

Freshwater in New Zealand: past, present and a possible future

Purpose

1. This paper is to support you in your various engagements on freshwater policy – with Ministerial colleagues, industry, Māori and the public in due course.
2. We have provided you with some ideas of how the Government could support its freshwater regulatory programme and engagement with Māori on freshwater rights and interests matters, with a new approach to innovation that goes to the heart of the freshwater challenges New Zealand is facing.

Key points

- A. New Zealand has many waterbodies that are in very good or good health. However, where land use is intensive, freshwater health is often poor. In some areas it is very poor. For example, nearly every lowland lake in New Zealand is in very poor health or worse.
- B. Waterbodies dominated by urban areas have the worse freshwater health, but these make up a small fraction of New Zealand's rivers and lakes.
- C. In general, the impacts of excessive contaminant discharges into waterbodies (a form of over-allocation) present significantly greater economic and environmental challenges than the impacts of excessive water extraction.
- D. Dairy expansion (especially in the South Island) has added a great deal of additional nutrient discharges to waterbodies, especially nitrogen. But, dairying is by no means the whole story.
- E. Hill country that has been denuded of forests and converted to pasture has also led to sediment, Phosphate and biological contamination (as indicated by measuring *E.coli*) of waterbodies at levels far above the natural levels of such contaminants. This is especially so in the North Island and has been a major problem for many decades. Previous efforts to address these issues have been local and not sustained – but they have shown that major reductions in sediment discharges are possible while maintaining hill country farming systems.
- F. Sediment is the master stressor of rivers, lakes and estuaries. The technologies and land management practices to address sediment are known and widely available. These often involve integrating more trees into the farm. Phosphate is bound to soil, so actions that reduce sediment also tend to reduce Phosphate.
- G. The freshwater farm plan system will be a vital to addressing sediment and phosphate. However, we think new innovative ways to fund and encourage adoption of better practices are also needed. The nature of sediment and Phosphate loss means that market-type policy instruments will probably never be technically or administratively feasible.
- H. Providing farmers with cheaper and more flexible ways to access the value of carbon sequestration (i.e. alternatives to joining the ETS) is probably the most powerful financial tool available that could support farmers planting more trees on farm - but this would require innovative new policy.

- I. Excessive nitrogen and biological contamination/*E.coli* are much more challenging to address, especially where large reductions in contaminant loads are required. New technologies and production systems, as well as new policy tools – beyond resource consents and plan rules – will be needed.
- J. For nitrogen, the use of market instruments may be essential to create the incentives and flexibility to drive innovative solutions. However, there are considerable technical challenges that must be overcome before markets are even a viable option. While the challenges are considerable so are the potential economic and environmental benefits.
- K. For many potential water storage projects to be viable, excess nutrients will need to be reduced to create headroom to accommodate the land use intensification that often accompanies and finances such projects.
- L. Addressing highly degraded waterbodies, while also providing for primary production and economic growth, presents enormous technical, economic, social, and political challenges. Our view is that councils do not have the capacity, capability or investment levers to meet these challenges alone.
- M. Further, we consider that the current regulatory tools available under the RMA are inadequate to address these issues efficiently. In some catchments, the power of markets to efficiently allocate resources and – most importantly – stimulate investment in innovation and adoption of new technology and production systems will be needed.
- N. What is clear is that achieving reasonable freshwater outcomes in many highly degraded catchments will not be possible with measures like adoption of good/best practices, farm plans, catchment groups or community initiatives (even though these measures can be effective where modest levels of improvement are required).
- O. Further, achieving the twin goals of healthy freshwater with a thriving and growing primary sector will not be possible through changing national direction and/or the RMA alone.
- P. Rather, New Zealand needs to complement legislative and regulatory change with a strategic and coordinate approach to finding solutions to its freshwater challenges – including technical, management and policy innovations.
- Q. Such an approach has never been attempted before in New Zealand in respect of freshwater, though it is the cornerstone of successive Governments' policies on agricultural greenhouse gases.
- R. Moreover, the policies of successive Governments have tended to separate climate change mitigation, freshwater, biodiversity and climate resilience/catchment management. However, from the land manager's perspective these issues are all integrated (e.g. a restored wetland or retired block of marginal land can achieve all these outcomes simultaneously).
- S. We consider it is critical that national policy settings are developed from the land manager's perspective first and foremost so that land managers can logically optimise their practices and access financial incentives by delivering a range of benefits. This would require considerable policy innovation.

- T. The approaches outlined in P and S above might also help develop opportunities for Māori land development and help address some aspects of Māori rights and interests in freshwater. However, no-one should be under any illusions about the magnitude of freshwater challenges New Zealand faces in many of its intensively farmed and urban catchments.
- U. Addressing these issues would require a sustained effort with the private sector as a foundational partner. Our view is that many sector groups have approached freshwater issues by lobbying various arms of government for policies and rules that largely accommodate their existing practices (with marginal improvement), rather than investing in finding durable, game-changing solutions.
- V. Changing this dynamic could only happen with clearly signalled expectations from Ministers that a new approach is needed, while recognising that such an approach must necessarily recognise the interests of existing farmers and their investments.

