drink clean palatable water and will drink more from water

[404] Milking platforms are areas of a dairy farm where cattle are kept on a daily basis during the milking season.

[405] Landcare Research, Survey of Rural Decision-makers www.landcareresearch.co.nz/science/portfolios/enhancing-policy-effectiveness/srdm/srdm2017/summary-of-results-2017

troughs, with associated gains in productivity, than from streams.[406] Unfenced rivers can also result in stock losses through drowning (particularly new born and young stock).

Conclusion

Regional stock exclusion requirements and industry approaches to achieve stock exclusion have variable success across regions and primary sectors.

Except where there are strong industry drivers (such as the Sustainable Dairy Accord) or regulatory requirements (such as in Canterbury) there is relatively low uptake of stock exclusion practices, and stock entering water bodies continues to be a pressure on water quality and the ecosystem health of freshwater bodies. Most costs of stock entering water bodies are borne by the public (in terms of increased health risks, denial of the ability to fully use water bodies for recreational or cultural use) and by ecosystems in terms of degraded habitat.

Feedback on the 2017 stock exclusion proposals

In the 2017 consultation on stock exclusion[407], there were 4251 submissions on the proposed stock exclusion regulation, representing the views of 6038 people (some campaign submissions presented collected views of supporters). Submissions raised eight key themes: timeframes for implementing the regulations, assessing land gradient or slope, types of stock, types of waterbodies, alternatives to exclusion, fines, stock crossings, and setbacks.[408] Officials reflected the themes and content from the 2017 consultation in the development of the stock exclusion proposals for Action for healthy waterways.

Policy objective

The objective of the policy is to halt, as quickly as is feasible, current and future degradation of freshwater caused by livestock accessing water bodies.

Design of a stock exclusion regulation

The variables considered in designing the scope and nature of stock exclusion regulation include:

- What **water bodies** should the regulation apply to
- What **intensity** of activities should be regulated
- What **terrain** should the regulation apply to
- What **stock** should be excluded
- Should **setbacks** be required
- What **timeframes** should be provided to allow farmers to implement the regulations
- What type of regulation (national environmental standard or section 360 of the RMA)?

Water bodies – Lakes, rivers, intermittent streams, and drains

There is little doubt about the value of excluding stock from lakes, wetlands, and large rivers (>1m wide, as in the Sustainable Dairying: Water Accord). However, smaller streams and intermittently flowing streams often have not been targeted for stock exclusion by industry initiatives or regional rules though they account for an average 77% of the national nutrient load of the total river

[406] Beef and Lamb Fact sheet, July 2018, Stock exclusion – managing stock around waterways. Available at https://beeflambnz.com/knowledge-hub/PDF/stock-exclusion-managing-stock-around-waterways

[407] New Zealand Government 2017. Clean water: 90% of rivers and lakes swimmable by 2040

[408] Ministry for the Environment, May 2017. Analysis of submissions and recommendations on the proposed stock exclusion regulation.

catchment.[409] That may be changing as Table 1 above indicates - see Southland, Waikato and Canterbury plans.

Lack of stock exclusion on smaller waterways is largely because of the increase in scale associated with excluding stock from smaller and intermittently flowing streams, which increases the cost. Auckland Council, for example, estimates there are 16,500 km of permanent rivers in the Auckland region, and a further 11,590 km of intermittent and ephemeral rivers. However, small streams and intermittent streams can have very high biodiversity values (being critical for certain life stages of certain species), often greater than those in larger streams.

There are also issues of practicality to consider. Intermittently flowing streams can contain water for much of the year, and during that time, stock access represents a considerable risk to values. Not including small and intermittent streams would mean that any national regulation is only partially addressing the problem. Furthermore, it can lead to implementation and interpretation challenges.

Drains can be a major source of contaminants into natural water bodies. They can take a variety of forms and in some landscapes may be indistinguishable from modified (channelised) natural rivers (a modified watercourse is included in the Resource Management Act's definition of "river"). Some drains, however, are shallow and only contain water after heavy rain events. It will generally be impractical to exclude stock from those shallow drains.

Although there is little data on existing fencing of drains, a common practice in many landscapes is for drains to form the boundaries of paddocks and for at least one side to be fenced. Where banks are highly erodible and drains are critical to pasture management, both sides of drains are commonly fenced to protect the integrity of the drain. However, there are many thousands of kilometres of drains that are currently unfenced.

Drains are included in regional stock exclusion rules over much of Canterbury and in the Waikato River catchment.

Water bodies to include – wetlands

Some wetlands such as peat bogs, or those where native vegetation is dominant (or strong seed banks exist), are best left un-grazed to encourage native regeneration and avoid the introduction of pest plants. When undertaken with care, grazing can be a pragmatic way to control introduced grass swards over large areas. Some rare plant communities can benefit from very light grazing to control introduced grasses; others are best left un-grazed. Where a wide range of exotic species are well established throughout the wetland, grazing may be justified. Without management, these species can invade the ephemeral wetland zone and result in loss of native wetland plant species. Introduced plants can also become a hindrance for public access and enjoyment of waterways.[410]

Terrain

For stock exclusion regulatory development to date, terrain as defined by land slope has been used as a proxy for likely intensity of land use. However, specific intensive farming practices including fodder-cropping, break-feeding, and grazing of irrigated pasture can be undertaken on land of higher slopes as well. Terrain and activity intensity combine to produce the environmental risk profile of stock exclusion access to waterways.

[409] McDowell et al 2017. Assessing the yield and load of contaminants with stream order: would policy requiring livestock to be fenced out of high-order streams decrease catchment contaminant loads? Journal of Environmental Quality, 46(5) 1038-1047.

[410] Otago Fish and Game submission to Healthy Waterways October 2019.

Riparian setbacks

There are multiple potential benefits from providing a setback from the streambed when stock exclusion is in place. These include:

a. Prevention of de-vegetation, trampling and pugging near the river, thus further reducing soil loss and sediment inputs compared to fencing alone.

b. Allowance for some natural movement of stream channels without loss of effective stock exclusion.

c. Fences are less likely to be damaged by flooding.

d. Filtration of overland flows, and slowing the velocity of flow (allowing for greater deposition) reducing inputs of sediment and contaminants directly to water. Even a dense grass sward can be an effective filter.

When setbacks are planted there can be additional benefits including:[411]

e. Uptake of excess nutrients from surface and subsurface flows.

f. Increased organic matter inputs to streams (via leaves and woody debris), increasing the diversity of both food resources and habitats/refuges for aquatic life.

g. Vegetation providing shade, which keeps water temperatures more stable, providing a more suitable environment for aquatic species, including fish and invertebrates.

h. Shade also reduces growth of algae in water bodies. Some freshwater algae (cyanobacteria) can be toxic to humans, pets, livestock and wildlife. Algal mats also reduce light penetration and oxygen concentrations, reducing the life-supporting capability of fresh water.

i. Habitat and refuges for aquatic life (invertebrates and fish). Stable, vegetated banks offer a greater range and quality of habitats (and refuges) for aquatic life.

j. The use of setbacks to support farm income, for example honey production.

The realisation of these benefits, however, is dependent on the local circumstances. For example, the effectiveness of buffers in sediment interception depend on a range of site-specific biophysical factors including the steepness of adjacent land (and banks), rainfall and soil drainage[412]. This makes setting a nationally consistent buffer width that is equally effective everywhere challenging. Most research on the benefits of buffers has been undertaken on setbacks of at least 5m. While wider buffers do generally offer greater benefits, that does come with significantly greater costs.

Setbacks and their effectiveness in reducing sediment delivery to waterways

Excluding stock from waterways with an associated setback buffer reduces sediment input to streams by reducing streambank erosion, reducing surface erosion near the stream, and intercepting sediment from overland flows.

Streambank erosion

[411] Daigneault et al 2017. A national riparian restoration programme in New Zealand: Is it value for money? Journal of Environmental Management. 10.1016/j.jenvman.2016.11.013; McKergow et al 2016. https://doi.org/10.1111/emr.12232

[412] Zhang et al 2010. A Review of Vegetated Buffers and a Meta-analysis of Their Mitigation Efficacy in Reducing Nonpoint Source Pollution.

Streambank erosion is a significant, highly variable, and poorly understood component of overall suspended sediment loads in New Zealand catchments. It is particularly problematic as a cause of fine sediment deposition in streambeds, which has significant negative ecological impacts. In the flat lowlands, streambank erosion is the most important erosion process.

A Waikato study[413] reviewed quantitative estimates of bank erosion's contribution to suspended sediment loads, and it found that the contribution ranges from nearly 0% to 100% (see Table 3 below). The same study concluded that bankside erosion contributes approximately 60% of the sediment in Waikato tributaries.

Regional-scale erosion modelling using SedNetNZ estimates that, on average across catchments in Hawke's Bay, Waikato, Northland, and Manawatu-Whanganui, streambank erosion contributes 18% of total suspended sediment loads[414].

