

MĀTAKI

ENVIRONMENTAL

RESEARCH • STRATEGY • REGULATION

Environmental data and information in local government

Survey and stocktake

November 2024

Executive summary and recommendations

Environmental data and information help us to understand the natural world and minimise the impact of human activities on it and identify future challenges. Local government collects and manages a wide variety of data, but the scope, depth and quality of that data and information is poorly understood outside the sector. Improving the understanding of environmental data and information in local government will help support effective system change.

The purpose of this project is to support the wider work programme of the Parliamentary Commissioner for the Environment with respect to environmental data. This report sets out the findings of the survey and stocktake of a subset of councils, which inform answers to the following questions:

1. What information is currently collected or held by local government entities within each domain?
2. Why is the information collected? Is it a requirement for legislative, compliance monitoring or enforcement purposes, or is it collected for another function/purpose?
3. What methodology/standards are followed? Are there quality assurances/quality controls in place?
4. How is the data stored, accessed, and distributed? What constraints are there to sharing or accessing information?

A digest of key insights is included as Table 1.

The scale of data and information about the environment which is held by local government is immense in aggregate. Water, land, biosecurity and biodiversity data however enjoy different levels of priority. Councils recognise the importance of Mātauranga Māori data but may need further support in understanding the best ways to support its collection and application to planning and other functions in the future.

The stocktake provided a comprehensive and empirical picture of the land, water, biodiversity and biosecurity data held by the five subject councils. Bay of Plenty Regional Council identified 67 data and information sources, some of which clumped significant work programmes across all four topic areas. A smaller regional council – West Coast - identified 18 data and information sources for the stocktake and acknowledge that they hold very limited amounts overall. Most of their data and information applies to water and where possible is shared to LAWA.

Marlborough District Council, which has dual unitary functions, identified 112 data and information sources. The council manage a wide range of internal IT solutions to manage the sources. Tauranga City identified 55 data and information sources, deep diving on matters required to perform their role, atop considerable regional data from Bay of Plenty Regional Council. Tararua identified 5 data and information sources, with 4 relating to water. No sources were identified for biosecurity or biodiversity, for which the council is wholly reliant on its regional council and others.

Regional sector data are heavily relied upon by other actors in the system, but distribution of costs and benefits is uneven (i.e. regional ratepayers primarily fund it). Councils rely on data and information from other actors in the system and are vulnerable to changes made in the management

of that data. Central government could better support collaboration and consistency in the local government sector through funding and direction.

Statutory drivers are key to ensuring information is collected, particularly in resource constrained environments. Councils with very limited resources rely on statutory drivers to justify investment and staff time to manage. There are minimum specific obligations for data collection by local government, so 'non-statutory' data should not be thought of as spurious or unnecessary. Of the four areas of data and information explored, biodiversity is least well represented likely due to lower relative priority, primacy of statutorily driven collection and differing perceptions of roles and responsibilities.

Councils recognise the importance of robust data and information and are likely to adopt standardised methods and quality assurance steps as they become available. Where they are available, they tend to be readily adopted (e.g., standards for collection of water quality data). The stocktake demonstrated that many records do not have formal quality assurance steps and rely heavily on internal peer review. The National Environmental Monitoring Standards, where they exist, were frequently referred to, as was the use of accredited laboratories for analysis.

A lack of confidence in the veracity of data or information is likely to constrain its further use, and as such there is significant sector support for the advancement of projects that standardise data and information management, particularly with centralised funding and support.

The greatest challenge for data and information sharing is its storage and management. Other constraints on sharing of data include privacy and commercial sensitivity. ICT solutions on the market are seldom fit for purpose, requiring significant and costly customisation to enable usage and to maintain over time. Data and information are complex and multi-dimensional, requiring significant capacity and capability to orchestrate effectively. Councils have made considerable progress on standardisation of the various parts of the data value chain through informal collaboration, but a more structured approach is required. Shared procurement and coordination for systems and system maintenance has already occurred (e.g. Iris, LAWA) but more is needed.

An opportunity in the system for stronger and more effective centralised mandates is clear to improve consistency and coverage and ensure underlying standards of management are met. Resourcing is very uneven across the sector and current cost sharing arrangements likely require review. Suggestions for improvement include technological improvements but also span ways of working. Improving collaboration and sharing is seen as a key area for improvement and is likely to require additional funding and improved central government participation and leadership.

Doole M (2024) *Environmental data and information in local government: survey and stocktake*. Report prepared for the Parliamentary Commissioner for the Environment. November 2024, Mātaki Environmental Ltd. Wellington, NZ

Digest of key insights (based on the key questions mentioned above)	
Q1	- Local government collects a significant range of data and information across land, water, biodiversity and biosecurity, but expends different levels of energy on each. - Of the four areas of data and information explored, biodiversity is least well represented likely due to lower relative priority, primacy of statutorily driven collection and differing perceptions of roles and responsibilities. - Regional sector data and information are heavily relied upon by other actors in the system, but distribution of costs and benefits is uneven (i.e. regional ratepayers primarily fund it). - Central government could better support collaboration and consistency in the local government sector through funding and direction. - Councils rely on data and information from other actors in the system and are vulnerable to changes made in the management of that data. - Councils recognise the importance of Mātauranga Māori data but may need further support in understanding the best ways to support its collection and application to planning in the future.
Q2	- Statutory drivers are key to ensuring information is collected, particularly in resource constrained environments. - Councils with very limited resources rely on statutory drivers to justify investment and FTE to manage. - There are minimum specific obligations for data collection by local government, so 'non-statutory' data should not be thought of as spurious or unnecessary.
Q3	- Councils recognise the importance of robust data and information and are likely to adopt standardised methods and quality assurance steps as they become available. - A lack of confidence in the veracity of data or information is likely to constrain its further use. - There is significant sector support for the advancement of projects that standardise data and information management, particularly with centralised funding and support.
Q4	- ICT solutions on the market are seldom fit for purpose, requiring significant and costly customisation to enable usage and to maintain over time. - Innovations include technological improvements but also span ways of working. Improving collaboration and sharing is seen as a key area for improvement and is likely to require additional funding and improved central government participation and leadership.

Table 1 Digest of key insights for quick reference

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Overview

Introduction

A significant proportion of environmental information is gathered and held by local government (regional councils, unitary authorities, and territorial local authorities) through their statutory and non-statutory functions. As a step to developing a national picture of the range of environmental information being collected and how improvements can be made, this work seeks to better understand existing environmental information collected by local government.

A good understanding of the current state of environmental information is needed if we are to identify and target improvements afforded by new and emerging environmental monitoring technologies. This report sets out a brief background to the issues related to environmental data and information in local government.

Background and alignment with previous work

This report sets out the results of an information gathering exercise designed to support subsequent stages of the PCE's ongoing and extensive analysis of environmental data and information, research and reporting over several years. Centred around the problem definition that data gaps, along with inconsistent data collection and analysis, make it hard to construct a clear national picture of the state of our environment – and whether it is getting better or worse.

Councils collect and manage a range of environmental data and information across their broad mandate. A key driver for this area of work are statutory obligations related to monitoring and reporting in statutes such as the:

- Resource Management Act 1991 (including the Resource Management (Measurement and Reporting of Water Takes) Amendment Regulations 2020)
- Biosecurity Act 1993
- Local Government Act 2002
- Water Services Act 2021 (including the Drinking Water Quality Assurance Rules 2022).

Councils also collect data and information while discharging their broad roles such as the collection and collation of resource management consenting and compliance data, information about council owned assets such as conservation parks (biodiversity and biosecurity information) and three waters assets (water quality, quantity and discharges from network infrastructure).

Councils have – due to limited national guidance and investment – generally been left to develop bespoke approaches to data and information management to support their environmental management responsibilities. Inconsistency and duplication between tiers of government and across the system has been the inevitable result. However, in many instances, the regional sector in particular has taken opportunities to collaborate, overcoming structural deficiencies in the system in doing so, including by:

- Procuring thought leadership on matters of collective interest (e.g. biodiversity activities and mandates)¹

¹ Willis, G (2014) Biodiversity Roles and Functions of Regional Councils. Enfocus Ltd available at [Biodiversity \(waikatoregion.govt.nz\)](https://www.biodiversity.waikatoregion.govt.nz/)

- Collectively procuring information management systems (e.g. Iris and the developing work for Iris Next Gen)²
- Collectively investing and participating in centralised data and information interfaces (e.g. LAWA)³
- Developing their own performance monitoring frameworks

A highly relevant example of thought leadership was the 2016 report⁴ to Regional Sector Chief Executives (hereafter called ‘the Sapere report’). The Sapere report set out what the regional sector could expect in the coming years, summarised as including:

- Increasing legislative obligations to provide a broad range of data
- Increasing demand for information on resources including quality issues
- Increasing demand for information on natural resource protection
- Growing demand for open access and transparency
- Growing complexity and volume of data, including requirements for analytical tools
- Growth of new digital technologies to support all aspects

These metatrends provided very useful insight into the way ahead, and the benefit of eight years hindsight appear to have been borne out in reality.