What's in this paper

- 3. In this paper we provide:
 - a. a summary of the state of freshwater in New Zealand and the drivers of this
 - b. an overview of the role of councils and national direction on freshwater
 - c. a description of the major challenges New Zealand faces in improving freshwater
 - d. a proposal to complement the Government's regulatory changes with a multi-discipline, multi-stakeholder work programme to develop efficient and effective solutions to freshwater challenges.

Many waterbodies are in good health, but many need very big improvements

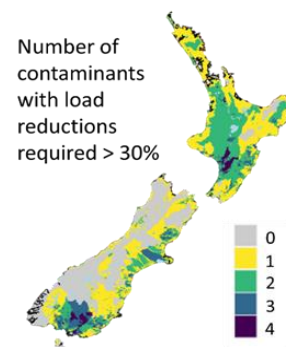
- 4. The 'health' of water bodies depends on several factors, including:
 - a. the volume of water flowing in a river or into a lake, especially important at times of low flow and when temperatures are high
 - b. how much nutrient is stored within a waterbody (e.g. in sediment on the bottom of lakes and rivers)– which is typically a result of historical land use
 - c. how much nutrient is flowing into and out of a waterbody now¹ - which is typically a result of recent land use and management practices
 - d. shading and habitat – which can affect water temperature, algal growth and aquatic ecosystems.
- 5. Waterbody health generally declines as water moves from those parts of a catchment dominated by indigenous vegetation through to those parts of a catchment in pastoral

¹ This includes nutrients from groundwater that feeds waterbodies through springs. It can many years for groundwater to resurface, meaning the effects of recent land management may not be reflected in changes in a waterbody for some years – in extreme cases this can take decades.

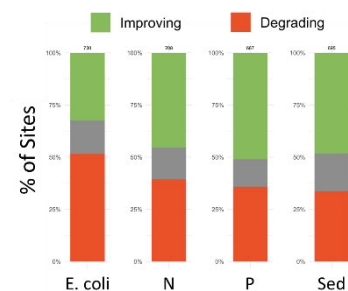
agriculture, horticulture and urban use. Typically, the more of the upstream catchment that is in farmland, the greater the decline in waterbody health. As land use becomes more intensive, water health also tends to decline.

6. Urban waterbodies are generally in the worst health; though catchments dominated by urban areas make up less than one percent of waterbodies.
7. Exotic forestry generally produces high quality water, though increased sedimentation occurs in the 5 or so years following harvest. In extreme cases, when soils are subject to mass movement in major events, exotic forests can also generate significant woody debris post-harvest (though this is not typical for most of New Zealand in most weather conditions).

Notwithstanding these general trends, many waterbodies in New Zealand are still in good health or require only modest improvement. Many however, require large improvements for at least one of the major contaminants of freshwater (nitrogen, phosphorus, biological, sediment) and some require very large improvements across multiple contaminants (discussed later in this note).



8. New Zealand's lowland lakes are almost always in poor to very poor health. There are also trends of degrading health in some highland lakes.
9. Trends in the changing health of waterbodies are mixed. Many areas show no clear trend, many are improving, but many are still in decline.



10. Wetlands have continued to be lost. Despite being among our most depleted ecosystem types (90% lost nationwide) and a national priority for protection since the inception of the Resource Management Act in 1991, almost 5400 hectares of freshwater wetland was lost to non-natural causes between 1996 and 2018.
11. There is also pressure on waterbodies from over-extraction of water, with some waterbodies undoubtedly being over-allocated. However, for the reasons discussed in the next section, we consider issues of over-allocation of water takes to be more tractable and less significant economically and socially than excess contaminants.

There are four main contaminants of waterways, none of which can be practically managed using market-based mechanisms at present

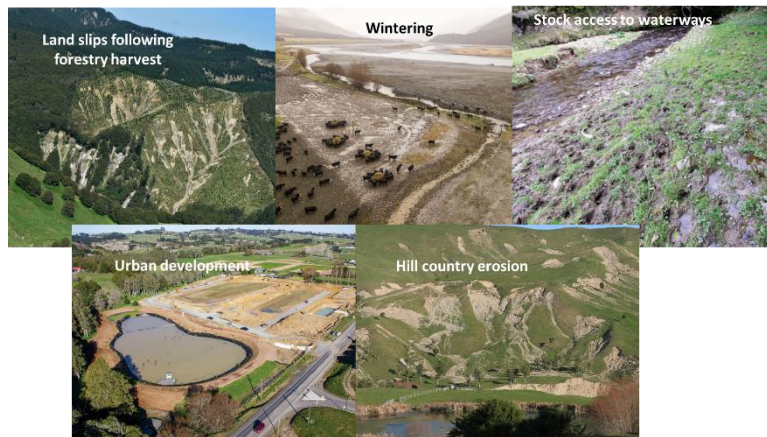
12. There are many contaminants that can enter waterbodies including heavy metals (e.g. zinc from roofing; copper from brake pads), petrochemicals, agrichemicals, plastics and the like.

13. However, freshwater management is generally focussed on the big-four: sediment, nitrogen, phosphorus, and biological contaminants (as indicated by *E.coli*, but includes a wide range of water-borne pathogens like Giardia, salmonella, cryptosporidium and campylobacter).