Table 3 Estimates of bank erosion to catchment sediment yield

Proportion of bank erosion to catchment sediment yield (%)	Location	Study
~ 60%	Mangaotama Stream, Waikato	De Rose (1999)
0 – 100 %	Waiokura catchment, Taranaki	McDowell and Wilcock (2007)
28%	Pohangina River, Manawatu	Rosser et al. (2008)
~1%	Waipaoa River, East Coast	De Rose and Basher (2011)
64% and 94% (2 sites)	Waituna catchment, Southland	McDowell et al. (2013)
>90%	Kopurererua Stream, Bay of Plenty	Hughes and Hoyle (2014)

Reduced surface erosion and delivery to streams

Riparian setbacks influence near-stream erosion and sediment transport processes. Pugging and de-vegetation of riparian margins, a common result of stock access to waterways, cause bare soil, soil compaction, and other problems that increase erosion and sediment delivery. A recent continuous simulation study[415] using observed precipitation rates and 15-minute time-steps estimated that land with a slope of 10% (approximately 6 degrees slope) and 25% bare soil had, on average, 10 times greater sediment generation compared to land with full pasture cover.

Multiple studies have assessed the effectiveness of livestock exclusion from streams in reducing streambank erosion[416] and delivery of sediment to streams. These studies show variable effectiveness of buffer zones in intercepting sediment, though they are consistent in showing small increases in sediment interception beyond 15m of setback width.

[413] Hughes, A. 2015 Waikato River suspended sediment: loads, sources, and sinks Information to inform economic modelling for the Healthy Rivers Wai Ora Project. May 2015.

[414] Dymond JR, Herzig A, Basher L, Betts HD, Marden M, Phillips CJ, Ausseil A-G, Palmer DJ, Clark M, Roygard J 2016. Development of a New Zealand SedNet model for assessment of catchment-wide soil-conservation works. Geomorphology 257: 85–93

[415] Paradigm and Morphum (2019) Effect of Annual Variability and Land Disturbance during Construction on Predicted Sediment Yields. Continuous Simulation of Land Development Scenarios.

[416] E.g. Hughes, A. 2016. Riparian management and stream bank erosion in New Zealand, New Zealand Journal of Marine and Freshwater Research, 50:2, 277-290, DOI: 10.1080/00288330.2015.1116449

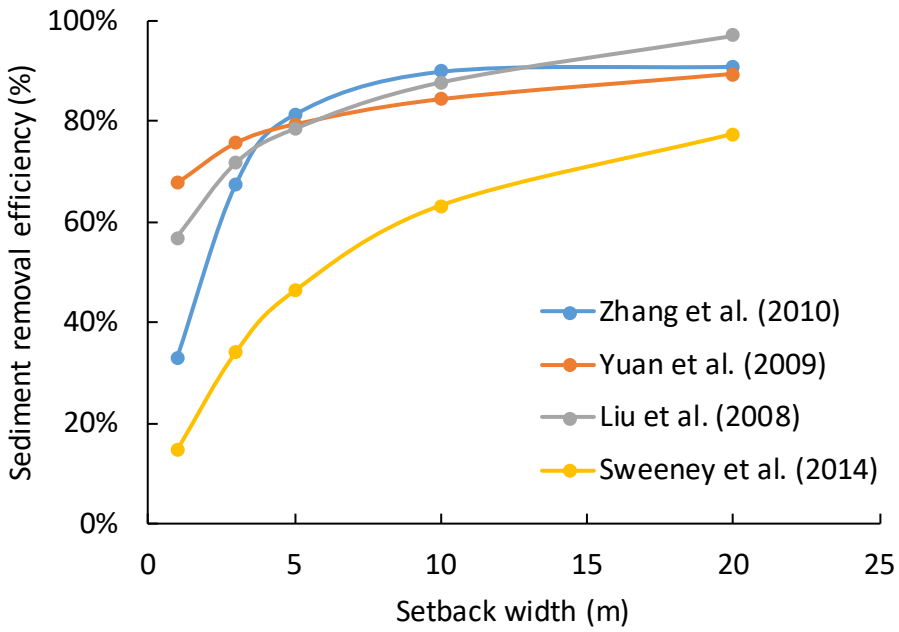

Figure 1 Sediment removal in relation to stream buffer width (comparison of 4 meta-analyses)[417]

Planting the setback area

Maximising the benefits of riparian planting depends on local circumstances. Larger planted buffers can be highly desirable to achieve freshwater ecosystem and biodiversity outcomes. Studies[418] have shown a clear correlation between riparian planting and ecosystem health (as measured by MCI). However, the most appropriate planting will depend on the particular risk sought to be addressed or objective sought to be achieved (for example, shading smaller streams to reduce water temperature, or intercepting sediment). A fenced stream in an open paddock removes the direct impacts of stock on the stream, but may not mitigate the effects of nutrients and sunlight (see photo 2 below).

Photo 2: Lake Brunner catchment, West Coast (MfE)

[417] Semadeni-Davies, A; Haddadchi, A; Booker, D. (March 2020). Modelling the impacts of the Draft Stock Exclusion Section 360 Regulations on river water quality, E. coli and Sediment. Figure D-1, page 66. Niwa client report 2020052AK

[418] E Graham, C M Jones-Todd, S Wadhwa, R Storey, Analysis of stream responses to riparian management on the Taranaki ring plain. NIWA 2018

The initial costs of riparian planting can be very high. Typical native planting costs around $3.70 per metre for a single row of plants. For a 1 km length of stream, where just two rows of native planting are required on each side, the cost is estimated to be around $14,700. In addition, the riparian buffer will require on-going maintenance (weed control and replacement of lost plants) at least until the plants are established. Buffers up to approximately 10 to 15 metres wide are less likely to need long term-going weed control than narrower buffers because once they are established they become self-sustaining. Farmers will need to consider these factors at the farm scale and decide where to invest in wider buffers because they will be very expensive to establish over long distances.

Modelling suggests riparian planting effectively doubles the cost of stock exclusion fencing of even a modest 5m setback for a typical Waikato dairy farm (adding $90,727) and more than doubles the cost on a sheep and beef farm ($138,970). [419]

Implementation timeframes

There is need for some flexibility in timeframes for different stock types to comply with the stock exclusion requirements reflecting what is feasible for each sector, given the amount of work left to do and the costs and practical constraints for different farm types.

The industry reports 97% compliance with industry targets for the exclusion of dairy cows (excluding third party grazing). The pork industry is similarly well progressed with regards to stock exclusion, so a deadline of 12 months after gazettal of the regulation has been assessed as achievable for rivers and streams >1m wide. However, there is a lot of work left to do for beef cattle and deer, and the costs for individual farmers are likely to be higher due to the (generally) larger size of these farm types. Extending exclusion to streams <1m wide would significantly increase the task.

Timeframes would enable those farmers who have not planned to exclude their stock to budget and plan for the necessary work, and would provide them the ability to spread the costs over time. Extending implementation timeframes also reduces costs. Giving achievable timeframes has the benefit of being more feasible and being likely to achieve a higher rate of compliance.

The stock exclusion proposals consulted on in 2017 proposed short timeframes (2017 to 2019) for compliance for pigs and dairy cattle on the plains, with longer timeframes (2022 to 2025) for beef cattle and deer, and for all stock in the hill country. This staging of requirements would provide a lead in time for farmers to plan for the requirements (e.g. book fencers, start on a farm plan).

Designs of regulatory approaches and options

Many different permutations of all the variables described above are possible. The assessment of options not considered, ruled out of scope, and recommended prior to consultation is reported in the interim RIS (pages 382-383; 390-395) and not repeated here.

There are two regulatory instruments available under the RMA: national environmental standards can require specified activities to be undertaken in accordance with specified standards or in accordance with resource consents, and section 360 regulations can prescribe requirements to exclude specified stock from water bodies. A section 360 regulation can apply to any stock access immediately, regardless of any existing use rights, or compliance with regional rules. No consent is required, meaning there is no administrative cost for applying for and assessing a land use consent (as there would be for a national environmental standard).

[419] Journeaux, 2019. Modelling of Mitigation Strategies on Farm Profitability: Testing Ag Package Regulations on-Farm.

Stakeholder views prior to consultation

Prior to consultation, the Ministry engaged with a range of stakeholder groups, as well as the Minister-appointed advisory groups (Kahui Wai Māori, Freshwater Leaders Group, and the regional sector water sub-group). The feedback generally reflected widespread support in principle for national intervention on stock exclusion.

Kahui Wai Māori supported the proposal, with concerns that the flexibility provided by freshwater modules in farm plans (or other means) may undermine the policy. The group noted the importance of compliance monitoring.