In 2022⁵, the PCE released a synthesis report of three previous works.⁶ A series of recommendations were made throughout, which focused on centralised direction and standardisation and more whole-of-government approaches to environmental spending (and the cooperation and collaboration that that implies). A recommendation from 2019 was to ‘Develop a multi-year investment case to deliver the recommended improvements to New Zealand’s environmental reporting system, taking into account a fair distribution of costs between central and local government’.

It is noted that over the course of the research, the Ministry for the Environment (MfE) released a comprehensive stocktake of the information pertaining to 55 environmental attributes nationally.⁷ The review set out the current state of knowledge for each attribute, linkages to human and environmental health, the state of current monitoring among a wide range of lines of inquiry. The data collected by councils features strongly across many of the attributes. While focused on a subset of information, aggregated data does support broader use as users and potential users become aware of existing assets that could meet their needs.

² Iris NextGen is a collaborative project between Regional Sector Holdings Ltd and most regional councils and unitary authorities. The replacement of Iris software with Iris NextGen is underway now. Further information can be sourced here: [RSHL | Regional Software Holdings Limited](#)

³ LAWA stands for Land Air Water Aotearoa and is a collaborative data interface that makes a range of key environmental information available to the public. Launched in 2014, LAWA can be accessed here - [Land, Air, Water Aotearoa \(LAWA\) - New Zealand](#)

⁴ Sapere 2016 Future challenges and opportunities in the provision of resource information for the Regional Sector. Sapere (provided in confidence by Te Uru Kahika)

⁵ PCE 2022 Environmental reporting, research and investment Do we know if we’re making a difference? October 2022 available at [environmental-reporting-research-and-investment-do-we-know-if-were-making-a-difference.pdf \(pce.parliament.nz\)](#)

⁶ Focusing Aotearoa New Zealand’s environmental reporting system, A review of the funding and prioritisation of environmental research in New Zealand and Wellbeing budgets and the environment A promised land?

⁷ [Information stocktakes of fifty-five environmental attributes across air, soil, terrestrial, freshwater, estuaries and coastal waters domains | Ministry for the Environment](#)

Key questions

The purpose of this report is to use the survey and stocktake to inform answers to the following questions:

- What information is currently collected or held by local government entities within each domain?
- Why is the information collected? Is it a requirement for legislative, compliance monitoring or enforcement purposes, or is it collected for another function/purpose?
- What methodology/standards are followed? Are there quality assurances/quality controls in place?
- How is the data stored, accessed, and distributed? What constraints are there to sharing or accessing information?

Scope

The stocktake was intended to capture the scope and scale of information held by a representative sample of councils (regional council, unitary authority, and district/city councils), in addition to a survey targeted at a broader subset. This stocktake and survey focused on land, water, biodiversity and biosecurity data.

Environmental data and information included (for the purposes of this report):

- State of the environment monitoring
- Monitoring of policy and plan development, implementation, and effectiveness
- Consent information
- Compliance monitoring, and enforcement information
- Other information sources as relevant (e.g. operational, administrative, cadastral data).

A more fulsome list is presented as Appendix 1. Note that data related to air and emissions were considered out of scope. Questions in the survey did ask local government about other data and information sources led and managed by other actors that they relied upon, and the results section includes a series of examples. Sources managed by others were out of scope for the stocktake, however.

Methods

The project was undertaken in two concurrent parts: a written survey filled in by staff at 15 councils, and a deep dive stocktake of datasets held by a subset (5) of those councils. Choosing an array of councils that were representative would enable the research to reflect the full scope of the sector, rather than the perspective of councils that are comparatively well-resourced. This ensures any insights or recommendations can be appropriately contextualised.

Five representative councils were selected for the survey and the stocktake and an additional 10 for survey only. The total of 15 constitutes approximately 20% of councils in New Zealand. Choosing councils to focus on required choices to be made between many possible combinations of focus organisations. The following matters were considered in determining the best targets for this analysis:

- Ensuring all types of councils (unitary, regional, city and district) were represented
- Ensuring spatial representation across Aotearoa and geographic size of jurisdiction
- Ensuring a mix of councils with varied population and rating bases
- Ensuring a mix of resource use profiles and industry presence/diversity
- Ensuring a mix of environment types

An initial list was compiled and a workshop-style session with the PCE team supported finalisation.

Council Name	Council Type	Survey + Stocktake	Survey only
Canterbury Regional Council (ECan)	Regional		✓
Bay of Plenty Regional Council (BOP-RC)	Regional	✓	
Waikato Regional Council (WRC)	Regional		✓
West Coast Regional Council (WCRC)	Regional	✓	
Auckland Council (AC)	Unitary		✓
Gisborne District Council (GDC)	Unitary		✓
Marlborough District Council (MDC)	Unitary	✓	
Christchurch City Council (CCC)	City		✓
Invercargill City Council (ICC)	City		✓
Palmerston North City Council (PNCC)	City		✓
Tauranga City Council (TCC)	City	✓	
Queenstown Lakes District Council (QLDC)	District		✓
Selwyn District Council (SDC)	District		✓
Waitomo District Council (WDC)	District		✓
Tararua District Council (TDC)	District	✓	

Table 2 Councils included in this analysis (stocktake and survey)

The **survey** was narrative based, designed to elicit the approaches to data and information management that are in operation. Final questions are attached as Appendix 2. The **stocktake** of environmental information focused on land, water, biodiversity and biosecurity data. The stocktake comprised a list of all the information sources/datasets within scope of the project held by the council in question (see Appendix 3). The methodology was as consistent as possible across the subject councils, although some variation was inevitable for reasons outlined later. Strengths and limitations of this approach are also outlined later.

Method for survey collection and analysis

The process followed to administer the survey was as follows:

1. The PCE sent a letter of introduction to the project to the Chief Executives of the selected councils.
2. Mātaki distributed detailed introduction to the project to councils inclusive of survey and – for the 5 in the subset – information about the stocktake.
3. Survey was distributed, identifying it as a LGOIMA request to encourage expediency.
4. Responses were managed and collated by Mātaki and follow up phone calls, Microsoft Teams calls, and written clarifications of questions were actioned as required.
5. Informal discussions with other stakeholders besides councils themselves were undertaken as needed to ensure a fulsome understanding of context (e.g. with Regional Sector Holdings Ltd).
6. Once responses were received, information was occasionally sought to clarify matters. If responses seemed out of the ordinary based on the judgement of the Contractor, an offer to further discuss the responses was given.
7. Results were collated and finalised, including where multiple versions of the survey were provided by different parts of the council.
8. Results were analysed to input into the report.

Method for stocktake (i.e. collation of databases)

The process followed to administer the stocktake was as follows:

1. The PCE sent a letter of introduction to the project to the Chief Executives of the selected councils.
2. Mātaki distributed detailed introduction to the project to councils inclusive of survey and – for the 5 in the subset – information about the stocktake. Chief Executives were given a timeframe to nominate a key staff member for liaison.
3. Travel was arranged for a mutually convenient times, generally for a one-day visit (2 for the West Coast Regional Council).
4. Meetings and other engagements were arranged between Mātaki and relevant individuals in the organisation with the support of the key staff members.⁸
5. Receipt of completed spreadsheets occasionally resulted in further contact to clarify details of data and information sources.
6. Results were analysed to input into the report.

⁸ Visits to the councils typically entailed an overarching meeting with staff to introduce the project, discuss common issues and provide support to complete the spreadsheet. Meetings were commonly held with multiple parts of council present, or separate engagements with different experts or functional areas. The model of engagement was mutually agreed with the key liaison to suit the council and the availability of their people and meeting rooms.

Results

The analysis covers all 15 surveys and the 5 stocktakes, with key aspects highlighted at the beginning of the five key sections. The five parts of the survey were:

Part 1 is concerned with an overview and the sufficiency of the data and information sources council holds (or relies upon) across the key topic areas.

Part 2 focuses on the sufficiency of different types of data and information across different functional areas (however they are arranged in council).

Part 3 is concerned with the sufficiency, drivers and barriers of data and information management (including collection, storage, analysis and sharing/usage).

Part 4 addresses the linkages and relationships in the management of data and information.

Part 5 looks to the future, inquiring about innovations underway and possible, including support needs for improvement.

The generic term for survey participants is 'councils' and refers to all 15 respondents, while 'sector' denotes the entirety of local government. Additional informal interviews were undertaken, which are also drawn on. The informal interviews provided an opportunity for staff to discuss matters of detail, to discuss more sensitive matters more frankly, and they have been used to sharpen problem definitions particularly in the discussion.