14. **Sediment** is a master stressor of waterbodies. It can smother the habitat of macro-invertebrates and shellfish in estuaries. In sufficient quantity it can also affect inshore fisheries and aquaculture. Sediment in lakes can introduce nutrients that support algal blooms and aquatic plant growth and can be nearly impossible to remove. Sediment can also exacerbate flooding by reducing river capacity and reduce hydro-generation storage.



15. Sediment processes are complex and driven by various types of erosion (including natural erosion); flow from critical source areas in cultivated land and intensive winter grazing; stream-bank/river-bed damage, especially by cattle; and poorly managed earthworks, roading and forest harvesting.



16. The best protection for erosion is mature forest cover. Mature indigenous forest typically provides the best protection, while pasture cover typically produces the most erosion and sediment during major rainfall events.

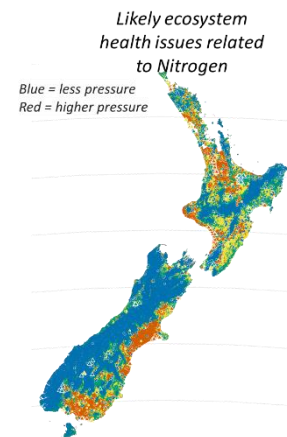


17. Sediment can also be generated from a point-source, such as from the earthworks associated with a housing development. These are typically well managed.
18. The vast majority of sediment contamination comes from diffuse discharges – that is discharges associated with human activity from across a landscape that cannot be traced back to a single point or land user. This means managing sediment through market-based instruments is impractical, and likely always will be.

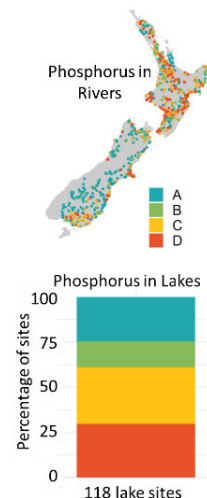
19. Nitrogen and phosphorus have a **fertilising** effect in



waterbodies. They support algal blooms, periphyton (slime), excessive weed growth and ultimately can cause lethally low oxygen levels in water when excessive vegetation decays. The amount of nitrogen in a water body that leads to these effects is often contested², as there are typically multiple factors at play.



20. However, what is uncontested is that there is a clear relationship between excessive nutrients and negative freshwater health.
21. Nitrogen can have chronic **toxic** effects on aquatic life at quite low levels and acute toxic effects on aquatic life at higher levels. At very high levels, nitrates can also be toxic to humans (though research is continuing into the long-term effects of lower levels of nitrates on colorectal cancer).
22. The nitrogen cycle is highly complex, and nitrogen can move between various states, some stable and non-leaching, others highly soluble. In the right conditions nitrates can be converted into harmless nitrogen gas in the soil or in wetlands.
23. Almost all nitrogen and phosphorus contamination comes from diffuse discharges.
24. As with sediment, managing nitrogen and phosphorus through market-based instruments is impractical at present. It may be possible (and as we discuss later, we think it may be essential in some cases) to manage nitrogen through market instruments in future. However, this depends on developing credible models/tools to estimate nitrogen discharges at the individual property scale³.

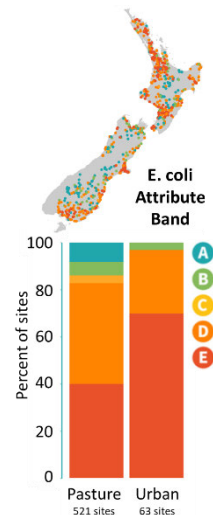


² For example, during the development of the NPS-FM 2020 the majority of scientists on the Science and Technical Advisory Group (STAG) recommended that the NPS-FM set a national bottom line of no more than 1 mg/l of dissolved inorganic nitrogen (DIN) in rivers (a NBL for N in lakes was set in the 2017 NPS-FM). A minority of the STG considered there was insufficient evidence to support a DIN of 1. In the end a DIN bottom line was not included – which was a contentious decision.

³ The model-based 'Overseer' tool has been used widely by farmers, consultants and researchers to estimate nitrogen inputs and outputs at farm and catchment scales. Some councils had incorporated Overseer modelling into their regulatory systems (e.g. Horizons, ECan). However, following questions about the accuracy of Overseer's estimates, its use in regulation is under question and it is unlikely to be an acceptable basis for market-based allocation approaches. No alternative model exists that could reasonably support market-based allocation of nitrogen.

25. **Biological contamination (as indicated by measuring *E.coli*) affects human health**, rather than the health of waterbodies and their ecosystems *per se*. People can be made sick through a range of pathways including casual contact (e.g. boating, fishing); food gathering; swimming; and drinking water.

26. Biological contamination is caused by faecal contamination from all kinds of warm-blooded animals, including livestock, waterfowl, feral animals, domestic pets, and humans. The greatest health risk is posed by human faecal contamination, however, as demonstrated by Havelock North, livestock contamination (in that case from sheep) can also have serious human health consequences.