Freshwater Leaders Group supported national intervention on stock exclusion that would go further than existing industry initiatives. It questioned aspects of the proposal (including both the proposed carrying capacity threshold and a 5m setback, suggesting the latter may not be appropriate for all situations). Freshwater Leaders Group also suggested that setbacks should be required to be planted. Any grand-parenting of existing non-compliant fencing (fencing that does not provide for a setback) was opposed.

The regional sector water sub-group strongly supports national regulation of stock exclusion. However, it considers that where stock are already excluded but the required setback has not been provided, landowners should not be required to shift fences (unless required by a regional plan or a freshwater farm plan). The sub group also questioned whether 5m is justifiable in all situations. The group raised questions about the difficulty of compliance monitoring and the absence of information held by regional councils on stocking rates and carrying capacity.

Decisions from Ministers prior to consultation

Prior to consultation, Ministers decided that intermittent and ephemeral streams, drains, and small streams under 1m wide would not be part of the proposed regulations. They also decided that the regulation would not require riparian planting or management beyond setback requirements.

Proposal for consultation

The Government consulted on the use of a section 360 regulation to regulate stock access to water bodies.

The draft regulation proposed excluding dairy and beef cattle, pigs and deer from water bodies as follows:

Stock type	Waterbody	Slope	Activities	Timeframes
Dairy and beef cattle, deer, and pigs	All wetlands and lakes Rivers >1m wide	Low slope – 5, 7 or 10 degree options; High slope – for dairy support, beef cattle and deer based on a high carrying capacity (intended to capture intensively stocked land) otherwise the same as low slope for dairy cattle and pigs	Grazing on low slope and specified hill country land Feeding on fodder crops Break feeding Irrigated pasture (current or within last 12 months)	Applies at gazettal for new systems, 1 July 2021 for dairy cattle and pigs, 1 July 2023 for beef cattle and deer, and for dairy support in the hill country.

Additionally, the proposal required:

a. Stock to be excluded from the riparian margin, with a 5m average setback. Non-compliant fences with existing setbacks 2m on average and no less than 1m anywhere to be fully compliant by July 2035, otherwise by 2025

b. Cattle and pigs must not cross a river, lake, or wetland more than twice a month except by a dedicated culvert or bridge.

c. An exemption regime would allow regional councils to allow non-compliance with any part of the regulation if the activity met criteria specified in the regulation.

The proposal did not require riparian areas in the setback areas to be planted.

Relationship with the Healthy Waterways package

The proposals for stock exclusion form part of the Action for healthy waterways Package aimed at stopping further degradation of fresh water, particularly for reducing inputs of sediment, *E. coli* and nutrients to surface water, and protecting freshwater habitat. Stock exclusion regulations would therefore help implementation of other parts of the NPS-FM, by helping councils achieve target attribute states set for those contaminants, and achieving objectives set for the habitat component of the compulsory value of ecosystem health.

Another part of the Action for healthy waterways Package is require farmers to have farm plans. Farm plans will perform an important part of achieving the policy objective to halt, as quickly as is feasible, current and future degradation of freshwater caused by livestock accessing water bodies.

Feedback from 2019 consultation

The stock exclusion proposals were one of the most polarising issues in the Action for healthy waterways Package, with over 13,000 of the 17,000 submitters commenting. More than 10,000 submitters used the pro-forma submissions prepared by environmental organisations that generally supported the proposals and requested that they be strengthened by including smaller streams or requiring planting in the riparian setbacks.

The 1,500 submitters using the pro-forma submissions prepared by primary sector organisations supported some aspects but sought significant changes primarily in relation to the setback buffer and the requirement to move fences to comply with the setback. Nearly 1,400 individual submitters identified as farmers and commented on the high costs of fencing, particularly in the hill country.

Fourteen regional councils submitted. Among other issues, all were concerned about requirements to move fences and thereby “punishing” participants of riparian protection programmes. Many were concerned about enforcement problems with the average setbacks as well as wider council resourcing issues in terms of regulatory implementation.

The two most contentious aspect of the proposals were the requirement to move fences to comply with wider setbacks (see photos 3 and 4 below, provided in submissions), and the trigger for compliance in the hill country being the “carrying capacity” of the land, rather than actual stocking rates or a more direct measure of risk. Many opposed the lack of flexibility of a national regulation, especially if they had already taken action to protect the environment, while some questioned the need to exclude stock from rivers where water quality was not degraded.

Photo 3: Waingongoro Catchment, South Taranaki (submitted by the Waingongoro Catchment Group to demonstrate effective stock exclusion and riparian work with one to three metre buffers).
Photo 4: Waimanu Farm Stream, Canterbury (submitted by MHV Water, Ashburton showing the effectiveness of a two metre planted setback).

Summary of options considered following consultation

The Ministry assessed several options following consultation that reflect various "bundling" of the regulatory components described above. Based on feedback received in submissions, the Ministry considered changes in the proposals related to the following themes:

1. Moving existing fences to comply with setback requirements
2. Setback distance requirements
3. Definition of the lowlands area
4. Stock affected in hill country areas
5. Application to wetlands in the hill country
6. Defined criteria for regulatory exceptions

Two possible options generated in this process reflected feedback from hill country primary sector interests and environmental organisations. These options were very similar to Option 1 (highly targeted stock exclusion regulation) and Option 2 (comprehensive stock exclusion regulation) in the interim RIS, which were not progressed[420]. These two options are not analysed further here.

Another two options modified the approach proposed in consultation to address concerns expressed in submissions. One reflected the recommendations of the Independent Advisory Panel (IAP) and the second reflected a modification the IAP approach.

Summary assessment of two options considered

Table 4 Summary of options assessment

Criterion	Option 1 (consultation approach with recommended changes from the IAP)	Option 2 – (modified IAP approach)
Effectiveness	+	++
Timeliness	**0**	+

[420] See pages 390-395 of the interim RIS

Fairness	+	++
Efficiency	+	++
Principles of the Treaty of Waitangi	**0**	**0**
Te Mana o te Wai	+	+
Overall assessment	+	++

Option 1 – approach recommended by the Independent Advisory Panel

Option 1 is recommended by the Independent Advisory Panel and retains aspects of the option proposed in consultations, and some modifications:

1. The proposed requirements preventing cattle, pigs and deer access to all water bodies on low slope land are retained
2. The proposed requirements applying to stock crossing wetlands, lakes or rivers are retained
3. The low slope threshold is 10 degrees averaged across the land parcel.
4. Setbacks are 5m, averaged across the farm.
5. Fences with non-compliant setback distances can remain without replacement until the end of their natural life.
6. The proposed requirements preventing cattle, pigs and deer access to wetlands in the hill country are retained.
7. Requirements to prevent dairy support cattle, beef cattle and deer access to rivers and lakes in the hill country to apply according to the farm's stocking rate, rather than a carrying capacity threshold as proposed.
8. The stream width is defined as the "bank-full channel" consistent with the definition of "bed" in the RMA.
9. A set of criteria for exemptions includes a general exemption where the farm has a certified farm plan that provides for the exclusion of stock from waterways.

Table 5 Analysis of option 1 – approach recommended by the Independent Advisory Panel

Criterion	Option 1 – approach recommended by the Independent Advisory Panel
Effectiveness	+ This option goes beyond existing industry initiatives and most regional plans. Importantly, it captures intensive beef farming. The 2016 stock exclusion cost benefit study[421] showed a large marginal increase in benefits from moving beyond dairy cattle ($125 million in benefits from regulation focusing on dairy cows only versus $716 million for a regulation that addressed beef cattle as well as dairy). The use of actual stocking rates means that the regulation may apply one year and not the next because farm stocking rates fluctuate within and between years and the calculated "stock unit" depends on the breed, age, sex, and weight of the animals. As a result, there will be significant interpretation and enforcement issues with the regulation. Allowing exemptions for farms with a farm plan could be more effective at addressing the problem than relying on the regulation, but the regulation applies to the stock owner, rather than the farm and the stock owner may not have any influence over the implementation of the farm plan. Additionally, submissions about the Action for healthy waterways proposals for farm plans, particularly from the environmental NGO sector, were opposed to allowing farm plans to be more lenient than a regulation.
Timeliness	**0** Some aspects can be implemented rapidly, although meeting setback requirements in all places will take time given significant existing fences in lowland areas. Likewise, fencing in hill country areas will require a transition period given the extensiveness of operations and difficulty of fencing the territory.
Fairness	+ Fair approach because all those with like land (and hence similarly feasible fencing burden) will be treated similarly. In addition, those with similarly intensive practices will be treated similarly. Those with existing fences would be treated somewhat preferentially as they do not need to meet setback requirements until the end of the fence's life. Hill country farmers would face an additional burden in determining on a regular basis whether they fit into the exclusion requirements as their stocking rates change.
Efficiency	+ Would be economically efficient because it would avoid imposing costs where fencing is especially costly and farms are not intensive. Therefore, it effectively increases the benefit to cost ratio compared to more targeted or comprehensive options. While it is administratively efficient in the lowlands, it will have significant issues of interpretation or implementation discretion in the hill country. This will lead to implementation challenges and likely lead to large numbers of applications for exemptions for councils to process.
Principles of the Treaty of Waitangi	+ Offers high level of protection for Māori interests. Would not fall disproportionately heavily on Māori landowners.
Te Mana o te wai	+ Provides good balance between putting the needs of the water first and taking into account the needs of people.
Overall assessment	+ Likely to significantly improve status quo by putting regulation in place across the country in a manner that reflects risk but without the delay of waiting for regional rules to be developed and made operative. However, difficulties in implementation of the regulation in the hill country may weaken the overall effectiveness of the regulation.