Overall trends

To avoid repetition, the following trends are set out because they are relevant in many instances throughout the project and cited very often by councils. The survey and stocktake demonstrated that:

- Regional councils and unitary authorities have generally much greater volumes of data than city or district councils, but there are exceptions.
- Spatial data are very important to local government, and rich layers of information support many aspects of council activity, with high built-in reliance on other actors in the system (e.g. national databases).
- The sector (i.e. all councils) has a strong interest in improvements and innovation in this area and substantial work is already underway.
- Resourcing and expertise are unevenly distributed across the sector, resulting in variable capacity and capability.
- Capacity and capability appear to play a pivotal role in the degree of focus on data and information management.
- There is likely considerable opportunity to improve coordination of data internally and externally for councils.
- Collaboration costs time and resources that can shift energy from the collection and ongoing management of data and information.
- The amount of information varied considerably in response to survey questions, including some respondents who provided considerably more information than the question required.

The source taxonomy for scores is Table 1 of the Survey (Appendix 2) reproduced here to aid understanding.

Rank	Explanation of sufficiency (based on meeting day to day needs)
0	Does not exist.
1	Poor or very limited
2	Below par – lots of gaps but a few areas where it is fit for purpose
3	Adequate – has some gaps but is mostly fit for purpose
4	Good – some highlights and other areas that need more work
5	Comprehensive – consistent and effective

Table 3 Score table provided in the survey for councils to rank sufficiency

Part 1: An overview including stocktakes (question 1-6)

Question 1 Overview

Councils were asked to provide a very brief description of the data and information they held related to land, water, biodiversity and biosecurity. Environmental data and information comprised a range of sources including individual reports through to long running monitoring programmes that result in significant datasets maintained over time. Water is a key topic for councils, with more records being reported by stocktake councils and more comprehensive answers being provided in surveys. Land was also comprehensively answered, while information about biosecurity and biodiversity data was less detailed. Both the surveys and direct engagement demonstrated that some councils have narrow perception of their biodiversity mandate, an issue potentially requiring further exploration.

There was a stark distinction in how comprehensive the response was between the regional sector compared with territorial authorities in respect of land. Biodiversity and biosecurity data were much patchier, with regional councils holding more information than territorial authorities. Territorial authorities rely heavily on the regional sector to provide environmental information to inform their mandates, particularly with respect to land use. Examples of critical information from regional councils to territorial authorities includes geotechnical and erosion data and modelling of expected coastal inundation through sea level rise.

Sources of environmental information cited by councils included:

- Technical reports (one off and regular) for a wide range of issues
- Monitoring datasets (continuous and otherwise for water, soil, trace elements)
- Specific ecosystem and species monitoring for state of the environment purposes
- Spatial data including both that procured by council and from outside the organisation to monitor and make accessible information on a wide range of issues (e.g. irrigated land, land use types, heritage sites, protected features, overlays)
- Databases of information maintained by councils to collect information from council staff and other parties (resource users, community groups etc)
- Management plans and other forward-looking documents that may require monitoring (e.g. earthworks, pest control, resource use such as mining)
- Asset information (parks, network infrastructure)
- Condition assessments (ecosystems, catchment, riparian areas)
- Assessment of environmental effects, expert reports to support applications for consent and the consent information itself to support monitoring
- Property information (land use type, erosion susceptibility, flood zones)
- Consent monitoring and compliance rates, held against property and consent data
- Policy effectiveness evaluations (plan monitoring)

- Resource management information regarding water abstraction (ground and surface), industrial and municipal discharges, sea level rise, wells and bore, water treatment
- Historical records including old historic aerial photos and information on past land use, previous locations of water courses/flood plains
- Specific databases, tools and monitoring frameworks to support implementation of national direction (e.g. urban development, renewable energy, forestry)
- Management actions by council and others (spray records, agrichemical use, drain clearing, flood management regimes)

A range of specific examples were shared under the different topic areas and a handful of examples are set out below with relevant links where they are available.

Water

Councils have a wide range of water related responsibilities including managing discharges to freshwater ecosystems and the coast, maintenance and management of water related network infrastructure and the quality and safety of recreational water for swimming and boating. Water related data and information is more comprehensive than other topic areas in scope, particularly in regional and unitary authorities.

Even where resources are limited, regional councils administer significant water monitoring programmes. West Coast Regional Council reported that for the purposes of state of the environment (SOE) monitoring they undertake monthly water quality samples for 120 river locations and 38 lakes in addition to 60 groundwater sites at different intervals (hours and days to months). They also test for *E. coli* and cyanobacteria at 25 locations and undertake a range of further sampling (e.g., a 5 yearly survey of heavy metals from rivers and sediment monitoring in 4 key catchments).

Territorial authorities provided more comprehensive answers in response to water queries compared with other categories. While most information related to water supply, network infrastructure and consumption some councils reported holding freshwater ecology data related to surface water bodies.

A strong driver for territorial authority activity is the drinking water regulations and associated responsibilities for councils to ensure tools like water risk management plans are in place. Territorial authorities still rely on the regional tier of government to support with a range of information including recreational data and ecological data.

Some specific data and information sources highlighted include:

- Monitoring of wetlands and estuaries to support understanding of their extent and condition – reports are collated and available online ([Estuaries - Marlborough District Council](#))
- Regional irrigated land data (ECan - [Irrigated land area | Environment Canterbury \(ecan.govt.nz\)](#))
- Benthic condition surveys based on bathymetry (Auckland Council – see StoryMaps [Benthic Habitat Analysis Across the Hauraki Gulf \(arcgis.com\)](#))

Land

Regional and territorial councils share responsibilities relating to land management, with territorials primarily managing land use issues and their related impacts. For instance, territorial authorities have responsibilities for ‘the control of any actual or potential effects of the use, development, or protection of land, including for the purpose of the maintenance of biodiversity’ – see s31(1)(b)(iii) RMA).

Land related data are commonly held across local government. Information about land supports both territorial functions related to land and subdivision as well as the regional functions related to broader environmental risks and management issues. Some specific data and information sources highlighted include:

- Harvest plans to support implementation of the National Environmental Standard - Commercial Forestry (NES-CF) and other forestry rules
- Contaminated sites information including HAIL (Hazardous Activities and Industries List)⁹ registers, some of which are available online (e.g. Environment Canterbury - [Listed Land Use Register \(ecan.govt.nz\)](https://www.ecan.govt.nz/land-use/register/))
- Rating information, property boundaries, information to inform land information memoranda (LIM reports) population, migration, urban expansion
- Peat subsidence monitoring (Waikato - [Peat subsidence | Waikato Regional Council](https://www.waikatoregion.govt.nz/peat-subsidence/))

Biodiversity

Regional councils have the primary responsibility for biodiversity, but territorial authorities have responsibilities in respect of section 6 of the Resource Management Act (1991) ('matter of national importance'¹⁰). There is also an interplay with both land use and biodiversity and the management of council held assets like parks and reserves.

Councils reported holding a range of biodiversity information including:

- Information on conservation activities such as planting supported by councils (e.g. Bay of Plenty provided a demonstration of their dashboard that measures a range of outputs including hectares planted with council funds <https://www.ethosenvironmental.co.nz/project-list/kete-taiao>)
- Species monitoring data including birds (e.g. bittern), macroinvertebrates, herpetofauna, native fish, botanical and eDNA information including long running bird monitoring programme and a formal vegetation monitoring programme for council parks (Christchurch City Council)
- Reports on consents related to conditions (e.g. Gisborne DC provided an example of a requirement for dotterel surveys to monitor effects of river shingle extraction)
- Reports collating biodiversity covenant data (Auckland - [Land covenants in Auckland and their effect on urban development \(knowledgeauckland.org.nz\)](https://www.knowledgeauckland.org.nz/land-covenants/))

Biosecurity

Biosecurity responsibilities are shared between central, regional and local government in addition to industry and landowners. Councils have a regulatory role (mostly regionally led), but territorial authorities must also comply as land managers. It is difficult in practice to delineate between biodiversity and biosecurity information, owing to the important place that pest plant and animal control has in environmental management in New Zealand. Territorial authorities generally reported that they held no data on biosecurity other than where obligations exist to do so (e.g. Palmerston North City reported that they have obligations under the One Plan to prepare a plant pest management plan).

⁹ A Hazardous Activities and Industries List (HAIL) or register is a compilation of sites where activities have formerly or are currently occurring that may cause land contamination. HAIL sites are referred to and relevant to the scope of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.

¹⁰ <https://www.legislation.govt.nz/act/public/1991/0069/latest/dlm231907.html>

Councils may have information on pest and weed control in their asset locations but would otherwise generally rely on regional councils for this information. The Department of Conservation, Manaaki Whenua Landcare Research and universities are also very important sources of information. Regional councils have regulatory responsibilities under the Biosecurity Act 1993 which is a significant driver of effort.

Some specific data and information sources highlighted include:

- Monitoring and inspection data (e.g. Bay of Plenty reported annual inspections numbering over 3500 for Biosecurity Act purposes)
- Sightings of invasive species, some collected with bespoke tools (e.g. Waikato administers a rook sighting app that has helped control and remove rookeries - [Rooks | Waikato Regional Council](#))
- Data on pest control and changes in pest abundance levels, particularly on council-owned land.