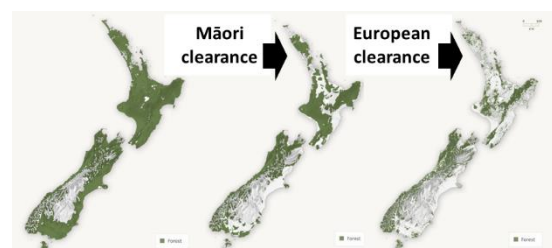


27. In some waterbodies, typically shallow lakes, waterfowl are a major source of contamination. However, by far the largest source of biological contamination is livestock. Because New Zealand farming systems are dominated by grazed systems, it is very difficult to limit contamination and there are few if any known mitigations that are cost-effective.
28. *E.coli*/biological contamination can be from point-sources (e.g. wastewater overflows) or diffuse discharges. However, the largest share and most difficult to control are diffuse discharges. As with other contaminants, managing *E.coli*/biological contamination through market-based instruments is not practical and likely never will be.

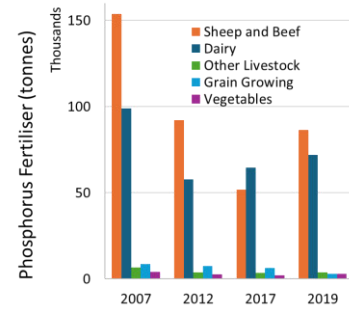
New Zealand's biggest challenge is how much contamination is being discharged into waterways (rather than how much water is being extracted) – and some of these issues have been around for a long time

29. There has been a lot of attention in recent years about the expansion of dairying and the affect this has had on waterbodies. While this has been significant, the reality is that degradation of waterbodies has a long history in New Zealand. We have characterised four key drivers:

- a. **Multiple waves of land clearance and drainage.** New Zealand's steep and young geology means that there are now millions of hectares of denuded hill country generating artificially high levels of sediment and *E.coli*/biological contamination. Draining wetlands has also removed natural water filtering and denitrification.

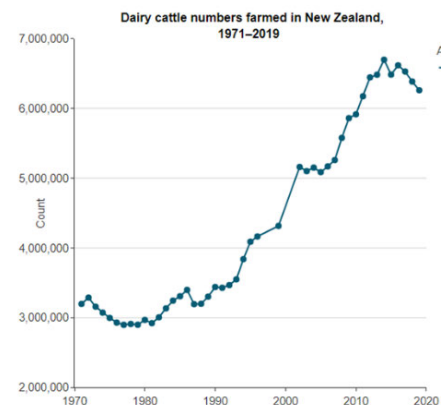


- b. **Top-dressing with Phosphate**, starting post-WWII. The combination of expand aviation and access to phosphate had a profound effect on Phosphate levels in New Zealand hill country soils and, as a result, waterbodies. Because phosphate is bound to soils, the same process that generate sediment tend to generate phosphate. Phosphate is a serious, long-term contaminant of lakes – once in lakes it is very hard to remove.

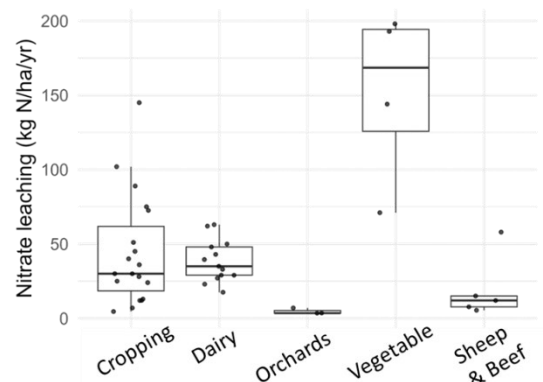


- c. **Poor control of point source discharges up to circa the late 1990s.** Many waterbodies were heavily contaminated for decades from point-source-discharges including: industry (e.g. meat processing, wood processing, chemical industries); urban wastewater; uncontained landfills; mining; and poorly managed earthworks. The resource consenting regime of the RMA has proven effective at controlling most such sources of contamination, though legacy contamination exists in some locations. Urban wastewater continues to be poorly controlled in some locations also.

- d. **Rapid expansion of the dairy sector from the 1990s to 2010s.** During this period the national dairy herd increased from ~3.2 million to ~6.5 million, the South Island dairy herd accounted for most of this increase; synthetic nitrogen fertilizer use increased by 600 percent and the area under irrigation increased by 90%, much of which into dairying. While there are signs of reducing herd numbers and nitrogen fertilizer use, very significant overallocation of nitrogen discharges continues in Canterbury and Southland, as well as parts of the Waikato and pockets elsewhere.



30. The table and graph provide typical discharges of contaminants from a range of primary-sector land uses in New Zealand. It is important to note that there can be considerable variation within each land use depending on the management decisions and knowledge of the land manager.

