7 Freshwater

This chapter lists the questions about freshwater that we would like addressed. We present a summary of the analysis of the official data that addresses those questions. We then outline the initiatives that have been identified to address our freshwater information needs.

> Fresh water is among our most valuable natural assets. New Zealand's rivers, streams and lakes are highly valued for recreational activities, providing a safe drinking supply and sustaining natural ecosystems that are home to many of New Zealand's native species.
>
> Fresh water is a vital part of the New Zealand economy: it is used to irrigate crops and pastures, dispose of or dilute trade wastes and sewage, and produce hydro-electric energy.
>
> Water is also a fundamental taonga (treasure) for Māori. Māori have cultural, historical and spiritual links with many of the country's springs, wetlands, rivers, hot pools, lakes and also value having healthy water bodies for mahinga kai (customary food and resource gathering) (Ministry for the Environment, 2007).

Freshwater questions

This section presents the enduring questions and the supplementary enduring questions on freshwater.

Enduring questions

How is the quality, abundance, and use of New Zealand's freshwater changing, and what is the impact on ecosystems and humans?

Supplementary enduring questions

A. What is New Zealand's freshwater[1] quality[2], what are the spatial and temporal trends,[3] and how are these affected by climate change, human activity, and other pressures?

B. What is the quantity (stocks) of New Zealand's freshwater, what are the spatial and temporal trends, and how are these affected by climate change, human activity, and other pressures?

C. What is the use (flows) and allocation of our freshwater, what are the spatial and temporal trends, and how are these affected by climate change, human activity, and other pressures?

D. What impact does the change to quality, quantity, and use of freshwater have on ecosystems and humans?

E. What is the health[4] of freshwater and freshwater mahinga kai (customary food gathering areas and practices) from a Māori perspective[5], and how and why is this changing?

F. What, where, and how is environmental protection effort[6] being done to maintain and improve freshwater?

Notes

1. Freshwater includes (but is not limited to) rivers, lakes, wetlands, rain, snow, ice, and ground water.

2. Quality includes measures of nutrient, heat, organic, sediment, macro-invertebrates, and bacteriological quality. Emerging contaminants, such as endocrine disruptors, may also be considered.

3. Trends include the general directions of the past and present, and predictions of future possibilities.

4. Health includes the look, sound, smell, and feel of freshwater, uses of the river, the abundance and diversity of mahinga kai, water quality, riverbank condition, water flow characteristics, and safety of the water to drink and other indicators.

5. At the catchment and site level.

6. Environmental protection effort includes remediating environmental damage, resource management, expenditure, areas protected under regulation and legislation, damage avoidance, research, and minimising natural hazards.

Gap analysis

Table 14 summarises how well official information (including Crown research institute data) informs the supplementary enduring questions on freshwater. See appendix 3 for details of the analysis process.

Table 14

How well official data informs supplementary enduring questions on freshwater

Supplementary enduring question (SEQ)	Question topic	Level at which official data informs SEQ
A	Freshwater quality	Medium
B	Freshwater quantity (stocks)	Medium
C	Use and flows of freshwater	Low
D	Impacts of changes	Medium
E	Health of freshwater and mahinga kai	Low
F	Environmental protection effort	Low

We scored four data sources as moderately informing the supplementary enduring questions (none scored highly):

- Freshwater ecosystems of New Zealand geo-database (FENZ)
- State and trends in the river water quality
- Snapshot of water allocation in New Zealand
- Snapshot of groundwater quality in New Zealand.

Freshwater initiatives

This section presents the freshwater initiatives by priority and a discussion of each in detail.

FW1 Create a freshwater national geospatial platform

The highest-scoring initiative for freshwater is to create one national geospatial platform linked to nationally consistent environmental reporting, applicable first to central government and second to local government. This initiative can be applied to all topics and many environment domain plan initiatives.

Geospatial information describes the location and names of features beneath, on, or above the earth's surface. At its simplest, this can mean the basic topographical information found on a map, but also includes different location-related datasets combined into complex layers that show information such as land use and population density.

Land and Water New Zealand's (LAWNZ's) web interface has the potential to be the national geospatial platform. LAWNZ is a regional council-led initiative that already displays freshwater information from all regional councils. The Ministry for the Environment is currently holding talks with regional councils to see if national-level data could be displayed on this same web platform. The datasets used by the LAWNZ website are held by regional councils and are collected and stored using different methods. However, multiple initiatives are under way to increase the consistency and encourage open access and data reuse.