[421] MPI 2016

Option 2 – Modified IAP approach

Option 2 is as recommended by the Independent Advisory Panel with modifications underlined:

1. The proposed requirements preventing cattle, pigs and deer access to all water bodies on low slope land are retained
2. The proposed requirements applying to stock crossing wetlands, lakes or rivers are retained
3. The low slope threshold is 10 degrees averaged across the land parcel and mapped as part of the regulation. The map would also include grazed river flats – areas of low slope within larger land parcels of higher average slope than 10 degrees but that are near rivers and are often farmed intensively.
4. Setbacks are 3 metre minimum rather than averaged across the farm.
5. Permanent fences with non-compliant setback distances need not be moved to comply with the setback distance.
6. For hill country wetlands:
   a. Exclude cattle, pigs and deer from wetlands listed in regional and district plans.
   b. Exclude cattle, pigs and deer from wetlands covered by the compulsory NPS-FM values of threatened species or mahinga kai by 2025, rather than all wetlands not listed in regional and district plans by 2023 as proposed.
7. In the hill country, no requirement to exclude dairy support, beef cattle and deer from lakes and streams >1m unless specified intensive activities are undertaken.
8. The stream width is defined as the "bank-full channel" consistent with the definition of "bed" in the RMA.
9. There is a set of criteria for exemptions, but this does not include a general exemption where the farm has a certified farm plan that provides for the exclusion of stock from waterways.
10. An infringement fee for an offence against the stock exclusion regulations will be $2,000 per offence.

This approach would be supported by the mandatory farm plans recommended as part of the Action for healthy waterways Package. Timeframes can be extended to provide time to plan and reduce financial hardships imposed through the Covid-19 emergency.

Table 6 Analysis of option 2 – modified IAP approach

Criterion	Option 2 – modified IAP approach
Effectiveness	+ As with Option 1, this goes well beyond existing industry initiatives and most regional plans. It is less effective than option 1 or the proposed regulation at addressing hill country rivers and lakes because these would be left to regional rules and farm plans. Explicitly linking exclusion requirements for wetlands to NPS-FM values provides councils clear direction on the relationship between the regulation (s360) and national direction in two national policy statements (freshwater and indigenous biodiversity).
Timeliness	**0** Exclusion in lowland areas and where intensive activities occur can be implemented quickly. Removing the proposed requirement to move fences means the regulation will be fully implemented more quickly, though tying wetlands exclusion requirements to NPS-FM values means some aspects will not be explicit until plans are notified. Excluding beef cattle and deer from water bodies in the hill country in regions without regional rules will take time because it will rely requirements set out in farm plans, which

Criterion	Option 2 – modified IAP approach
	will be implemented over the next five to ten years rather than within five years via a regulation.
Fairness	++ This is a very fair approach because it focuses on risks, and the most difficult aspects for farmers (hill country exclusion requirements) are linked with plan-making processes that have strong participatory elements. Allowing existing permanent fences with non-compliant setbacks to remain in place provides recognition of farmers who have implemented good practice early or who are complying with existing regional rules while still providing for long-term improvement to waterways. Clearly incorporating river flats in the mapping modifications more fairly targets areas with higher likelihood of intensive use. Stock owners facing genuine difficulty in excluding stock, or where environmental effects are controlled by other means, will have a clear set of criteria for an exemption to allow them to continue their existing practice without unnecessary costs.
Efficiency	++ Highly efficient in targeting the riskiest activities, enterprise types, and terrains. The reduction in an average five-metre setback to a minimum three metres recognises that the benefits in terms of contaminant interception in setbacks are comparatively smaller in lowlands than hill country, but loss of productive land in the lowlands carries higher costs. Therefore, reducing the setback area has relatively low foregone environmental benefits without imposing high costs. The smaller three-metre setbacks for intensive activities reflects short period over which these activities occur. Targeting the need to exclude stock from wetlands already identified in regional and district plans and those that are relevant for NPS-FM compulsory values where will be more efficient at addressing effects where the biodiversity or cultural value is high than taking a more general approach. Option 2 is more efficient than the proposed approach or Option 1 because it has fewer interpretation and compliance issues arising from calculating carrying capacity in the hill country, assessing stocking rates on farms in the hill country, and working out when fences need replacing. This makes it simpler to implement and enforce.
Principles of the Treaty of Waitangi	**0** Offers high level of protection for Māori interests. Would not fall disproportionately heavily on Māori landowners.
Te Mana o te wai	+ Provides good balance between putting the needs of the water first and taking into account the needs of people.
Overall assessment	++ This option provides a very good mix of environmental benefits and costs to farmers because it most effectively targets higher risk activities and vulnerable areas, and provides a regulatory backstop for farm plans. In addition, it is more practical, simpler to implement, and ultimately more enforceable than the proposed approach or Option 1. It is likely to provide significant environmental benefits in the near-term, which will increase as NPS-FM plans are made that specify wetlands for hill country exclusion requirements and as councils and communities determine how additional regional rules to exclude stock from waterways are necessary to implement the objectives of the NPS-FM.

Recommended approach

Prevent the access of dairy and beef cattle, pigs and deer from wetlands, lakes and rivers more than one metre wide using a section 360 regulation as follows:

a) Exclude all dairy cattle, pigs, beef cattle and deer on land with an average slope across the land parcel of less than or equal to 10 degrees ("low-slope land") from wetlands, lakes and rivers more than one metre wide[422]

b) Outside the low-slope land area, exclude all dairy cattle and pigs, and high risk activities (grazing on irrigated pastures, break feeding animals, and fodder-cropping) from lakes and rivers more than one metre wide (measured as the bed of the river)

c) Outside the low-slope land area, exclude all cattle, pigs and deer from wetlands identified in regional or district plans and those identified as part of the NPS-FM compulsory values of threatened species and mahinga kai.

d) Where cattle, pigs and deer are excluded from a wetland, lake or river, those stock must also be excluded from a minimum setback of three metres from the bed of tat water body.

e) Cattle and pigs are not permitted to cross wetlands, lakes and rivers more than one metre wide except by a dedicated culverted or bridged cross point (unless that crossing is infrequent - no more than twice per month). (This requirement would not apply to deer.)

f) Provide for an infringement fee of $2,000 for offences against the regulation.

To mitigate costs (estimated costs of this option are described below):

i. The requirements should be phased-in over five years as follows:
   - dairy cattle and pigs by 1 July 2023 (lakes and rivers),
   - for beef cattle, dairy support cattle and deer by 1 July 2025 (lakes and rivers)
   - all stock from wetlands listed in current regional and district plans by 1 July 2023
   - all stock from any additional wetlands where the compulsory values for threatened species or mahinga kai apply by one year after the wetland is listed in the relevant regional plan (no more than one year after 1 July 2025)

ii. An opportunity should be provided for stock-owners to seek an exemption from requirements (or an extension of the phase-in timeframes) in defined circumstances, or this should be accommodated within the regulation itself

iii. Where stock are on land with existing permanent fences that do not comply with setback requirement, there will be no requirement to move the fences.

The regulation will allow regional councils to adopt more stringent rules in its regional plan.

[422] A map will be available online to allow stock-owners to determine whether the areas they graze are "low-slope" land for the purposes of the regulation.

A section 360 regulation can apply to any stock access immediately, regardless of any existing use rights, or compliance with regional rules. No consent is required, meaning there is no administrative cost for applying for and assessing a land use consent (as there would be for a national environmental standard).

Summary of costs and benefits of the recommended approach

Constraints on the analysis

Ideally, when assessing the costs and benefits of stock exclusion proposals information would be available about where across the country new stock exclusion is required and the stock it applies to. This is because both benefits and costs will vary depending on terrain types and land use. Fencing in steeper areas is more expensive, and setbacks in the hill country impose a lower opportunity cost because of the lower productivity of the land. The benefits of pathogen and sediment reduction in setbacks vary according to the terrain, with greater reductions achieved on higher slope land.

However information is relatively limited. While it is relatively straightforward to locate lakes and rivers passing through pastoral land in low-slope areas, there is incomplete information on how many of these, and wetlands, are already fenced, and with what setback. This makes it difficult to establish with accuracy and precision the total cost of any proposed regulations.