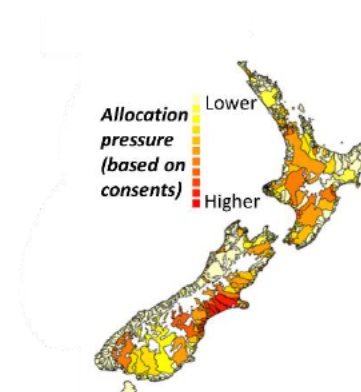


Classification

	AREA (MILLIONS HA)	N PER HA (KGS)	P PER HA (KGS)	SEDIMENT TONNES PER
DAIRY	2.3	38.0	0.9	4.2
SHEEP & BEEF	8.3	10.2	0.5	12.4
FORESTRY	1.9	2.0	0.2	3.2
NATIVE (FOREST & SHRUBLAND)	~9.0	1.2	0.1	2.6

31. We consider that New Zealand's most intractable freshwater issues - presenting the largest potential economic and social impacts - are driven, not by how much water is being extracted, but rather by how much contamination is being discharged into waterbodies from diffuse discharges. This is an overallocation of the assimilative capacity of waterbodies.
32. The ability to lawfully discharge to water (or to land which then discharges to water) is a highly valuable right and can affect land values by tens of thousands of dollars per hectare. If the ability to discharge is restricted by an environmental limit, this can set up competition between land users for the right to discharge that can have profound effects on an individual's land use options and land values. The larger the level of overallocation, the greater the likely impacts on individuals, communities and industries.
33. Generally, issues with overallocation of water takes are of a lesser scale and/or can be more readily resolved, because:
- councils have controlled most water takes through resource consents
 - levels of water take have generally been related to how much water is available (i.e. allocated within an estimated environmental limit)
 - water takes can be measured at the individual property scale and increasingly in real-time
 - extra water resources can be 'made' through investment in storage.
34. This is not to say there are not significant and difficult issues to deal with regarding water takes, including:

- addressing over-allocation of water takes in some catchments (e.g. Manuherekia in central Otago)
- high pressure on extraction of water resources in many key areas of production
- establishing policy settings that help finance and facilitate additional water storage and distribution, and
- ensuring water is available to optimise hydro-generation capacity.



Classification

35. However, compared to addressing large overallocation of contaminants, we consider matters related to water takes are generally possible to deal with using existing technologies and the policy tools available in the RMA.

Regional councils are responsible for managing and protecting freshwater but have often struggled to do so

36. The RMA makes regional councils primarily responsible for managing freshwater outcomes. They are required by section 6 of the RMA to recognise and provide for the preservation of the natural character of wetlands, lakes and rivers, and the protection of them from inappropriate subdivision, use, and development.
37. Sections 14 and 15 of the RMA prohibit people from taking, diverting or damming freshwater or discharging to freshwater (including through diffuse discharges), unless it is expressly permitted in a council plan, by a resource consent, in a national environmental standard or other regulation. There are some exceptions to these provisions, such as taking water for stock and personal needs.
38. Regional councils have struggled to meet their statutory obligations in respect of freshwater because:
- a. the RMA does not deal with diffuse discharges and cumulative effects well. It is designed to deal with individual large effects – such as a discharge from an industrial plant - rather than many hundreds of small discharges that can't be directly measured or traced back to an individual property
 - b. the planning process is too slow and litigious to respond to rapidly changing circumstances, such as the market forces that drove dairy expansion
 - c. the information and modelling upon which decisions must be made is necessarily uncertain and often contested, including through the courts
 - d. where resources are allocated through consents, these are difficult and costly to review as circumstances change, and first-in-first-served allocation has tended to lock in existing users and lock out new users, stifling innovation and efficiency
 - e. the approaches councils have typically relied on, such as voluntary industry programmes and catchment groups, have undoubtedly made improvements, but these have been overwhelmed by increasing discharges from the intensification of agriculture.

Successive Governments have intervened in councils' management of freshwater through national policy statements - which has become progressively more directive

39. In response, successive Governments developed freshwater national policy direction to impose requirements on councils' planning processes (with the previous Government extending this to include direct regulation of some land use activities).
40. At their core the 2017 and 2020 versions of the NPS-FM require(d) councils to:

- a. set environmental limits to achieve an acceptable standard of freshwater health and other freshwater values like human health (the environmental limits are called ‘target attribute states’ in 2020 and ‘freshwater objectives’ in 2017 versions of the NPS-FM)
 - b. set environmental limits at no worse than either the current state of the water or a nationally set bottom line (*note that because of the way the 2017 version was drafted, degradation from current state was possible in some circumstances – which was controversial*)
 - c. avoid any further over-allocation of freshwater and phase out existing over-allocation
 - d. develop plans that would, over time, work toward achieving those environmental limits
 - e. go through a process of engagement with communities and tangata whenua to set environmental limits, the timeframes for meeting those limits, and the methods (e.g. planning rules, policies and other methods) to achieve the limits.
41. The 2020 version was more directive on how councils must do the planning process and it set a single planning objective of achieving the freshwater hierarchy of values (first the health of waterbodies, then the essential needs of people, then all other uses). It also added 13 more attributes for councils to monitor and set environmental limits for, and it restricted the drainage of wetlands.
42. Neither the 2017 nor the 2020 version directed councils on what limits they should set (beyond the minimums), or how they should achieve them, or how long it should take to achieve them. However, both versions provided some guidance on these matters.
43. The 2017 version required councils to balance these decisions considering a range of objectives being environmental, economic and social.
44. The 2020 version has the hierarchy as the only objective, so instead it laid out a formal process allowing councils to set interim limits across multiple planning periods (which are typically 10 years each). There is no limit on how many planning periods councils could take to achieve the limits, though the direction in the NPS-FM is that this should be ‘ambitious but reasonable’.