An important current database is the Freshwater Ecosystems of New Zealand (FENZ) geo-database. FENZ provides an independent national representation of the biodiversity values and pressures on New Zealand's rivers, lakes, and wetlands.

Additionally, the New Zealand Geospatial Office, part of Land Information New Zealand, provides significant geospatial information.

Doing this initiative will have the following key benefits for New Zealand:

- geospatial information supports many businesses, government, and community activities
- use and reuse of this information has significant productivity-related benefits.

Government topographic data forms a common base layer for many location-related datasets used by government and non-government organisations. The New Zealand Government has invested heavily in collecting geospatial information, but at present using this information to its full potential is often difficult. For example, linking separate pieces of information about the same location is sometimes impossible because of the different ways the location is described.

The New Zealand Geospatial Office's goal is to overcome these issues by promoting the collection, management, and use of geospatial information to build a common base of data so people and organisations can use them for many applications.

On ownership or governance, freshwater communities of interest should contribute to forming the governance structures, which will define and agree on standards, fund their development, approve them, drive their evolution, and certify their application.

FW2 Identify and assess freshwater values

This initiative concerns the many values surrounding freshwater, specifically which values are associated with fresh waterways, and how well we are protecting these values.

To achieve and measure a coherent national set of values, including Māori values, this initiative requires:

- identifying the many values related to freshwater
- having accessible databases holding freshwater values data
- understanding the status of the resource against values at the appropriate scale and site
- having values-data available to inform good water decisions and making trade-offs between values, for example, the decisions on one value compared with another.

Identifying and assessing values requires building a national picture of freshwater health from a Māori perspective, and linking that with other values, including other cultural values, and those surrounding fisheries, swimming, economic use, and other ecological values, which all need to be considered together. Currently, there is work under way by the Ministry for the Environment on the proposed National Objectives Framework which has strong links to freshwater values.

This initiative should recognise the development and adoption of a consistent typology of values by the Land and Water Forum and National Objectives Framework. This work has helped to come up with a coherent and consistent set of value names, and can inform an agreed list of values and sub-values.

Initially, it is necessary to confirm agreement on value names and meanings for such freshwater elements as:

- biodiversity
- wild and scenic rivers
- recreational use, such as white water rafting
- tangata whenua
- hydropower generation
- other river lakes and stream use.

After agreeing on value names and meanings it is necessary to:

- identify all values among the different groups and sectors
- assess where those values are held throughout New Zealand
- establish databases with values information
- analyse and assess how well we are meeting those values.

FW3 Reassess information to answer supplementary enduring questions

Reassess the information available to answer the enduring and supplementary enduring questions, to more fully answer the freshwater topic questions. This initiative could be extended to reassess the supplementary enduring questions.

This reassessment could confirm:

- what information is available
- at what scale this information is available
- what's missing
- what's needed
- what mechanism exists for prioritising further initiatives.

Additionally, this initiative covers designing a system to ensure the right questions are asked, establishes the solutions to data needs, and include scale and temporal answers to the enduring questions.

Initially, assessments of how much water is being used by industry (by sector) and households are required. It is conceived that new information from Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 on actual use will contribute to meeting this objective, and enable answering the supplementary enduring questions to some degree.

This initiative requires integrating freshwater quality and quantity monitoring, reporting, decision making, and policy making, and highlighting questions such as:

- What information is needed by whom and where and why and at what scale and timeframe?
- What do we need to know to answer the supplementary enduring questions?
- Is water available for use?
- Is water supply and use fit for purpose?
- What will the water supply regime cost?

In particular, building a national picture of environmental protection effort on freshwater may become achievable – from compiling a new national dataset of these based on existing information. Environmental protection effort reporting will use the System of Environmental-Economic Accounting (SEEA) standard.

FW4 Expand data governance

Expand governance over freshwater data. Governance is an initiative present in many of the environment domain plan's 10 topics. Establishing data governance creates an enabling structure to:

- govern the collection and storage
- share the costs
- collect and store the data
- ensure data and database management.

Consolidating on previous efforts, a governance structure at the national level for freshwater builds on other work, such as the National Environmental Monitoring and Reporting project (project participants include the Ministry for the Environment (MfE), National Institute of Water and Atmospheric Research (NIWA), GNS Science, and Opus), Land and Water Forum, and the National Environmental Monitoring Standards initiatives. All of these projects involve regional council groups.