Informational limitations about existing stock exclusion on low-slope land have been addressed in the impacts analysis by using the survey of rural decision-makers as the basis for assumptions about how likely it is that a given river will be fenced already (the survey asks respondents about the amount of rivers fenced from stock, but not lakes and wetlands),[423] and considering the record of accord streams fenced from dairy cattle.

The challenges in knowing the extent of activities that would be affected by the high-slope aspects of the proposals are even greater. This requires information about stock type and farm management practices (such as allowing grazing on irrigated pastures and fodder cropping) on high slope land. The lack of information prevented benefits and costs, arising from this aspect of the policy, being included in the impact assessment.

New technology such as wireless, virtual fencing (using collars on the stock) and land management such as provision of alternative water supplies to meet stock exclusion requirements can decrease costs significantly. The technology for virtual fencing is still in its early stages in New Zealand, and so the extent of its adoption as a means of compliance is difficult to predict.

Estimating the costs and benefits of the recommended approach

The first step in the impact assessment of the stock exclusion proposal was to form a view as to the rivers, lakes and wetlands that might be potentially affected. This was done in the context of rivers, but not lakes and wetlands, due to the availability of information.

Multiple geospatial data sets which combined information about land use, slope and the width of streams were considered in order to estimate the length of stream segments that potentially need stock exclusion. This analysis concluded that 81,000 km of stream length would potentially need fencing. Results reported from the Survey of Rural Decision Makers were then considered. These indicated that approximately 60% of streams would have existing stock exclusion measures, meaning

[423] Landcare Research, Survey of Rural Decision-makers https://www.landcareresearch.co.nz/science/portfolios/enhancing-policy-effectiveness/srdm/srdm2017/summary-of-results-2017

a far lesser length – 32,000 km of streams – would be impacted by the stock exclusion proposal. Separate analysis, undertaken by NIWA, arrived at a similar estimate of streams requiring new stock exclusion.[424]

NIWA's analysis enabled the stream segments requiring stock exclusion to be allocated across different farm types – namely, dairy, dairy support, sheep and beef and deer. This enabled sector-specific fencing cost estimates and sector-specific profit-per-hectare values to be used for the cost assessment. Costs were estimated as fixed capital outlays (for the construction of fences only, not riparian planting which is not a requirement of the policy) and the opportunity cost (the profit foregone from the land from which stock would be excluded).

In this analysis we use a central discount rate of 3% and with sensitivity analysis using 0%, 1% and 6%. The 3% central discount rate reflects analyses in the social rate of time preference in New Zealand, and uses the low rate used by Treasury in its CBAx model.[425]

Fixed capital expenditure, which is a one-off expense, was amortised using a 3% real interest rate over 25 years. The amortisation treatment means the interest cost (or interest foregone on capital) of achieving stock exclusion is incorporated in the analysis and an annual value is produced for this item which can be combined with opportunity cost estimates.

The assumptions per sector, and estimated costs per sector are provided in Table 7. The opportunity costs provided in Table 7 are based on a 3 metre setback. If a 5 metre setback is used, the annual opportunity cost for all of New Zealand increases to $29.6 million (compared to $17m as reported in Table 7) which has a cumulative value of $240m (PV).

Table 7. Assumptions and estimated costs per sector

	Dairy sector	**Sheep and Beef**	**Dairy support**	**Other**	**Total NZ**
Fencing cost $ per metre	$5.00	$14.00	Excluded from the policy	As for sheep and beef	
Profit $ per hectare	$2,230	$520	Excluded from the policy	As for sheep and beef	
Total fixed capital expense $m	$74.9m	$668.3m	N/A	$30.2m	$773.4m
Opportunity cost $m p.a.	$10m	$7m	N/A	$0	$17m
PV (2023 to 2050), total costs $m					$1,118m

[424] NIWA's analysis considered a number of policy options. They concluded that, for the option of exclusion combined with a 3m setback, the length of streams impacted by the policy would be 32,100 km. (See Semadeni-Davies, A., et al. 2020. Modelling the impacts of the draft stock exclusion section 360 regulations on river water quality - *E. coli* and sediment.)

[425] Denne, T., March 2020. Essential Freshwater package: cost analysis (draft report)

The costs and benefits of the recommended approach are summarised in Table 8 below. A description of the methodology and assumptions used to estimate these costs and benefits is provided in the following section.

The estimated up-front capital costs come to $773 million and per annum opportunity costs arising from lost grazing land within the setback area of $17 million. The present value of these costs assessed over 27 years (from 2023 to 2050) and using a discount rate of 3% comes to $1.1 billion. The total monetised benefits are estimated at $2,489 million (PV). This comprises the monetised value for water clarity improvements of $123 million PV, and $2,366 million PV for reduced risk to human health from because of *E. coli* improvements. The PV total net benefit of the regulations at a 3% discount rate, is $1,274 million (see table 9 below).

Table 8 Summary costs and benefits of proposals

Affected parties	Comment	Impact	Evidence certainty
Additional costs of proposed approach, compared to taking no action			
Regulated parties	Affected waterbodies and farms approach (excludes costs on stock owners undertaking intensive activities, eg break-feeding)	Estimate $1.1bn PV assuming fences costing $5/m to $20/m (depending on sector) and productivity in setbacks varying by sector. This leads to $773 million in capital costs and $17 million per annum in productivity losses. The option not recommended (Option 1) would incur an additional approximate $240 million PV above the figure listed because of the wider (5 metre) setback.	High
	Farmers' mental wellbeing	Negative effect derived from additional pressure and anxiety if financial costs associated with fencing and stock exclusion are perceived to significantly affect the available income of farming families. [426]	Low
Regulators	Costs of compliance monitoring and taking follow-up and enforcement action. Costs of processing applications for exceptions	$10 million per annum Calculated from an estimate of the additional staff the 'average' regional council would need to meet this requirement.[427] Nil (recovered from the stock owner)	Low
Wider government	General oversight of effectiveness of regulation	Low	High

[426] Farmers' mental health: A review of the literature (ACC Policy Team, 2014) https://www.mentalhealth.org.nz/assets/ResourceFinder/wpc134609.pdf Also see Botha N, Roth H and Brown M (2013) '*The Adaptation of Pastoral Farmers to Environmental Policy Changes: A New Zealand Case Study*.' South African Journal of Agricultural Extension, Vol. 41: 16-25

[427] Castalia. March 2020. Administrative Costs of Proposed Essential Freshwater Package on Regional Councils

Other parties	**Impact of rural production/revenue at community scale**	Modelling in the Ruamahanga catchment in Wairarapa suggested a catchment wide net revenue reduction relative to the BAU (i.e. given the regional rules already in place) of 0.6% (a regional production output of 2.2% and a regional employment reduction of 2.1%) Of some note, the same modelling showed a reduction of catchment revenue of 4.6% when modelled relative to a "no exclusion" BAU scenario. This illustrates that modelling results that do not take into account existing regional rules will overestimate the marginal cost of the national regulation.	Low
Total Monetised Cost	*Regulated parties*	**Estimate $1.1bn PV assuming fences costing $5.m to $20/m and varying productivity in setbacks. This leads to $773 million in capital costs and $17 million per annum in productivity losses.**	High
Non-monetised costs	*Local government and stock owners*	Potentially $10 million per annum Unmanaged setbacks may be colonised by weeds and pest plants, which could increase costs for weed management across the farm, or compromise biodiversity along the river corridor.	low

	Expected benefits of proposed approach, compared to taking no action		
Regulated parties	Improved water quality on farm (for stock drinking etc. and reduction in stock losses).	Low/medium. Excluding stock from waterways enhances productivity by preventing stock losses from drowning (particularly new born and young stock) and improves stock health as water quality in water troughs is expected to be higher. Locating across paddocks can also help improve pasture quality and utilisation.[428] It would contribute to enhance access to consumer markets demanding greater sustainability, provide more opportunities to gain a greater market share. Where fencing waterways is accompanied by riparian planting, this will improving the aesthetic and financial value of rural properties.	High
	Positive effect on farmer wellbeing (anxiety/mental health)	Low/medium. This will be particularly so if: - financial benefits are realised in the near future (e.g. reduced stock losses, improved stock health) - excluding stock from waterways builds the farming industry's social licence to operate. [429] - There is certainty about what is required and when - Increased opportunity for recreation/leisure in the local area (e.g. fishing, swimming)	Low/ medium

[428] Beef and Lamb Fact sheet July 2018 Available at https://beeflambnz.com/knowledge-hub/PDF/stock-exclusion-managing-stock-around-waterways

[429] Clark-hall, P. (2018). *How to Earn a Social Licence to Operate.*

	Greater safety at work	Low/medium. Keeping stock out reduces the need for people to go in waterways. Mud, crumbling or steep banks make waterways hazardous for farm employees.	Low/ medium
Regulators		Medium Avoid the need to develop regional stock exclusion rules and remove associated debate and litigation in regional plan-making processes	High
Wider government	Potential benefits to government's biodiversity enhancement and climate objectives	Medium	Medium
Other parties	Improved water quality, ecological and recreational values. Social and cultural benefits	**$2,366 million in benefits to human health** **$123 million in benefits to water clarity from reduced sediment** $1.8 to $5.4 million per annum in reduced erosion (this is counted in the RIS for the sediment attributes) Medium. Contributes to New Zealanders' cultural identity and values. Recommended option would give greatest assurance that future generations will have access to at least the same natural capital while dealing with a more extreme climate. Benefits the mauri of waterbodies, increasing opportunities for food gathering / mahinga kai as a result improved ecosystem health, particularly where fenced areas are planted. Improved perception of the farming community as stewards (kaitiaki) of the land.	High
Total Monetised Benefit		$2,366 million in benefits to human health $123 million in benefits to water clarity from reduced sediment **Approximately $2,489 million (PV)**	High
Non-monetised benefits		Improved ecosystem health because of improved habitat, and reduced nutrient loading to rivers and lakes due to uptake and interception in the riparian zone Reduced greenhouse gas emissions due to changes in riparian vegetation	Medium

What other impacts is this approach likely to have?