Both NPS-FM versions set national bottom lines – being the lowest acceptable environmental limit – the most consequential NBLs are consistent between both versions

45. Many of the most consequential mandatory attributes and/or national bottom lines (NBLs) are largely unchanged between the 2017 and the 2020 versions. This includes nitrogen and *E.coli* attributes which are the most challenging to meet and could have the largest economic and social consequences.

46. Neither version requires councils to set environmental limits beyond what would occur in a natural state⁴.
47. In both 2017 and 2020 version, the NBLs are generally set at the threshold between a C and D band of freshwater health⁵. This means that a considerable amount of human impact on waterways is deemed acceptable in terms of the bottom lines set by central Government. Local communities may want a higher standard of environmental protection (e.g. freshwater health set at the B band and C band boundary), which councils are empowered to set should they wish (following due process).
48. We understand that as part of the plan-making process, some communities are indeed asking councils to plan for freshwater outcomes that are better than the NBLs in the 2017 and/or 2020 versions of the NPS-FM.

If waterbodies are already in a healthier state than the NBL then the current state becomes the bottom line - which means many catchments are essentially fully allocated

49. The NPS-FM 2020 requires councils to set environmental limits at not worse than the current state. This means that councils must develop plans that do not allow for further degradation. In practice this means many catchments are essentially full allocated for discharges of contaminants.
50. In turn, that means that to facilitate further development and intensification, councils need to be confident that the plans they develop will create enough headroom to accommodate any additional environmental impacts within the environmental limit.
51. Councils have many options to deliver such headroom, including upgrading wastewater systems (where a waterbody is affected by wastewater); a general lifting in practice such as through catchment group initiatives and/or freshwater farm plans; rules requiring reduced inputs or reduced discharges; rules on certain activities; and increasing dilution of nutrients such as through water storage that includes environmental flows or managed aquifer recharge.
52. The 2017 version was drafted in such a way to allow degradation in some areas if this was offset in improvement elsewhere in a freshwater management unit. It also allowed degradation provided freshwater health did not step from its current band into a lower band. This allowed for significant degrading of water in some cases. Both these provisions were highly contentious and were changed in the 2020 version.

⁴ this is an often quoted 'requirement' of the 2020 version, which is not correct. The 2020 version specifically provides that where natural levels of a contaminant are higher than the national bottom line, then the national bottom line doesn't apply. Naturally high levels of phosphorus, sediment or E.coli (e.g. from birds) could trigger this exemption.

⁵ For example, for the 'Total Nitrogen in Lakes' attribute the NBL falls at the threshold of the C and D band. **C Band** means ecosystems are moderately impacted as a result of nutrient levels well above natural conditions.

National direction told councils to set environmental limits, but it didn't provide any practical solutions to achieving those limits

53. Neither version of the NPS-FM created practical solutions to New Zealand's most difficult challenges with freshwater.
54. To draw an analogy to climate change, both versions of the NPS-FM told councils they needed to set environmental limits, being more-or-less the equivalent of New Zealand's national emissions target. But, having set such limits neither version set up any tools (like the ETS) or investment in solutions (like the agriculture greenhouse gas research initiatives) to help councils find and implement practical mitigations.
55. Moreover, freshwater management deals with four distinct types of contaminants being discharged into literally thousands of distinct receiving environments (as opposed to one receiving environment for GHG being the atmosphere). Further, the impacts of these discharges are often seen by communities living in close proximity to lake, river or estuary.
56. This makes freshwater management far more complex and technically challenging than managing greenhouse gases. Despite this, central Government has largely left councils to their own devices in attempting to find solutions, including within the limited policy mechanisms available through the RMA.

New Zealand's most economically important catchments are typically highly overallocated and would require widespread land use change - unless new solutions can be found

57. Most regional councils have been working to understand where contaminants are coming from and to quantify the contaminant load reductions needed in catchments and sub-catchments to meet environmental limits. Councils have also been working through the level of water takes and developing new ecological flow regimes where necessary.
58. Councils typically talk of three types of catchments:
 - Type I: Catchment is within environmental limits and water-related values are met
 - Type II: Catchment is outside environmental limits / values not being met, but these can be achieved in the foreseeable future with known and emerging mitigations and generally within the existing land use patterns
 - Type III: Catchment is heavily overallocated and a significant degree of land use change or major farm system change is likely to be necessary (unless new technologies and mitigations are developed).
59. With respect to sediment, phosphorus and nitrogen, most catchments in New Zealand are either Type I or Type II (*E.coli*/biological contamination is the exception as discussed later). There are relatively small areas of Type III catchments for these three contaminants, because:
 - a. two of the three contaminants – sediment and phosphorus - can to a large degree be addressed by practice change and adoption of known mitigations

within existing land uses (for example supported by freshwater farm plans and catchment groups)

- b. for the remaining contaminant – nitrogen – a large proportion of catchments are not likely to be overallocated, and in those that are, a proportion should be able to be addressed through practice change and known and emerging mitigations (e.g. supported through freshwater farm plans and catchment groups)

60. Many catchments overallocated for water takes should be able to be addressed through a combination of: practice change/efficiency; water storage and managed aquifer recharge; and reduced demand for water as a result of some land use change (e.g. toward fruit crops).

61. However, major challenges remain in that:

- a. **There is very high N overallocation in some key catchments.** While only around 4% of New Zealand is likely Type III catchments for nitrogen overallocation – these areas contain some of New Zealand’s most productive and expensive land (Canterbury plains, and parts of Waikato, Manawatu, Hawkes Bay and Southland).