Question 2 Common types of data and information and scores for your council

The purpose of Question 2 was to elicit some comparable information from local government agencies. The table set out a range of common data types and asked councils to rank the adequacy¹¹ of the data relative to the benchmark relied on for the survey (the extent to which it can meet day to day needs). The scores applying to the questions that were answered most fulsomely for comparative purposes are presented here. Some councils provided multiple scores for the same question, and these were averaged.

The following examples are included:

- Data on land use including proportions of jurisdictions under different types (1)
- Data and information on water quality for drinking purposes (2)
- Data and information to inform the state and trends associated with species and ecosystems (collected for or by the council) (3)
- Data and information on consented land clearing (4)
- Data and information on biodiversity policy effectiveness (5)
- Data and information on the extent of invasive plant species (6)
- Data and information on the extent and impact of ungulates (7)

Table 4 shows that the highest scores of sufficiency for day-to-day purposes for both the territorial councils and the regional/unitary authorities were in the first two categories: data on land use and data on water quality for drinking purposes. The lowest related to information on biodiversity and biosecurity. This data reflects the overall weighting towards land and water data evident in questions 1 and 2. Several councils submitted more than one response per survey and the scores provided were often disparate. Some nuance is lost in the averaging of these figures. Councils who submitted very variable figures were encouraged in post-project communication to consider the reasons for those disparities.

¹¹ See Table 1 of Appendix 2 which provided a consistent score system for respondents to apply to each question

	1 Land-use	2 Water Quality	3 State and trend	4 Land Clearing	5 Policy Effect.	6 Invasive plants	7 Ungulate impacts
Council Name	Rank						
Bay of Plenty RC	3	4	2	3	3	4	3
West Coast RC	3	3	0	2	0	4	1
Environment Canterbury	3.5*	3	3	3	3.5	1	0
Waikato RC	3	4	2	3	2	3	3*
Marlborough District	3.5*	3*	3*	2.5*	1*	4	1
Auckland Council	4*	2*	3*	2*	2*	2*	2*
Gisborne District	3*	3*	0.5*	2*	0*	1*	0.5*
AVERAGE	3.5	3	2	2.5	1.5	3	2
Tauranga City	3	5	2	DNA	4	1	1
Christchurch City	1	4	2	1	2	3	3
Invercargill City	0	5	0	0	0	0	0
Palmerston North City	0	5	5	DNA	4	3	0
Tararua District	3	3	NA	NA	NA	NA	NA
Queenstown Lakes District	4	5	1	4	0	2	2
Selwyn District	2	5	0	2	0	n/a	n/a
Waitomo District	DNA	5	DNA	DNA	DNA	DNA	DNA
AVERAGE	2	4.5	1.5	2	1.5	2	1

*Table 4 data on responses to a subset of question 2 which asked councils to rank various types of data and information they may hold. Scores ranged from 0 meaning no data through to 5 referring to comprehensive data. NA is the response provided by the council and means 'not applicable' while DNA means 'did not respond' and referred to when no answer was given. * Is average of answers from council staff*

Question 3 Are there other data and information sources not owned by council that you consider to be particularly important in these areas? - describe some examples (Q3 and 13 combined).¹²

Councils rely on other organisations to meet many of their data and information needs and the complexity and scale of this web of data and information is considerable. Territorial authorities also rely heavily on their regional council.

Councils listed a considerable number of data and information sources; many of which they combine to support decision-making. Table 5 provides some examples of those which were frequently mentioned. Interviews identified that resources are scarce and as a result most councils will generally not attempt to duplicate existing information.

¹² Question 13 covered similar ground and demonstrated that the system is highly interdependent with various actors relying on the output of others, with whom they may or may not have a formal, let alone financial, relationship with

Entity type	Example of reliance by local government
Crown Research Institutes (CRIs) and universities	A range of data and information sources maintained by Manaaki Whenua Landcare Research (Land Cover Database, Tier One monitoring results, LUCAS plot measurements, S-MAP soils ¹³). Meteorological data, river monitoring data and URQIS ¹⁴ information from NIWA and GNS Science information on geology, soils, aquifers, geothermal areas and natural hazards. Partnerships with universities for biodiversity data gathering (e.g. Palmerston North City Council).
Central government agencies	Land Information New Zealand (LINZ) datasets. Ecological and other information from the Department of Conservation including the Threat Classification System, carbon capture information, Protected Natural Areas Programme Surveys. Ministry for the Environment and Statistics New Zealand (particularly the information which supports the reporting under the Environmental Reporting Act 2015 such as 'indigenous land cover' (Indigenous land cover Stats NZ)) which repackages the Land Cover Database for easy access. Fire and Emergency New Zealand (e.g. rainfall and fire risk by fire district). ¹⁵ Ministry for Primary Industries (species incursions, forestry, shellfish health).
Iwi and hapū	Information on culturally significant sites, input as a result of cultural monitoring programmes etc.
Consultants and other private entities that manage and broker knowledge	Models and data owned by consultancies that is paid for by clients but not accessible thereafter, much less at scale (e.g. flood modelling).
Consent holders and resource users generally	Private sector information pertaining to the environment (e.g. Lyttleton Port Company tidal data, power generation company information on wind, river levels and geothermal resources).
Primary sector organisations	Multiple propriety datasets from primary sector organisations (e.g. AgriBase).
Sector organisations	Information from organisations with adjacent roles (e.g. REINZ, Colliers).
Individuals and community groups	Citizen science through platforms such as Birds New Zealand, eBird, iNaturalist, TrapNZ.

Table 5 Council responses identify the following data and information sources as particularly important with respect to land, water, biodiversity and biosecurity

¹³ [S-Map Online | Manaaki Whenua - Landcare Research](#)

¹⁴ URQIS is a resource developed in 2012 that provides stormwater and urban stream quality data to the public by accessing a database of urban runoff quality data collected from all over New Zealand, compiled by NIWA. The database includes data supplied by Councils, Transport Agencies, Research Institutes and Universities across New Zealand. The development of URQIS has been funded by NIWA's Freshwater and Estuaries National Centre and Auckland Council's Stormwater Team

¹⁵ [Fire weather station climatology data by Fire District | Fire and Emergency New Zealand](#)

All territorial authorities referred to their regional council as a critical source. Landowners can also be critical components of regional scale monitoring such as by providing farm bore access for groundwater testing (e.g. West Coast do not have purpose driven bores and use farm-based ones in the community).

Interviews and discussions with staff also demonstrated the importance and complexity of working relationships with some organisations, and the challenges that are encountered. These are summarised below:

The Department of Conservation – Councils noted the critical importance of the data DOC holds but some expressed concern about having to ‘pick up the slack’ as DOC progressively withdraws from action on the ground and participation in processes. The lack of resourcing for conservation on the ground is placing pressure on some councils and the relationships between them and DOC.

Territorial authorities’ relationship with regional councils – Regional councils work with their territorial authorities to varying degrees. Territorial authorities rely heavily on the data and information held by regional councils. With scant funding at a local level, regional councils often support projects related to data and its collection and storage (e.g. Bay of Plenty paid for the assessment of significant natural areas (SNAs) for the Opotiki District, West Coast co-funds GIS systems with Buller District and several agencies combine forces in Southland to support ‘DISH’¹⁶). The relationship between the different tiers of the local government sector can be complex as regulatory roles intertwine with other responsibilities which can affect the basis for participation.

Territorial authorities working together - Territorial authorities also collaborate in data and information management (e.g. Tauranga and Western Bay of Plenty co-fund initiatives and share resources as neighbouring jurisdictions under the same regional council). Bay of Plenty RC noted that sometimes the interplay of regulatory roles can mean co-funding is not appropriate and investment decisions are made on a case-by-case basis as a result.

Question 4 Please provide a general overview of the extent to which Mātauranga Māori data and information are collected, stored, analysed or shared/used by your council across land, water, biodiversity and biosecurity topics supporting a range of council activities?

Collection and management of Mātauranga Māori data and information is complex, and responses indicate most councils are early in the journey of understanding how such data and information can be considered and managed in the system. There are clear differences between councils and the extent to which they engage with this topic. Bay of Plenty’s science team noted the following:

‘We have a Mātauranga specialist in the science team but do not actively collect this information. The focus to date has been to support iwi and hapu to better understand their waterways through monitoring initiatives but they retain the Mātauranga’.

The often-narrow implementation is absent for some councils (e.g. WCRC reported that ‘The council does not currently collect Mātauranga Māori data’) while Selwyn reported ‘Just starting the journey and engaging with rūnanga to bring this together’. Other councils have more comprehensive approaches such as Waikato albeit focused on regulatory matters:

‘We have undertaken a transfer of functions to Tūwharetoa Māori Trust Board (TMTB) who now undertake the water quality monitoring in the Lake Taupo catchment. We envisage the next stage when TMTB are ready will be for them to start incorporating Māori values. A

¹⁶ Data Insights Southland Hub is a collective platform supported by councils and other agencies in the Southland Region - [Data | Great South](#) (platform is password protected for member agencies)

number of the other River Iwi on the Waikato River have joint management agreements with WRC. As part of these is the development of a joint monitoring framework. To date focus has been more on the regulatory aspects of council. The JMA's are under review and discussions include confirming environmental monitoring outcomes.'