A sensitivity analysis of the costs and benefits with four different discount rates is given in Table 9 below.

Table 9. Sensitivity Analysis, using various discount rates.

Discount rate	PV of costs ($ million)	PV of benefits ($ million)	PV net benefit ($ million)
0%	1,729	3,732	2,003
1%	1,472	3,180	1,708
3%	1,092	2,366	1,274
6%	737	1,609	872

The Government is examining the potential for riparian planting to attract a form of GHG emissions credit, or other monetary credit, to incentivise landowners to plant setbacks with appropriate vegetation.

There will be benefits to wetlands from avoided stock trampling and grazing.

Conclusion

The analysis shows that there would be significant costs to some stock owners associated with the recommended option, alongside significant environmental and social benefits.

Waikato, Manawatu-Wanganui, Canterbury, Otago and Southland have highest lengths of rivers requiring stock exclusion, and will therefore face the highest costs (see Table 10 below). Of these, Manawatu-Wanganui, Canterbury and Otago will see the greatest improvements in water clarity and *E. coli* reductions, with Bay of Plenty, Hawke's Bay, Taranaki and Greater Wellington also seeing significant improvements in water clarity or *E. coli* (see tables 11 and 13 below). These improvements are significant because currently, water clarity and *E. coli* levels in Northland, Waikato, Taranaki, Manawatu-Wanganui, West Coast and Southland are the worst in the country, and "very likely worsening".[430]

The costs will fall most heavily on farmers with beef cattle because these farms have lower levels of existing stock exclusion. Higher costs for these stock owners will be mitigated by allowing a longer timeframe for compliance, thereby allowing farmers to spread costs.

If Option 1, which has more stringent measures for setbacks and stock exclusion in wetlands and the hill country, was adopted, there would be an additional 12,688 hectares within setback areas (see Table 10 below), with associated opportunity costs of lost grazing. But, as described above, the associated additional benefits from the increased setback would not increase proportionally.

Overall, the preferred option has lower costs, is easier to implement and is more enforceable than option one (see Table 6 above). While the environmental benefits could be lower than option one, these reduced environmental benefit will be addressed by other components of the Action for healthy waterways Package, in particular, targeted measures that regional councils will implement to achieve proposed national bottom-lines for sediment in rivers, and targeted measures that will be

[430] Environment Aotearoa, 2019. See www.stats.govt.nz/indicators/river-water-quality-clarity-and-turbidity, and www.stats.govt.nz/indicators/river-water-quality-escherichia-coli.

implemented in the water component of farm plans. Where more stringent stock exclusion requirements are desirable, regional councils can set more stringent rules.

Implementation, compliance, monitoring and review

A general implementation plan for the Action for healthy waterways Package is outlined in section 6.

Section 360 regulations are administered by regional councils as part of their functions and roles under the Resource Management Act. Ministry for the Environment will help regional councils in their role by working with them and industry groups to develop guidance that is ready within six months of gazettal. The main stock owners to reach with implementation support will be those who establish a new pastoral system after gazettal of the regulations, because existing stock owners will have until 2023 or 2025 to exclude their stock from the specified water bodies. Regional councils will be provided with information about the approved policy prior to drafting and will work directly with any stock owner establishing a new pastoral system after gazettal of the regulations.

Regional councils are responsible for enforcing compliance with the regulation, and administering the imposition of any infringement fees. Compliance with the regional rules relating to farm activities is already an established part of regional council work, including the enforcement of their existing rules for stock exclusion, but according to information supplied in their submissions, all councils would have to increase the size of their compliance teams to enforce these regulations. The regulation will prescribe a maximum fee of $2,000 for each observed event of stock in a water body. This fee is payable to the regional council and will help ensure that the stock exclusion regulation achieves its public policy objectives, and incentivises farmers to comply with the regulation.

The regulation will be successful if dairy and beef cattle, pigs and deer are excluded from the specified water bodies by 2025 and the water quality in previously unfenced areas improves. Regional councils have reporting obligations under the National Policy Statement for Freshwater Management to measure and report on all components of ecosystem health. At a national level, the state and changes in water quality, as indicated by water clarity and *E. coli* levels, are reported every three years in Environment Aotearoa, in accordance with the Environmental Reporting Act 2015.

The effectiveness of the regulations will be assessed in 2023 and again in 2026 using the reports on the state of New Zealand's fresh water prepared under the Environmental Reporting Act 2015. This assessment will also be able to take into account the effectiveness of any alternative approaches, such as targeting critical source areas with mitigation measures specified in farm plans, to evaluate whether the regulations are contributing to improvements as predicted, and whether they should be changed.

A potential risk to the successful implementation of the stock exclusion regulations is lack of support from some farmers and industry groups who opposed the regulations during consultation. This risk will be mitigated by active engagement with the industry groups to demonstrate how their concerns have been addressed. The ministers and senior management will start this process before any announcements are made, and engagement will continue once the regulations are drafted. In addition, the Government has allocated $229m to MPI and MfE over four years to support delivery of the Government's broader sustainable land use goals. Of this, $12 million has been specifically allocated to preparing and implementing farm plans and good management practice ($12 million).

Methodology for determining the costs and benefits of the options

This section describes in detail various components of the costs and benefits as summarised above.

Calculating the river length where stock would be excluded

New Zealand has over 425,000km of rivers/streams that are mapped in the digital river network according to physical factors such as climate, source of flow for the river water, topography, and geology, and catchment land cover eg, forest, pasture or urban.[431] According to the Ministry's geospatial analysis, about 143,000km of this river length is potentially accessible by stock because the rivers are located within grassland or annual cropping landscapes.

The low-slope land described in Options 1 and 2 (10 degrees threshold and including river flats) includes about 105,000km of stream segments. This significantly over-represents the length of streams that will require stock exclusion because it includes significant river lengths adjacent to land not currently in pasture (in case the land is converted to pasture in future). Taking account of land use leads to an estimate of 81,000 km of stream lengths that have the potential to require stock exclusion.

The figure of 81,000 km over-estimates the length that will require new fencing (or other exclusion method) for several reasons:

1. The low-slope land captures 83% of the country's dairy land and DairyNZ report that over 36,000 km of small streams and 99% of Accord Streams (wider than 1m and deeper than 30cm) have been fenced on dairy farms.[432]
2. Regional rules already require (or will require) fencing of streams and rivers on intensively farmed land in Auckland, Canterbury, Marlborough, Northland, and Southland. Bay of Plenty and Manawatu-Whanganui have regional rules that apply to priority areas, some of which will be in the mapped area as described in Table 2.
3. Farmers have already excluded stock in a substantial portion of river length.

River length that will require exclusion

Through GIS, the Ministry calculated the total length of rivers in pasture and cropland in the low slope area. This river length, 81,000nkm, was then refined to assess how much new stock exclusion would be required. This occurred as follows:

1. Subtract river length in catchments where regional rules already apply and the s360 would not introduce new requirements[433].
2. Subtract river length in other grazing land in proportion to stated existing fencing (proportions fenced according to Survey of Rural Decision-makers survey)

The yielded a total river length of 31,721 km requiring stock exclusion. This assessment cannot be exact because of data characteristics and gaps. Table 10 shows the regional breakdown of river length requiring exclusion and resultant setback areas in hectares (note that a 5 metre setback on both sides of a river amount to 10,000 square metres per kilometre, or 1 ha/km).

[431] River Environment Classification system, see www.mfe.govt.nz/more/science-and-data/classification-systems/freshwater-classification-system

[432] DairyNZ submission to Essential Freshwater consultation 2019.