In many cases very large reductions in N contaminant loads are needed, well beyond any mitigations currently available. The implication is that, unless new mitigations can be developed (something that is not being prioritised at present), widespread conversion from intensive uses like dairying to dry stock and even forestry will be necessary over time, with commensurate effects on economic activity, communities, and loss of capital value.

Moreover, these areas are typically where urban expansion is happening. If that urban expansion requires wastewater discharge to land or rivers, and these discharges are unmitigated (such as through a wetland), then that would add to overallocation of nutrients, something councils are required to avoid under both the 2017 and 2020 versions of the NPS-FM.

- b. **Implementing practice changes and known mitigations to make the necessary improvements in Type II catchments will still be challenging** and require significant investment and management focus from landowners.

For example, the Kaipara Harbour currently receives seven times more sediment than its natural level (700k tonnes per year compared to 100k tonnes natural state). This is seriously impacting the

We know how to reduce erosion



Pole planting (poplars or willows) can reduce the risk of land slips by up to 70%



Afforestation reduces soil loss by 90% compared with pasture



harbour, including its critical role as nursery for the North Island Snapper fishery. The Kaipara Moana project is aiming to reduce that load to a more manageable 300k tonnes per year. This will cost an estimated \$300 million to achieve; \$100 million of which is a subsidy from the Government to landowners via the Jobs-4-Nature programme.

MfE has previously estimated that the mitigations needed to achieve minimum environmental limits for sediment (and by extension phosphorus) would cost each hill country farm somewhere between \$80k and \$150K (though this would likely be spread over many years as financial resources allowed).

There are currently around 1.2 million hectares of highly erodible land outside the conservation estate without tree cover. This land is not suitable for pasture, nor is it likely to be well suited to commercial forestry. However, re-establishing indigenous forest on such land can cost \$40k+ per hectare.

- c. **There are still significant issues with how resources have been allocated** and whether they are allocated to the most efficient uses.

Most freshwater discharge rights in New Zealand are not allocated via resource consents, but are instead allocated by default as a by-product of certain land uses being permitted. For example, if dairying or sheep and beef farming or vegetable production or forestry are permitted activities in a region, then the contaminants associated with those activities are automatically allocated to the landowners undertaking the activities.

As noted in paragraph 50 above, many catchments in New Zealand are essentially fully allocated, meaning that further development and intensification is likely to be possible only if:

- some resource is taken from existing users and reallocated to other land uses (including urban development) – which is difficult legally and highly contentious
 - policies and rules are implemented that mean there is a general lifting in land management practice meaning headroom is created for allocation to new activities – which will only be effective where modest reductions in discharges are needed, not major reductions
 - the new activity uses less resource than the activity it is replacing (such as replacing dairy production for certain types of horticulture like fruit production)
- d. ***E.coli* / biological contamination is a major issue** – with nearly all the North Island's pastoral-dominated catchments being Type III, as well as most pastoral catchments in Southland and the Canterbury plains. There are few if any cost-effective mitigations for *E.coli*/biological contamination.

Modelling undertaken by MfE suggests that meeting the C-D band threshold for

*E.coli*⁶ would require very widespread conversion of hill country farmland to forestry; something that is both impractical and unreasonable.

In the lead up to the 2017 general election, proposed changes to the NPS-FM policy settings for *E.coli* proved highly controversial.

MfE has commissioned research to the effectiveness of *E.coli* as a proxy measure for detecting water-borne pathogens. 9(2)(f)(iv)

Notwithstanding any review, finding solutions to *E.coli* is likely to remain a key issue.

Regulation needs to be backed-up with a much greater focus on finding and rolling out practical, meaningful solutions

62. The Government's programme to review freshwater regulatory settings should:

- a. provide more regulatory certainty that decision makers must balance economic and social impacts when setting environmental limits and expected timeframes for achieving those limits
- b. clarify the priorities between competing objectives in some locations such as freshwater outcomes with housing, renewable energy, vegetable supply, and develop other critical infrastructure⁷
- c. reduce complexity and costs in implementation
- d. remove nationally-set activity regulations and transfer these to other, more flexible, policy mechanisms such as a revised freshwater farm plan system.

63. However, we do not consider there is any formulation of regulatory change that, on its own, will be effective in addressing freshwater issues while facilitating the expansion of agriculture production and significant growth in export volumes. That is because:

- a. councils and communities now have a far better understanding of the state of freshwater, the drivers of freshwater outcomes, and the magnitude of change needed to achieve reasonable environmental outcomes⁸
- b. it is likely that the public will continue to be highly engaged in matters affecting the health of rivers, lakes and estuaries

⁶ The C-D band threshold implies that anyone having casual contact with a waterbody (fishing, boating, food gathering) would, at random, be made sick 3 percent of the time on average.

⁷ Note that the 2020 NPS-FM did this in a limited way in respect of waterbodies affected by the six major hydro-schemes and vegetable growing in two key areas

⁸ For example the magnitude of nitrogen load reductions need for a desired state and sources of nitrogen can now be modelled for every river reach in New Zealand.