The governance group may include the Natural Resources Sector, Land and Water Forum, Crown research institutes, regional councils, National Environmental Monitoring and Reporting project, and other interested parties. This work may start by building the governance structure at the national level then expanding to fully include all regional levels.

Governance should:

- address the issue of water management, which is currently hindered by being inherently integrative but seldom integrated
- allow for adaptive freshwater management, reversible allocation, use of the precautionary principal which requires information and implies uncertainty

- provide for integration of quality and quantity in monitoring, reporting, decision-making and policy-making
- provide honesty and openness in providing freshwater information
- balance all user needs and timeframes in water management.

Issues for governance include financing data collection and data management. When funds decline, answering questions such as:

- What data will we have from the existing data collection?
- What datasets should be terminated or interrupted given enduring questions/priorities?
- What is happening now to assist in managing the issue?
- Where does funding come from (eg water users, government)?

FW5 Establish key indicators

Establish a set of key indicators for understanding freshwater, including:

- analysing the cost effectiveness of water use
- conducting sensitivity analysis of freshwater issues and hot spots
- observing trends in water quality and ecosystems health
- reporting on what people care about, including swim-ability, fish-ability, and water drinkability (work under initiative FW2, identify and assess freshwater values, will inform this question).

This is a wide-ranging initiative that reaches across all freshwater enduring questions.

To be very useful, key indicators information should be made available in a timely fashion and in a suitable format.

Key indicators may possibly include proxy indicators such as those for drivers of water quality. A possibility is water quality based on milk-solid production and correlating this to observed trends in water quality and surrounding ecosystems. Such indicators may inform on the links between land use and water quality.

Key indicators should be representative of all types of freshwater including:

- rivers, streams, and water races
- lakes and artificial lakes
- groundwater
- freshwater wetlands
- snow and ice.

Key indicators inform the enduring questions and supplementary enduring questions, as well as stakeholders and people who value freshwater. Important work for this initiative was started in the National Environmental Monitoring and Reporting (NEMaR) indicator and variable work, and continues in the National Objectives Framework project.

FW6 Produce a SEEA water flow account

For Statistics NZ to undertake a System of Environmental-Economic Accounting (SEEA) water flow account. The benefit of using the SEEA framework is that reports on water use in the environment and economy are on an industrial-sector basis.

This SEEA account would be undertaken by Statistics NZ, requiring data from regional councils and assistance from the Ministry for the Environment (MfE). New information on

freshwater use is being collected through measuring and reporting water takes according to the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010.

The benefit of this initiative to New Zealand is having an assessment of how much water is being used by industry sector and households, so policy and management decisions may be better informed. This information will be useful for reporting on Green Growth and Sustainable Development.

FW7 Agree on categorisation systems

Achieve comprehensive and agreed categorisation systems.

By achieving agreement on categorisation systems, having documentation, and disseminating categorisation systems, New Zealand will benefit because everyone understands concepts and terms the same way.

For example, for question E (What is the health of freshwater and freshwater mahinga kai from a Māori perspective and how and why are these changing?) there is a need for systems to categorise mahinga kai / health / matauranga – but at what scale do the categories apply?

Agreed categorisation systems will require extensive consultation, and reference to current categorisations, to be accepted. This work will build on current well-developed frameworks and categories.

Agreement and documentation of any agreement will be followed by dissemination.

The following terms are examples of what could be included in this categorisation initiative, where further agreement in meanings would be useful. These examples could benefit from agreement on clear definitions together with inclusions and exclusions:

- biodiversity
- wild and scenic rivers
- recreational use such as white water rafting
- tangata whenua
- hydropower generation.

This initiative could start with including the existing typologies (classifications) of rivers, lakes, and wetlands included in the Freshwater Ecosystems of New Zealand geodatabase and elsewhere in New Zealand.

FW8 Produce a SEEA environmental protection account

For Statistics NZ to undertake a SEEA environmental protection expenditure account. The benefits of using the SEEA framework include reporting environmental protection effort in the environment and economy on an industrial sector basis.

Environmental protection effort aids the analysis of the impacts of economic and social policy on the environment. In addition, it can be used to infer the economic response to environmental policies and regulations. Environmental protection effort also enables the calculation of the contribution of the 'environment industry' towards gross domestic product.