Common examples of this type of data include:

- Use of cultural impact assessments (plan-making, consenting and compliance)¹⁷
- Identification of sites of significance
- Incorporation of Mātauranga Māori into environmental monitoring
- Engagement and collaboration on key environmental campaigns (e.g. reducing marine pest spread, Spartina control and feral goat control – all examples from Gisborne DC)

Arrangements for collection, sharing and management of data and information vary considerably. Issues of data sovereignty were frequently mentioned. Supporting data for this area of work includes:

- Spatial data indicating iwi rohe extent and boundaries
- Formal arrangements such as strategic advisory groups, steering committees, joint management agreements or transfers of functions (such as Te Rangapū Mana Whenua o Tauranga Moana Partnership, an autonomous body of 17 representatives of iwi and hapū across Tauranga that provides guidance on the incorporation of Mātauranga Māori)

Variable approaches to managing the information are evident from council responses. Determinants of the collection and use of Mātauranga Māori data seem likely linked to the quality and depth of relationships of the council with tangata whenua, the expertise within the council and priority. Councils which had more comprehensive approaches to Mātauranga Māori data (e.g. had specific programmes in place, had specialist staff) also responded in surveys and interviews in more depth, detailing the nature of their relationships with iwi and hapū with data viewed as a subset of the overall picture.

Question 5 In respect of the data and information your council presently holds across the topic areas, what level of confidence do you have in its sufficiency for long-term decision making?

Council mandates require present day, short term and long-term decisions to be made in concert. The level of confidence is subjective and rely on those answering the question having a strong notion of the long-term issues and how they relate to the total data holdings. This is a significant expectation.

Regional councils appear most confident about water data supporting long term decision making (average rank 4), followed by land (average rank 3). Territorial authorities demonstrate a similar level of confidence between the two categories (this is understandable given their reliance on the same data and information).

Key themes included that:

- The data are patchy with some sources being excellent and others being very poor. Providing a single score was thus difficult
- Data and information are also patchy spatially, with some areas being relatively well understood, while others have very little information associated with them

¹⁷ Waitomo District identified that sites of significance to Māori are listed and described in the Proposed Waitomo District Plan

- Historic datasets are rarely available, meaning long term predictions often must be made on recent data over short timeframes
- Data are often there but not granular enough or not in a form that enables usage without significant processing
- Territorial authorities again rely significantly on their regional council

Councils also noted that shifting regulatory frameworks and prospects of institutional reform may mean the data no longer match the obligations, exemplified by this quote from QLDC:

‘QLDC considers that it has sufficient information to meet its long-term decision-making requirements for these topic areas as they currently stand, but notes that there is significant central govt and regional council reform in train that may place different obligations on local authorities that are currently unknown or unbudgeted for, for which new data and information will be required’

Council Name	Land	Water	Biodiversity	Biosecurity
	Rank			
Bay of Plenty RC	3	4	3	3
West Coast RC	2	4	1	3
Environment Canterbury	3	2.5*	2.5*	1
Waikato RC	4	4	2.5	3.5
Marlborough District	2.5*	3.5*	3*	4
Auckland Council	3.5*	3.5*	2.5*	1.5*
Gisborne District	3.5*	3.5*	1.5*	1*
AVERAGE	3	4	2.5	2.5
Tauranga City	4	4	2	2
Christchurch City	DNA	4	3	3
Invercargill City	DNA	3	DNA	DNA
Palmerston North City	3	3	5	3
Tararua District	4	2	2	1
Queenstown Lakes District	4	4	4	1
Selwyn District	2	4	1	DNA
Waitomo District	5	4	4	4
AVERAGE	3.5	3.5	3	2.5

*Table 6 Confidence in sufficiency of data for long term decision making – 1 is low confidence – 5 is high confidence. * is average of answers from council staff*

Stocktakes

Five councils were required to develop a stocktake of their data and information sources relating to land, water, biodiversity and biosecurity. Broad trends of note are the considerable differences in quantum of data between a small territorial and a large regional council, the complexity of data and information that unitaries hold and the variation within council types (that appears closely related to resourcing available). Further, councils all had to manually collate the data available and did not have centralised repositories of metadata available to guide this exercise. A brief description of the stocktakes is below in Table 7.

Specific information was collated in the stocktakes on approaches to quality assurance in respect of each listed source. Many records do not have formal quality assurance steps and rely heavily on standards of work and internal peer review. The National Environmental Monitoring Standards, where they exist, were frequently referred to, as was the use of accredited laboratories for analysis. Individual council systems often had quality assurance gateways or were supported by in-house or external peer review that were cited as important elements in ensuring quality inputs. Other quality assurance tools or pathways included ISO 17025, ANZECC 2018 guidelines and MfE Guidelines (e.g. odour assessment).

Councils completed the stocktake to varying levels of aggregation meaning the numbers of datasets are not easily comparable. Aggregation would have occurred where large programmes of work had similar attributes in the spreadsheet – this was a time saving measure. Also, councils are unlikely to plan work at the level of the dataset – they are generally part of an overall work programme that may be difficult to split in practice.

Council	Summary of stocktake
Bay of Plenty Regional Council	BOP-RC identified 67 data and information sources, some of which clumped significant work programmes across all four topic areas.
West Coast Regional Council	WCRC have identified 18 data and information sources for the stocktake and acknowledge that they hold very limited amounts overall. Most of their data and information applies to water and where possible is shared to LAWA.
Tauranga City Council	TCC identified 55 data and information sources. TCC have a strong base of information from BOP-RC and work to address areas of data gaps such as urban biodiversity.
Marlborough District Council	MDC identified 112 data and information sources across regional and territorial functions. MDC manage a wide range of internal IT solutions to manage the sources. The solutions are commonly disconnected and managed in silos, making collation a significant undertaking
Tararua District Council	Tararua identified 5 data and information sources, with 4 relating to water. No sources were identified for biosecurity or biodiversity, for which the council is wholly reliant on its regional council and others.

Table 7 Synopsis of stocktakes

The stocktakes are unlikely to contain all the technical reports councils have procured. This is partly because of the sheer number of them, and partly because they are rarely centrally managed with effective metadata. Some council staff noted that the reports can be impossible to find after being completed and one functional area will procure it but not necessarily consider the other possible applications and share it (or collaborate on procurement of it).

Many councils referred to many millions of records that were not properly stored, including data that can be difficult to store en masse (e.g. photos and videos). As a result, the stocktakes are not exhaustive.

Part 2 Sufficiency of data and information to support functional areas (Q7)

Councils were asked to rank the extent to which the data and information in that area is sufficient to meet day to day needs across four functional areas:

- Science and monitoring
- Strategy and policy
- Planning and consenting
- Compliance.¹⁸

The data are provided for six councils in Table 8 to demonstrate variation between functional areas. The councils were selected based on ensuring broad representation and mostly complete datasets.

	West Coast Regional				Waikato Regional			
Area	Land	Water	Biodiv	Biosec	Land	Water	Biodiv	Biosec
Science and monitoring	0	4	1	3	3	4	2.5	3
Strategy and policy	3	3	1	3	3	4	3	4
Planning and consenting	3	2	0	3	3	4	3	4
Compliance	4	4	3	3	3	3	2	4
	Gisborne District				Queenstown Lakes District			
Area	Land	Water	Biodiv	Biosec	Land	Water	Biodiv	Biosec
Science and monitoring	4	4	1*	1	4	4	2	1
Strategy and policy	4	4	1*	3	4	4	3	3
Planning and consenting	3.5*	3.5*	1*	2	3	4	3	1
Compliance	3*	3*	1*	2.5*	4	4	2	2
	Invercargill City				Taranua District			
Area	Land	Water	Biodiv	Biosec	Land	Water	Biodiv	Biosec
Science and monitoring	3	3	3	3	DNA	2	DNA	DNA
Strategy and policy	4	3	2.5*	2.5*	4	2.5*	2	DNA
Planning and consenting	3	4	3	3	3	2.5*	2	DNA
Compliance	3	4	3	3	3	2.5*	1	DNA

Table 8 Sufficiency of data for functional areas score as per Table 1 in the survey (0 = 'does not exist' through to 5 = comprehensive and DNA means Did Not Answer). * Is average of answers from council staff

Biodiversity data was ranked lower overall than land and water data in some councils. However, the trends associated with functional areas were less clear, with considerable murkiness in the results. It is possible that the quality of data does not differ significantly between functional areas as a result. Another possible explanation is that the information collected in one area is used across council for a range of purposes, meaning it is not reliant on transfer but may be centrally available and directly extracted.

¹⁸ A limitation of this question was the variable ways in which councils arrange their operations.

Part 3 Data and information management stages: sufficiency, drivers and barriers (Q8-10A)

Question 8 Sufficiency of data and information management for present and future needs.