- c. internationally, some jurisdictions like New Zealand are requiring farming to address their impacts on water (including nitrogen discharges). It is possible that farmers and consumers in such jurisdictions will apply pressure requiring imported products to be produced using similar environmental standards.

We propose the Government's regulatory changes be supported with a new programme to develop practical, meaningful solutions to overallocation, including potential new approaches to resource allocation

64. We recommend the Government adopt a three-pillar strategy for freshwater, based on:

- Pillar One: Completing the immediate regulatory changes, as signalled in the Coalition agreements and relevant manifesto commitments
- Pillar Two: Establish a multi-disciplinary and enduring work programme to develop effective and efficient solutions to New Zealand's freshwater challenges (discussed below)
- Pillar Three: Develop policy options to address matters of resource allocation for possible inclusion in RM Phase 3. This might also consider key matters of Māori rights and interests in freshwater.

65. Our proposed Pillar two to establish an enduring, solutions focussed work programme has not been done before for freshwater (though something similar is a cornerstone of agricultural climate change strategy).

66. We consider that such a work programme could take the Government's approach to freshwater policy beyond the cycle of regulatory resets and instead focus on supporting growth of the primary sectors while simultaneously making significant and efficient improvements in water outcomes.

We think a focus on new solutions is essential as councils do not have the policy levers, capability or commercial skills to address these challenges

67. Councils do not have the necessary policy levers⁹, financial capacity, science and innovation capacity and commercial relationships and skills to achieve freshwater outcomes in Type III catchments on their own.

68. As discussed above, achieving outcomes in Type II catchments will also be a significant challenge that councils will struggle to meet alone.

69. Each of the major contaminants will need its own tailored work programme. For example:

- a. *E.coli*/biological contamination will likely need greater emphasis on new science and innovation to identify and prove new mitigation techniques and technologies.

⁹ For example, using resource consents and/or reviewing consent conditions is highly unlikely to lead to efficient outcomes when very large reductions in nitrogen discharges are needed. More sophisticated market-based instruments may be needed to manage down discharges through incentivising the development and adoption of new mitigations and farming systems.

- b. Reducing nitrogen loads – while supporting production and profitability – will likely need a similar focus on new techniques and technologies.
 - c. Sediment has reasonably well understood mitigations, but policy frameworks and incentives may be the key focus for a work programme. For sediment this should include policies that link freshwater actions with the financial benefits that could be generated through climate mitigation or enhancing biodiversity.
70. In addition to contaminant-focussed work, the work programme would also need to look at whether there are system-wide needs that are common across the freshwater management system. This might include matters such as:
- a. how New Zealand could leverage proven freshwater/environmental outcomes to meet consumer demands and market access
 - b. creating faster and cheaper ways for new technologies to be commercialised and adopted.

The biggest challenges are overallocation of contaminants – so we suggest starting work on these

71. As discussed above, the challenges in addressing overallocated water takes are likely more tractable than for contaminant discharges, and therefore the case for focusing a work programme on water takes may be less compelling, at least initially.
72. This will need to be re-evaluated once councils have established new ecological water flow regimes and can then determine the level of overallocation at a catchment scale.
73. It may be that addressing highly over-allocated water takes needs to be added to a work programme later. It may also be that work under proposed Pillar Three: policy options for allocation, may be relevant to finding solutions to overallocation of water takes (for example, market-based allocation of water takes could help incentivise adoption of more efficient technologies).

Solutions will need to go beyond science and technologies – new approaches allocation and integrating policy will also be needed

74. As noted above, the work programme would need to be multi-disciplinary. It could cover areas such as:
- a. **New mitigations, technologies and management techniques** to reduce resource use and environmental impacts
 - b. **New policy instruments and innovative policy approaches** to drive efficiencies (especially dynamic and allocative efficiencies) in resource allocation and use. New and innovative policy approaches may be particularly relevant where traditional approaches of rules and/or consenting decisions and consent reviews are inadequate
 - c. **Decision support tools and information needs** - tools and information / science needed to make some policy/market approaches possible. This should at least include consideration of farm-level tool capable of estimating N discharges that would be suitable for inclusion in market/regulatory settings

- d. **Accessing the value of environment services** - initiatives that allow landowners to link their freshwater actions to the financial benefits from the provision of environmental services like climate change mitigation/carbon sequestration and biodiversity
- e. **Advisory and support services** that can assist landowners to diversify and/or adopt new farm and land management systems
- f. **Regional approaches to transition and new economic development pathways** - supporting the development of alternative land uses and business opportunities with low environmental footprint
- g. **Solutions for urban areas** – improving water in urban areas raises particular challenges that will need tailored solutions.

We think the Government would need to initiate and support a work programme – but it would only succeed with buy-in from industry

- 75. If Ministers were interested in pursuing this proposed strategy, officials could engage with primary-sector industry bodies and commercial interests - as well the science and innovation sector, councils, and freshwater iwi chairs technicians - to undertake an initial scoping exercise and develop further advice on options for resourcing and governing such a work programme.
- 76. To be effective, Ministers would likely need to play an active role in introducing the concept and setting expectations with the sector.
- 77. Our expectation is that the primary sector would play a major role in resourcing at least the technology aspects of the proposed work programme. Some level of new Government resourcing may also be needed given that MfE has no additional capacity for such a work programme.