[433] Semadeni-Davies et al 2020. Modelling the impacts of the draft stock exclusion section 360 regulations on river water quality – E. coli and sediment. Prepared for the Ministry for Primary Industries and the Ministry for the Environment. March 2020

Table 10 River length requiring exclusion per region and setback area

Region	River length requiring exclusion (km)	Setback area (ha) for 3 metre setback	Setback area (ha) for 5 metre setback
Auckland	618	371	618
Bay of Plenty	397	238	397
Canterbury	7,399	4,439	7,399
Gisborne	490	294	490
Hawke's Bay	1,551	931	1,551
Manawatu-Wanganui	2,378	1,427	2,378
Marlborough	619	371	619
Nelson	37	22	37
Northland	1,284	771	1,284
Otago	5,122	3,073	5,122
Southland	2,542	1,525	2,542
Taranaki	893	536	893
Tasman	499	299	499
Waikato	2,198	1,319	2,198
Wellington	1,023	614	1,023
West Coast	974	584	974
Total	31,721	19,033	31,721

Estimated costs for stock exclusion in low slope land

The estimated costs of stock exclusion are proportion to length requiring exclusion and setback area. The Ministry's assessment is based on two fencing cost scenarios and two setback area productivity figures. These reflect sheep and beef (high fencing costs and low productivity) dairy (low fencing costs and high productivity). This cost does not factor in the additional costs associated with stock exclusion such as water reticulation and riparian planting.

A 3 metre minimum setback (Option 2) on both sides of a river comprises 0.6 ha/km. Estimates of pasture productivity in near-river areas are that setback areas are 90% as productive as typical paddock pasture.[434] Thus a 3 metre setback on both sides of a river comprises 0.54ha lost grazing per kilometre of stream.

Opportunity costs are estimated as $520/ha for non-dairy farms, and $2,238/ha for dairy farms to reflect the earnings before tax and income of those farms.[435]

[434] LIC 2020. Pasture Growth Mapping Report. Client Report for MPI

[435] Journeaux (2019). Modelling of mitigation strategies on farm profitability: testing Ag package regulations on farm, pages 9-10.

Fencing costs have been estimated at $5 per linear meter (for dairy), $14/m for sheep and beef and $20/m for deer farms.

Finally, the fencing length to dairy (minimal length), sheep and beef (vast majority of area), and deer (minimal length) has been calculated according to proportion of catchment in that land use according to Semadeni-Davies et al 2020.[436]

This estimate results in up-front capital costs of $773 million and per annum opportunity costs of $17 million. The present value of these costs assessed over 27 years (from 2023 to 2050) and using a discount rate of 3% comes to $1.1 billion.

This cost is highly sensitive to fencing costs, and $14/m is a high average estimate for sheep and beef farms. For instance, Local Government New Zealand's (LGNZ) submission used a cost of $12.4/m for sheep and beef fencing. Thus, the Ministry concludes that this cost estimate is high and likely to be a ceiling cost figure for Option 2. Dairy farmers have fenced off the vast majority of Accord streams, which constitute the large majority of streams identified in the analysis (streams that fit the Accord definition are approximately 76% of the digital river network). Therefore, the Ministry expects the large majority of the identified costs to fall on farmers with beef cattle.

Estimated costs for exclusion outside of mapped areas

Within the non-low-slope land area, we estimate from GIS analysis that just 354km of river is adjacent to fodder cropping, 17% of dairy land still remains for exclusion (though they have already fenced 99% of Accord Streams, which constitute the large majority of river length), and the area adjacent to irrigated pasture is also likely to be very small. Thus for Option 2, the additional cost of high slope proposals is not expected to be high.

In relation to Option 1 for hill country areas (areas not mapped as lowlands), the proportion of river within and adjacent to land carrying more than 14 stock units per hectare is likely to be less than 10 percent of the total high slope river length and so is estimated to be around 9,600 km of river length.

The additional possible costs for exclusion on non-low-slope land inherent in Option 1 could therefore be an additional $268.8million for fencing and $2 million annually for setbacks of 3m ($29 million PV).[437] Again, this is assuming a fencing cost of $14/linear meter in hill country and low productivity values.

Thus, the total costs for stock exclusion based on Option 2 would range between $700-800 million, and the additional cost of Option 1 is anticipated to be approximately $300 million due to additional fencing costs and lost grazing opportunities over the next 20 years.

Additional discussion of costs

Against these costs, the Survey of Rural Decision-makers (with 4,500 respondents) reported that 75% of farmers found no change in profit after excluding stock from waterways, 8% reported increased profits and 17% reported lower profits. This contrasts with farmer expectations before stock exclusion where 51% believed they would have lower profits.[438] In addition, farm performance

[436] Semadeni-Davies et al 2020. Modelling the impacts of the draft stock exclusion section 360 regulations on river water quality – E. coli and sediment. Prepared for the Ministry for Primary Industries and the Ministry for the Environment. March 2020

[437] Assumes assuming fencing costs of $14 per linear metre (and fencing both sides), 7,680 hectare lost grazing land (because the first metre has no opportunity cost) for a 5m setback, at $520 EBITD per hectare

[438] www.landcareresearch.co.nz/science/portfolios/enhancing-policy-effectiveness/srdm/srdm2017/farm-plans-and-land-management/management-stock-exclusion-from-waterways

and environmental performance were both higher than expected (52% and 65% compared with their expectations of 20% and 41%).

Case studies of costs to stock owners

Prior to consultation, some indicative impacts of the stock exclusion proposals were assessed as case studies of three individual farms.[439] The results provided indicative information for farmers potentially affected by the regulation. They cannot be aggregated to a national estimate because they will not be representative across all regions.

Modelling assumed there was no existing compliant fencing, new fences would be 2 wire electric fence with fence maintenance costs, there would be alternative stock drinking water supplies provided (where required), and there would be a 5 year implementation timeframe.

The ongoing opportunity cost for 5 and 3-metre setbacks was calculated as the present value of the annual opportunity cost (calculated from the EBITD/ha) over 20 years at 6%. The area of land lost was based on an average length of streams on the specified farm-type, with no opportunity costs for the first metre, 50% for the next two metres, and 100% for the remaining setback (giving 0.6 ha/km of stream length for a 5 metre setback, and 0.2 ha/km for a 3 metre setback).

Fencing costs: A 125 ha Waikato/Bay of Plenty dairy farm would incur costs of $19,229 if a new fence was erected; a North Island 281 ha intensive (lowland) beef farm and stocking rate of 9.6 SU/ha would incur costs of $75,131 if a new fence was used; and a 571 ha central North Island hill country sheep and beef farm and stock rate of 8.7SU/ha would incur costs (based on 10% of the farm triggering exclusion) of $15,252 for new fence.

Setback cost: The Waikato/Bay of Plenty dairy farm would incur $67,414 opportunity cost in lost land from a 5m setback (or $16,853 for a 3m setback); North Island intensive (lowland) beef farm would incur costs of $14,018 opportunity cost in lost land from a 5m setback (or $3,505 for a 3m setback); A hill country farm would incur (based on 10% of the farm triggering exclusion) $1,899 opportunity cost in lost land from a 5m setback (or $475 for a 3m setback).

Separate modelling of a dairy farm in Canterbury indicated a reduction in operating surplus of $22,000pa (although this did not take into account existing setbacks or existing regional rules and modelled wholly new, rather than relocated, fences).

Costs to stock owners provided in submissions

Te Tumu Paeroa is the office supporting a Māori Trustee, and it administers around 87,000 hectares of Māori Freehold land, as well as general land and other interests and investments, on behalf of over 90,000 Māori landowners and stakeholders.

Te Tumu Paeroa is responsible for 180 blocks of Māori land within the Taranaki region. Sixty of these blocks have water on them and a riparian plan. Of these 60 blocks, there is a total of 130,020 metres to be fenced. At a minimum, being a post and two-wire fence at $10/m, the total cost of fencing will be $1,300,207. In terms of planting, which is not a requirement of the proposal, but something that Te Tumu Paeroa would undertake, there is a total of 142,395 metres to be planted. As there needs to be one plant every 2 metres, 71,198 plants would need to be planted. There are 2,500 plants to a hectare meaning that 28.5ha needs planting. They estimated a total cost of $1,063,050 across the 60

[439] Journeaux, P. May 2019. Modelling of Mitigation Strategies on Farm Profitability: Testing Ag Package Regulations on-Farm.

blocks for this level of planting. Based on their estimation, the total cost of planting and fencing is estimated to be $2,363,257 in Taranaki on these 60 blocks.

Comparison to LGNZ estimated costs and MPI 2016 national stock exclusion study

LGNZ cost estimate

The submission from Local Government New Zealand (LGNZ) on Action for healthy waterways estimated that stock exclusion requirements would cost (present value) between $775 million and $1.5 billion on low slope land alone. The range depends on the impact of three key variables: cost of fencing, length of fencing required, and land lost due to setback. LGNZ estimated the river length requiring fencing to be between approximately 16,000 and 50,000km (cf, the 31,000 km estimated for this analysis using data from NIWA).