Councils manage data and information across the data value chain¹⁹, and different elements of the chain are relevant to present and future decision-making depending on context. This question tested sufficiency including evenness of approach relevant to present day needs and the future.

The PCE has previously drawn attention to the focus being on active and passive data collection, with less energy being deployed further down the value chain.²⁰ Changes that affect the sufficiency of data including growing threats such as climate change, changes in institutional responsibilities and new policy instruments adding obligations.²¹

The purpose of this section of questions was to consider the key aspects of the data value chain (not all possible steps for brevity) and how those steps are treated in the context of local government. The following table (Table 9) sets out the aspects of the value chain that were focused upon.

Data management stage	Explanation
Collection	The gathering of information passively or actively by internal or external parties
Storage	The way data and information are stored for later analysis and use (e.g. notebooks, hard copy files, databases, spreadsheets)
Analysis	The way data and information are treated to understand what they mean
Sharing and usage (including providing access)	The creation of access to the data, active distribution to enable usage or direct usage by the council

Table 9 data management stages

Councils were generally less confident in the sufficiency of the data up the value chain for long term needs, but only marginally so. Councils provided a wide range of scores, and no clear trends were evident. The lack of obvious differences in the scores contrasts with the frequent reference to challenges with storage and access elsewhere in the survey. For example, challenges identified included not having sufficient continuous data historically to predict trends or historical data being available but not being in a usable form.

¹⁹ <https://opendatawatch.com/reference/the-data-value-chain-executive-summary/#:~:text=The%20data%20value%20chain%20describes,publiation%2C%20uptake%2C%20and%20im pact>

²⁰ PCE 2022 Environmental reporting, research and investment Do we know if we're making a difference? October 2022 available at [environmental-reporting-research-and-investment-do-we-know-if-were-making-a-difference.pdf](https://www.pce.parliament.nz/publications/environmental-reporting-research-and-investment-do-we-know-if-were-making-a-difference.pdf) ([pce.parliament.nz](https://www.pce.parliament.nz))

²¹ New policy instruments test sufficiency of existing data. Bay of Plenty Regional Council procured a review of their current biodiversity monitoring to ensure they had fit for purpose systems in place to support the National Policy Statement on Indigenous Biodiversity. This is an example of councils anticipating data requirements and planning for them, but policy uncertainty confounding this.

Area	West Coast Regional		Waikato Regional		Invercargill City	
	Present	Future	Present	Future	Present	Future
Collection	3	2	3	3	3	3
Storage	3	3	3	3	3	3
Analysis	3	2	3	3	3	1
Sharing/usage	3	2	3	3	3	1
Area	Gisborne District		Queenstown Lakes District		Tararua District	
	Present	Future	Present	Future	Present	Future
Collection	2*	1.5*	4	4	3	3
Storage	2.5*	2*	4	4	4	4
Analysis	1.5*	1*	4	4	3	3
Sharing/usage	2*	1.5*	4	4	3	3

*Table 10 sufficiency across value chain for current and future needs (0 = doesn't exist and 5= comprehensive). * is average of answers from council staff*

Councils demonstrate a desire to exchange and share data and this appears to be reflected in more even scores across the data value chain than expected. Responses indicated that some councils were very familiar with the concept of the data value chain, while others appeared confused.

Question 9 What are the key drivers of data and information management?

Considering what councils are driven by in the management of data and information can provide important insights into improving outcomes. A wide range of drivers were identified by councils including:

- Statutory obligations are important drivers of data collection. Examples include state of the environment reporting, requirements for plan effectiveness monitoring and data requirements for the National Policy Statement on Urban Development.
- Anticipating future community needs drives councils to obtain and analyse a wide range of information (such as demographic, land use patterns, natural hazard data, etc).
- Prioritising issues according to risk promotes the collection of certain types of information such as intelligence to inform regulatory approaches and biosecurity data on private property.
- Plan effectiveness monitoring under s35 of the RMA is an activity that is subject to national monitoring system reporting requirements and obligates councils to collect information on the outcomes achieved by their plan provisions.
- Obligations to appropriately store, manage and archive information over the long term.
- Requirements for supporting plan preparation that can withstand legal challenge in terms of quality for tasks such as SNA assessment and natural hazard information.
- Other considerations include security, privacy, health and safety and system requirements.

Question 9A Do the drivers differ between collection, storage, analysis and sharing/usage and if so, how?

Responses varied to this question across functional and topic areas in the comprehensive council responses.

A wide range of perspectives were evident with many responses indicating there was no distinction between the drivers. For instance, Waikato Regional Council noted (having added a fifth stage):

‘The drivers shouldn’t differ greatly; as publicly funded organisations the work we do should be available to our communities and to do these all five stages need to be undertaken.’

Invercargill City similarly noted that:

‘Drivers are similar across the full information lifecycle – focused on integrity and reliability, discoverability and supporting decision making.’

In contrast, other responses comprehensively set out how and why the drivers differed across each type of data, depending on:

- The purpose for which it was collected
- The area of council that holds the data
- The timeframe over which it is required
- The data quality including standards of collection (and therefore reliability)
- Whether the information was useful to share with the public (e.g. would impact the investment in sharing/usage compared with information that is administrative in nature).

Further analysis at a more granular level could potentially identify further trends in this space, but no further discussion is included for this report.

Question 10 What are the key barriers to the effective management of data and information?

Councils had a wide variety of views about the barriers to effective management of data and information. Complexities around data sovereignty, information sharing, and sensitive records are also evident, with underlying concerns across the board about the funding model and governance of environmental data more generally.

Key themes included:

Systems and processes - Councils identified that their information technology solutions are often not fit for purpose for data and information management. As a result, much is stored in ways that make it difficult to realise their value across the organisation and community (e.g. ecological surveys are commonly held in hard copy or in excel spreadsheets or scanned documents that limit extraction). Improved systems would support better management.

Uneven resourcing and capability - Resourcing and capability (particularly in terms of science, IT, and GIS) in councils is not evenly distributed and often not found in the areas experiencing particularly critical environmental challenges. A lack of in-house expertise and funding constrains the effectiveness of data and information management for that council, but also their ability to contribute nationally to datasets. Low resourcing relative to data availability also means much data cannot be unlocked to inform the areas of work that it could.

Direction from central government - Volatile or absent direction from central government on what to collect and how constrains investment in data or results in wasted resources from shifting requirements. The loss of continuity of datasets reduces their utility. Further, national directives can support councils to require necessary information from their communities without a locally led mandate needing to be derived, helping to enhance consistency. For instance, Councils commonly noted in interviews the value of the drinking water regulations for making obligations clear.

Governance and leadership issues - Changing political contexts and a sometimes-limited appreciation for environmental data at a governance level can constrain investment in necessary decision support data or contribute to inconsistent collection over time. Data and information can also reflect politically challenging trends such as water quality decline and encounter barriers to collection and sharing as a result. Data and information management requires stable and sustained commitment, and governance changes can prove challenging.²²

Lack of coordinated management - Councils commonly noted the challenge of weak direction from central government and a lack of core investment, resulting in an inconsistent system that relies on regional ratepayers to fund very complex IT infrastructure.

Stronger mandates for federation of data (brokered collaboratively) would provide councils with a more robust basis for prioritisation of some data collection and management. Further, more national approaches to procurement of data systems would avoid duplication of investment and innovation of very costly systems that require significant maintenance and management input.

Other challenges identified include:

- Lack of consistency in methods and processes
- Lack of adherence to accepted methods where they do exist
- Ownership and sovereignty issues
- Sensitivity of information and challenges with managing that
- The level of untapped data in resource management (see below)

²² Tauranga City noted the change from having commissioners to returning to an elected council meant there were different expectations of data and information availability and reporting that need to be adjusted to.

Case study: Resource management data – untapped potential

Councils commonly highlighted the sometimes-vast array of information submitted because of resource management processes (including assessments of environmental effects (AEEs), ecological monitoring etc) that contain valuable information that could be used at scale if the way the information was collected, submitted and managed could be changed at a council or sector level (they are generally just stored as PDFs with weak metadata).

Bay of Plenty RC provided some data to illustrate the scale of resource management information in a single year in respect of resource consents only.

‘During the 23/24 year, there were 8421 active consents across the region. Staff undertook 4437 consent related inspections and received 16,741 performance monitoring returns (water, geothermal, coastal, land and air related). Telemetered data of water records has increased significantly since the NER Water Measurement²³ was put in place in 2010. Electronic water records make up a significant proportion of the performance monitoring returns received.’

Elsewhere in the survey, Waikato also highlighted this issue, considering the value of making consent related data available for other purposes.

‘Consent application/compliance data and information is most often supplied in written report form which is then not flagged for incorporation or easily able to be incorporated into map metadata or databases. Because the focus is on consenting, key words are not added to file names for ease of extracting later’.

Unlocking the potential of this information would provide a much clearer picture of the state of the environment and improve the management of cumulative effects.