For Statistics NZ to undertake this work, coordination with Ministry for the Environment and access to in-depth environmental protection effort information from all councils and organisations undertaking environmental protection effort would be required.

FW9 Conduct cross-dataset reporting

Conduct cross-dataset reporting to enable reporting that is publicly accessible. Linking datasets allows for assessing structured data from various sources so they can be interlinked and become more useful. More value from data and potential large-cost savings are possible with this initiative.

This initiative can be applied to all topics and many environment domain plan initiatives, and would require extensive coordination and communication. Additionally, the linking of data to address values in reporting is seen as a priority initiative (see FW2, identify and assess freshwater values).

FW10 Carry out forecasting modelling

Carry out forecasting modelling, in particular to conduct national modelling including predictive forecasting and analysis. There would be a need to develop the ability to report on this and emphasise forecasting analyses during communication.

This initiative seeks to develop modelling for predictive forecasting. Also included in this initiative is developing a suitable communication and reporting tool.

FW11 Create a values inventory

Extends the work of initiative FW2, identify and assess freshwater values, by creating a values inventory. This inventory will include different regional and societal values.

This initiative seeks to bring together all the wider values of biodiversity, such as wild and scenic rivers, recreational use of freshwater, hydropower generation, tangata whenua, and other values held in New Zealand.

FW12 Develop an integrated catchment management tool

Develop an integrated catchment management tool that can establish cause and affect relationships. This initiative is a large task with extensive coordination and causational analysis required.

The benefits may include a better understanding of all factors in catchment management. It will also improve decision-making.

FW13 Produce a SEEA water monetary stock account

For Statistics NZ to undertake a SEEA water monetary stock account. The benefits of using the SEEA framework include reporting water monetary stocks in the environment and economy on an industrial sector basis.

Historically, water has been treated as a free and often unlimited resource, but irrigation, industrialisation, and population growth are leading to increased demand and competition. Allocation of water rights, pricing, pollution, and conservation are becoming increasingly important.

For Statistics NZ to undertake this work, coordination with Ministry for the Environment and in-depth water monetary stocks information would be required from all councils and organisations involved in water valuations and water market activity.

FW14 Establish a national map of water flow lag times

Create a national map of water flow lag times, including groundwater. This in turn will allow us to have a national map of lag times for flows of water above and below ground.

This national map will add to the understanding of the hydrological flow cycle and will benefit freshwater management in New Zealand.

This initiative requires extensive CRI and regional council involvement.

FW15 Undertake water flow lag-time predictions

Undertake water flow lag-time predictions, including groundwater, and predicting the future state of lag times. This initiative requires extensive Crown research institute (CRI) and regional council involvement. It also relates to initiative FW14; establish a national map of water flow lag times.

Freshwater initiatives table

Table 15 lists the freshwater initiatives by priority, estimates of their complexity, and the supplementary enduring questions they address.

Table 15

Freshwater initiatives by priority, complexity, and supplementary enduring question (SEQ) addressed

Initiative number	Initiative name	Priority	Complexity	Helps inform which SEQ
FW1	Create a freshwater national geospatial platform	1	Highly complex	All
FW2	Identify and assess freshwater values	2	Complex	D, E
FW3	Reassess information to answer supplementary enduring questions	3	Complex	All
FW4	Expand data governance	4	Complex	All
FW5	Establish key indicators	5	Complex	All
FW6	Produce a SEEA water flow account	6	Complex	B, C, D
FW7	Agree on categorisation systems	7	Highly complex	All
FW8	Produce a SEEA environmental protection account	8=	Moderate	F
FW9	Conduct cross-dataset reporting	8=	Moderate	All
FW10	Carry out forecasting modelling	8=	Complex	All

Table continued next page

Table 15 continued

Freshwater initiatives by priority, complexity, and supplementary enduring question (SEQ) addressed

Initiative number	Initiative name	Priority	Complexity	Helps inform which SEQ
FW11	Create a values inventory	11=	Highly complex	All
FW12	Develop an integrated catchment management tool	11=	Highly complex	All
FW13	Produce a SEEA water monetary stock account	11=	Complex	B, C, F
FW14	Establish a national map of water flow lag times	14=	Complex	B, C, D
FW15	Undertake water flow lag-time predictions	14=	Complex	B, C, D