The lower range of estimated costs, about $775-$930 million, is reflective of the recommended proposal ($773 million in capital cost and $17 million per annum in productivity losses, see Table 8 above) because it assumes cattle fencing only (what the proposals require) as well as no movement of existing fences and the setback area only applying to new fences (both of which are part of Option 2).

The largest cost variation according to LGNZ's submission stemmed from the cost of fencing presently unfenced areas of rivers and streams. A very large component (about $400 million) of other estimated costs stem from moving existing fences, which is not recommended, and the cost of a 5m setback (rather than 3 metres).

Therefore, LGNZ's cost estimates that do not require moving fences ($775 million to $930 million) are reflective of the policies, and the Ministry's assessment of total costs for the recommended option are significantly higher than LGNZ's assessment, especially given that the setback area in the recommended proposal (3m) leads to smaller losses in productive land.

MPI 2016 study

The 2016 MPI study concluded that excluding all dairy and beef cattle and deer from Accord waterways (wider than a metre, deeper than 30 cm) on flat and rolling land (up to 15 degrees) would produce net benefits, measured in PV terms, of $617 million (costs of $367 million and benefits of $983 million) over 25 years. This study used a high discount rate of 8%, which largely accounts for the major decreases in costs and benefits compared with the Ministry's assessment presented above. The MPI study also omitted to consider opportunity costs, focusing just on fencing costs. It is important to note that MPI's assessment included more waterways since it included streams in land up to 15 degrees whereas the recommended option here only includes streams in land up to 10 degrees.

The study estimated that extending the requirement for fencing cattle and deer out of Accord and non-Accord waterways into the hill country (slopes less than 28 degrees) increases the cost by over $1 billion. The total costs of fencing all dairy and beef cattle and deer from Accord and non-Accord streams on flat and rolling land and hill country (slopes less than 28 degrees) is significant, at $1.4 billion. However, the benefits are even greater at $3.4 billion, resulting in net benefits of $1.9 billion. This would result in over 70,000 kilometres of new fencing.

In summary, the Ministry's assessment of costs and benefits presented here is roughly in alignment with MPI's assessment in 2016 given the differences in discounting used and the different areas over which the policy impacts were assessed.

Benefits

Stock exclusion provides a wide range of environmental, social, and economic benefits. A few of these benefits may be monetised, others can be quantified, and many of the benefits can only be qualitatively described with current knowledge. The environmental benefits of reducing sediment in rivers to achieve the proposed national bottom line for sediment are summarised in the RIS chapter on sediment. Tables in that chapter provide extensive information on the benefits associated with reduced erosion and in-stream sediment generally. Likewise, tables in the chapter on improving water for contact recreation provides extensive information on the benefits associated with reduced pathogen loading.

Here we present the monetised benefits anticipated from the stock exclusion proposals only[440].

The analysis provided a range of sediment load reduction benefits depending on the sediment removal efficiency factor (what proportion of sediment the exclusion and setbacks prevent from entering waterways). These efficiency factors have a wide range, (see Figure 1 above), which strongly influences the overall results.

The *E. coli* analysis, in contrast, has a single reduction efficiency factor with total reductions driven by stocking rates across catchments. Therefore, it is estimated as a single value in load reductions (rather than ranges like for sediment).

Table 10 below shows the proportion of regional river length in three classes of water clarity – good (>2.4m), moderate (1.2-2.4m), and poor (under 1.2m) – before and after the stock exclusion proposals are implemented.

[440] Assessment of water quality improvements comes from: Semadani-Davies et al 2020. Modelling the impacts of the Draft Stock Exclusion Section 360 Regulations on river water quality, E. coli and sediment. Niwa client report 2020052AK.

Table 11 – Stock exclusion improvements in water clarity

	Before stock exclusion			After stock exclusion			Change		
Region	Good	Moderate	Poor	Good	Moderate	Poor	Good	Moderate	Poor
Auckland	4.1%	29.6%	66.3%	4.1%	39.0%	56.9%	0.0%	9.3%	-9.4%
Bay of Plenty	55.8%	44.0%	0.1%	57.0%	42.8%	0.1%	1.2%	-1.2%	0.0%
Canterbury	68.9%	30.5%	0.6%	76.4%	22.9%	0.6%	7.6%	-7.6%	0.0%
Gisborne	20.0%	80.0%	0.1%	20.2%	79.7%	0.0%	0.2%	-0.2%	0.0%
Hawke's Bay	28.9%	70.4%	0.6%	36.2%	63.6%	0.2%	7.3%	-6.8%	-0.5%
Manawatu-Whanganui	20.5%	59.8%	19.8%	20.7%	61.6%	17.6%	0.2%	1.9%	-2.1%
Marlborough	85.3%	14.7%	0.0%	85.9%	14.1%	0.0%	0.5%	-0.6%	0.0%
Northland	4.7%	56.2%	39.1%	4.9%	61.0%	34.1%	0.2%	4.9%	-5.1%
Otago	57.7%	30.6%	11.8%	62.0%	28.4%	9.6%	4.3%	-2.2%	-2.1%
Southland	54.2%	19.1%	26.7%	54.2%	24.0%	21.8%	0.0%	4.9%	-4.9%
Stewart Island	10.0%	76.3%	13.7%	10.0%	76.3%	13.7%	0.0%	0.0%	0.0%
Taranaki	38.6%	55.4%	6.0%	40.5%	55.1%	4.4%	1.9%	-0.3%	-1.7%
Tasman-Nelson	83.3%	16.6%	0.0%	83.8%	16.1%	0.0%	0.5%	-0.5%	0.0%
Waikato	18.0%	38.8%	43.2%	18.9%	39.3%	41.7%	0.9%	0.6%	-1.6%
Wellington	39.2%	59.4%	1.4%	41.2%	57.5%	1.2%	2.0%	-1.8%	-0.2%
West Coast	83.7%	16.2%	0.2%	83.9%	16.0%	0.1%	0.2%	-0.2%	0.0%
All regions	**48.1%**	**38.2%**	**13.6%**	**50.6%**	**37.4%**	**12.0%**	**2.4%**	**-0.8%**	**-1.6%**

Table 12 shows the proportion of river length according to the *E. coli attribute* bands before and after the stock exclusion proposals, and Table 13 shows how many LAWA swimming sites improve from "poor" to fair as a result of stock exclusion.

Table 12 – Proportion of river length in each *E.coli* attribute band before and after stock exclusion

Scenario	A	B	C	D	E
Baseline	107.2 (27%)	92.4 (23%)	50.5 (13%)	83.4 (21%)	66.5 (17%)
After stock exclusion	135.9 (34%)	102.6 (26%)	65 (16%)	70.5 (18%)	26.1 (7%)

Table 13 – Number of LAWA primary contact sites that improve from poor status following stock exclusion

Region	Baseline number of poor primary contact sites (before stock exclusion proposals)	Number of sites improved to "good" after stock exclusion	Number of sites improved to "fair" after stock exclusion
Bay of Plenty	23	0	6
Canterbury	15	0	5
Gisborne	4	0	0
Hawke's Bay	5	0	2
Manawatu-Whanganui	56	1	4
Marlborough	1	0	0
Northland	11	0	2
Otago	4	0	2

Region	Baseline number of poor primary contact sites (before stock exclusion proposals)	Number of sites improved to "good" after stock exclusion	Number of sites improved to "fair" after stock exclusion
Southland	6	0	2
Taranaki	11	0	7
Tasman & Nelson	7	0	2
Wellington	6	0	6
West Coast	4	0	3
National	**153**	**1**	**41**

It is possible to estimate some portion of the monetary value of these contaminant and pathogen reductions using willingness to pay, non-market valuation estimates (for visual clarity and *E. coli* improvements)[441] and damage avoidance estimates for sediment[442].

Using these methods and datasets, and assessing a 20-year period using a 3% discount rate like for the costs assessment, the monetised value for water clarity improvements shown in Table 10 is $123 million PV.

Likewise, using the described methods and datasets, and assessing the same period and discount rate, the monetised value for *E. coli* improvements shown in Table 12 is $2,366 million PV. The benefits from reduced *E. coli* levels in the water accrue as soon as the stock are excluded from the water body.

The avoided damage costs of reduced erosion (reduction of approximately 1.8 million tonnes per year Semadeni-Davies et al 2020) are between $1.8 million and $5.4 million per annum depending on whether one uses the low or high estimates shown in Neverman et al. 2019.

[441] For visual clarity, the method is based on the method developed in MPI 2016 as reported in Neverman et al 2019; the specific sediment improvements used for the analysis are shown in "Hicks 2020. Effects of stock exclusion scenario 3b on sediment load reduction and visual clarity." For *E. coli* the method is the same as used in MPI 2016 and the specific E. coli improvements monetised come from Semadeni-Davies et al 2020.

[442] Using the method described in Neverman et al 2019 and the specific sediment reduction values shown in Semadeni-Davies et al 2020.