Examples are available of the untapped potential of resource management information, such as the extraction of resource management consent data that informed the development of Marlborough’s significant marine sites programme and the collation of consent data for commercial and industrial uses by Tauranga City to inform understanding of the effectiveness of and compliance with rules.

Question 10A Do the barriers differ between collection, storage, analysis and sharing/usage and if so, how?

Territorial authorities were more likely to identify that the barriers did not differ across the steps in the value chain, and most councils identified resourcing/cost as a relevant issue. Regional councils provided more nuanced responses likely based on the experience of managing complex and voluminous data. Key, for several staff spoken to, was the difficulty of ensuring quality of some sorts of data collected, such as self-reporting by consent holders.

A lack of confidence in the data will affect the likelihood of further stages being pursued. This is exemplified in the quote below from Bay of Plenty:

‘one barrier to effective use of compliance data is that we don’t have any guarantee of the quality of the information being received. In a lot of situations, the data will be provided through competent sources (e.g. Stack testing where recognised experts do the field testing and report writing) but sometimes it could be a retired person measuring the temperature of their spa pool discharge. Unless you put a quality

²³ NER refers to the Resource Management (Measurement and Reporting of Water Takes) Amendment Regulations 2020

stamp on it (such as the NEMS system) it is very hard to know that the data is accurate'.

The challenge of managing the sharing stage of information is reflected in this quote from Waikato Regional Council *'for sharing and usage some issues with privacy obligations and sharing data from private land between agencies and across purposes'*. Privacy law for instance requires that data are used for the purpose for which it has been obtained; varying the purpose later can be legally fraught.

Rural councils noted that remote areas affected the management of data and information across the value chain (e.g. limited access to suitably qualified people, distance to testing laboratories, accessibility of landscape), and noted that different community types may need different support. Gisborne also noted that barriers may also differ across the value chain according to *'capacity, training, willingness to adopt new technology and systems'*.

Part 4 Linkages and relationships

Linkages and relationships between the different functional areas of councils and other organisations helps ensure best use is made of environmental data and information.

Question 11: Use the score table to rank the quality of the linkages or relationships between these different types of data and information for your council.

Using these V To inform this →	Science and monitoring	Policy implementation and effectiveness	Planning and consenting	Compliance and enforcement
Science and monitoring (S&M)		S&M/PIE	S&M/P&C	S&M/C&E
Policy implementation and effectiveness (PIE)	PIE/S&M		PIE/P&C	PIE/C&E
Planning and consenting (P&C)	P&C/S&M	P&C/PIE		P&C/C&E
Compliance and enforcement (C&E)	C&E/S&M	C&E/PIE	C&E/P&C	

Table 11 Abbreviations to support question 11

To interpret the below table (Table 12), it is important to recognise the basis of the information. This is set out above (Table 11). Headings can be matched. The functional area down the left-hand side collates data and information, and the table is an indication of the extent to which those data are linked to the area along the top line of the table. For example, S&M/PIE refers to the extent to which science and monitoring data are linked to policy implementation and effectiveness.

Councils responded very variably to this question, with some providing incomplete responses. A selection of responses is drawn out that were fulsome to illustrate some trends at the council level.

Council	S&M/PIE	S&M/PAC	S&M/C&E	PIE/S&M	PIE/PAC	PIE/C&E	PAC/S&M	PAC/PIE	PAC/C&E	C&E/S&M	C&E/PIE	C&E/PAC
ECan	3	3	2.5	3	2	2.5	3	3	2.5	3*	3*	3*
Selwyn	4	3	2	4	3	3	4	4	2	2	3	2
Christchurch	1	1	1	1	2	2	1	3	3	1	2	3
Waikato	2	3	2	3	3	3	4	3	3	4	3	3
Waitomo	5	5	5	5	5	5	5	5	5	5	5	5

Table 12 Linkages between functional areas. * is average of answers from council staff

Environment Canterbury scored its linking consistently midway through the scores, with the lowest score applying to the connection between policy implementation and effectiveness data through to compliance functions. Waikato's highest scores pertained to the connections between planning and consenting and science and monitoring, and between compliance and enforcement and science and monitoring. Selwyn and Christchurch are territorial authorities within ECan's jurisdictions and scored themselves quite differently. Waitomo ranked its connections between different functional areas at the top of the scale for every measure.

Some councils submitted multiple surveys with a different score for each measure. These were averaged for the purpose of the table above. However, the scores were very disparate and suggest that perceptions internally of sufficiency and linkages vary considerably. For example, the eight survey versions submitted by Auckland Council included scores about the connection between compliance and monitoring data and planning and consenting between 1 and 5. More detailed

analysis may help explain the very variable scores in this table, variability within council organisations and what they might point to.

Question 12 What would improve or maintain the efforts made currently to link data and information within your council, from one area of council to another?

This question focused on the improvements to internal linkages of data and information. This means the sharing of information between different areas of council. Internal silos were occasionally highlighted in earlier questions and this response provided an opportunity to consider how to address the problems.

Silos arise due to heavy workloads, disconnected statutory obligations, organisational structure, spatially separate teams, weak systems and tools for collaboration. Silos may also arise because of deliberate changes in responsibilities between teams which break chains of connection. For instance, one council noted that changes in the management of telemetry data from the science team to the compliance team can limit the extent to which the data are available for wider analysis if systems are not in place to support access.

Key suggestions for improvement in internal sharing of data and information include the following.

Common systems - More functional areas of a council using the same system or systems to reduce silos and avoid duplication of data collection.

Integrated approaches to data procurement and storage - Improved ability to extract and interrogate data for a wide range of needs (e.g. analyse community conservation data for state of the environment monitoring) – which relies on those entering the data to be mindful of other applications and ensuring metadata processes allow for this.

Improved use of emerging technologies – Using novel tools such as drone monitoring, artificial intelligence (AI) and machine learning for monitoring and analysis can increase efficiency and effectiveness of data collection and ongoing management. Better resourcing and technical capability in some councils would support this where it does not already exist.

Further improvements suggested included:

- Increased leadership mandate to collaborate internally and manage silos
- Improved resourcing for internal collaboration and enabling data and information management to support this (e.g. Bay of Plenty Regional Council applies a 'science and data' charge for consent monitoring, which supports the management of key systems)
- Greater internal collaboration to share about information held across the organisation to promote broader usage (e.g. Tauranga have started regular internal meetings via Microsoft Teams between staff from different areas to exchange information and promote sharing).

Part 5 Innovation and opportunities

Question 14 What innovations is your council most proud of in terms of the collection, storage, analysis and sharing/usage of environmental data and information across the topic areas?

Much innovation is occurring in the environmental data space in local government, although primarily in regional and unitary authorities. This question provided councils with an opportunity to highlight areas they were most proud of. It should be noted that for this section, many of the innovations transcend the categories of land, water, biodiversity and biosecurity, and some apply to all four.

Not all councils provided examples, suggesting that innovation is rare or not happening at all. Further, innovations reported by some councils would not be considered innovations in other councils, but this simply illustrates the uneven capacity and capability, investment and potential for novel technology implementation across the sector. It's important to recognise where agencies take steps forward in the management of data and information even where progress is modest. Many councils operate in highly constrained fiscal environments and innovation is a luxury many cannot afford.

Councils also made reference to innovations that were underway but are now in doubt due to policy changes, such as the Integrated National Farm Data Platform (INFDP). This included Bay of Plenty which noted:

'The INFDP²⁴ project, where a centralised system was being developed to handle all FWFP²⁵ information, would have been a good step forward, especially if it was to be extended to better manage N-Cap data as well (and any other data requirements coming at farmers through Regulations). This type of nationally based system could be extended for many areas of Regional Council business e.g. a central portal for NES-CF (Harvest Plans).'

Councils are also concerned that important sources of funding for research (particularly Envirolink) are vulnerable in the current political environment. Envirolink is annual funding of approximately \$1.6m, administered by MBIE, available for Advice grants and Tool Development grants. During interviews and engagement several local government staff identified that Envirolink has had an outsized impact for a relatively small amount of money over many years and provides an opportunity for councils with small rating bases to address key operational and strategic issues where it would otherwise be unaffordable.

Improving accessibility of data and information internally and externally - Councils identified a wide range of similar innovations around the establishment of live feeds, dashboards and the use of other analytic tools focused heavily on making the many types of data and information more accessible to internal and external stakeholders. This supports integrated management and helps avoid duplication and increases the range of purposes for which data can be used. Examples of improved access include the following:

- Tauranga CC highlighted the development of an interactive platform (AGOL) which records the location of open drains, stormwater outlets, riparian vegetation areas subject to erosion and the general condition of waterways.

²⁴ Integrated National Farm Data Platform – see [Update for the rural community - June 2023 | Ministry for the Environment](#)

²⁵ Freshwater Farm Plans (national level system explained here - [Freshwater farm plans | Ministry for the Environment](#))

- Auckland Council has mapped all instances of a breach of the relevant plan and tracks spatially all resource consents as a result.
- Queenstown Lakes District Council has published an electronic version of their Operative and Proposed District Plans.²⁶
- Auckland Council also identified the long running SafeSwim site, as an 'innovation in the generation and communication of real-time data relating to the public health risk of microbiological contamination of recreational waters' (in 2017 Safeswim was reconfigured - see case study).

Strategic management of data as integral to long term planning – Many councils have comprehensive strategic frameworks that include consideration of data and information pertaining to the environment and innovative ways of sharing them. For example, Selwyn District Council highlighted their recently released Waikirikiri Ki Tua Future Selwyn (a digital strategy that includes the data and information through interactive maps and tables).²⁷

Use of international frameworks and platforms for making data and information publicly available (e.g. ECan and their usage of the Global Biodiversity Information Facility (GBIF)²⁸ or iNaturalist²⁹).

Development of reporting platforms to collect data for particular purposes from outside the council, aggregate it and present it back to users. Ensuring efficient gateways for data collection can also reduce processing time through avoiding manual entry. For example, Bay of Plenty RC has developed a care group app (Kete Taiao) for recording care group activities and data.³⁰

Expanding monitoring programmes to improve coverage and quality of environmental information such as estuarine monitoring (Marlborough) and soil quality (Gisborne).

Increasing scope for analysis by establishing systems and spaces to support sharing and data interrogation (e.g. 'data sandpit' testing environment established by ECan) including where data are shared between councils.

Development of pioneering methods in environmental assessment (sometimes using novel technology). Examples include:

- Methods for monitoring and estimation of regional riparian characteristics (riparian protection) and regional peat surface change (subsidence) data (both Waikato RC).
- Use of machine learning to identify birds and predators from audio and images data respectively (PNCC).
- Use of oblique images for monitoring loss and disturbance of wetlands (Bay of Plenty).
- Use of AI in addition to LIDAR to analyse tree cover change in urban areas by local board area. This enables stature as well as spatial extent to be reported (Auckland Council).
- Machine learning/AI to identify and map pest plant species from remote sensing (ECan).

²⁶ <https://www.qldc.govt.nz/yourcouncil/district-plan/eplans/>

²⁷ [Selwyn District Leading the Way with Web-Based Strategy : New Zealand Planning Institute](#)

²⁸ [GBIF](#)

²⁹ [A Community for Naturalists · iNaturalist](#)

³⁰ <https://www.ethosenvironmental.co.nz/project-list/kete-taiao>

In-house design and development of apps and other data capture systems where market options are limited or exceed available resources, including:

- Marlborough uses an app designed by a staff member to collect biodiversity data
- Gisborne have developed an in-house spatial analysis tool for threatened species using eDNA data
- Gisborne, West Coast and others report capturing information digitally in the field with things like ESRI³¹ apps to reduce paper records
- Bay of Plenty reported using an in-house AGOL system to allow efficient data collection, storage and analysis when current systems were not fit for purpose (which has since been adopted by other councils)

Case study – SafeSwim³²

Prior to 2017, Auckland Council had assessed water quality at beaches in the Auckland region of New Zealand for over 20 years, primarily using a weekly sampling approach consistent with New Zealand's 2003 guidelines for recreational water quality monitoring, which reflect the 2003 guidelines for safe recreational water environments published by the World Health Organisation.

In 2017, Auckland Council realised that the existing compliance monitoring regime was not fit for purpose. First, monitoring that relies on weekly (or even less frequent) sampling of bathing waters has a number of now well-recognised limitations which mean that short-term pollution events will almost never be detected by sampling and long-term bathing water classifications will never reflect the true public health risk of bathing waters. Secondly, information about public health risk needs to be presented in an engaging format in real-time if it is to be useful to the public. Auckland Council was therefore concerned that the compliance-focussed approach could not provide timely (i.e., advance) warning of the public health risk of bathing and was contributing to a false sense of security about the quality of Auckland's recreational waters.

After demonstrating that predictive modelling substantially outperformed the traditional monitoring approach, Auckland Council subsequently committed to moving Safeswim to a predictive modelling-based approach and implementing proactive communication of public health risk forecasts through a redesigned Google Maps-based public interface. In the absence of regulatory mandate, Auckland Council led a 'coalition of the willing' to build the new programme. While Auckland Council provides funding and resources to manage programme delivery, expertise, information, and support is provided by other institutional partners, including Watercare Services Ltd, Surf Life Saving New Zealand, Te Whatu Ora Health New Zealand, and Northland Regional Council (which joined the programme in 2022 to provide coverage of bathing waters in the Northland region of New Zealand).

Oversight of the science and communication of public health risk is provided by an independent panel which includes New Zealand and international subject matter experts in water quality, public health and microbiology. Safeswim's water quality predictions are produced using a range of modelling techniques that differ in sophistication, functionality and information needs to provide the best possible information for each location. Auckland Council has invested in continuously improving the sophistication and robustness of the models each year, through frequent validation and re-calibration exercise.

The Safeswim models use the results of water quality sampling and their relationships with environmental factors to predict water quality in real time, calibrated to each individual beach. This means that beaches next to each other may show a different status because water quality is

³¹ ESRI is an American multi-national corporation that develops GIS applications (e.g. ArcGIS)

³² This example was provided verbatim by Auckland Council, setting out the history of the programme.

influenced by factors specific to each beach, including tide, wind, wave, and solar radiation conditions, the flow of currents and location of channels, and the nature of discharges to the beach, including natural streams and discharges from stormwater and wastewater networks. Auckland Council continues to collect water quality samples. In fact, the programme now undertakes more sampling than before, including ongoing routine sampling for model validation and calibration and targeted sampling to support the investigation and monitoring of pollution sources and to demonstrate the outcomes of infrastructure improvements.

Through the partnership with Watercare Services Ltd, real-time monitoring information for 55 discharge points from Auckland's wastewater network have been integrated into the Safeswim system. Alarms at monitored engineered overflow points or pump stations (next to the beach) trigger an automatic override of the models to indicate a wastewater overflow. The health risk forecasts generated by Safeswim are reported in real-time on the Safeswim website (safeswim.org.nz) and associated mobile application using simple, colour coded iconography that allows people to see and understand the health risk at a glance. Information on safety hazards at beaches is also provided and, through the partnership with Surf Life Saving New Zealand, information on lifeguard patrols and real-time safety warnings are provided for all lifeguarded beaches.

Safeswim implements international best practice and was recognised by the World Health Organisation in 2021 as a global exemplar of recreational water quality communication. In 2023 the World Economic Forum (WEF) selected Safeswim as one of three winners of the Digital Twin Cities Global Pioneer Project.

Question 15 What current innovations (in the planning stage, in progress or complete) have been most effective at improving the management of environmental data and information by local government (either by your council or at a sector level)?

Innovations highlighted involved new technologies, but many responses referred to the importance of how councils operated and managed data. Two key innovations were raised by many councils, specifically in the regional sector. These are:

- The related package of initiatives to improve national consistency and collection of environmental data (largely funded by the regional sector), being:
 - The Environmental Data Management System (EDMS) project (currently paused for internal assessment and external Audit NZ review of the RFP process to date).
 - The National Environmental Monitoring Standards (NEMS) project intending to improve quality of data collection.
 - Land Air Water Aotearoa (LAWA) and Environmental Monitoring and Reporting (EmaR) initiatives.
- The collaborative sector investment in Iris Next Gen. Iris Nex Gen is a collaborative investment programme in an information and communication technology (ICT) solution that refines the existing Iris system. The majority of the regional sector is contributing to the new system and work is underway on its release.

A range of similar innovations at a regional or local level were identified by councils, whereby multiple agencies co-fund and coordinate their operations to avoid duplication and pool scarce resources (e.g. Data Insights Southland Hub – DISH). Smaller councils lack the resources to obtain large systems, and collaborative procurement can support them to achieve economies of scale. The

challenge of receiving large volumes of data were noted throughout the survey with many respondents unsure their systems were fit for purpose.

Innovations that improve the direct and automated flows of information (e.g. telemetry requirements for water) help reduce the time burden associated with collection and storage. Setting up real time flows of data held by other agencies into the council, or between different parts of a council can also avoid multiple steps in sharing and using that data. For example, Marlborough noted the advantage of setting up an API (Application Programming Interface) to pull data from a range of systems to meet reporting requirements such as those related to the National Monitoring System.

Improving the flow and quality of information is usually difficult to achieve voluntarily, and council rules take a long time to bring about given local interests. Councils noted the value of the water metering standards released by the Ministry for the Environment as the standards overrode consents and enabled councils to refresh the nature of obligations and improved the overall process of data collection significantly. Council staff specifically noted that the Ministry for the Environment did not initially get the regulations right but undertook a review which resulted in significant improvements in response to sector concerns.

The value of central direction and funding was repeatedly highlighted throughout the survey. Councils are very aware of the inconsistencies in data but no one agency can lead. Support from central government to determine collection and associated standards would help drive greater quality and coverage. New Zealand has a history of weak national direction leading to a proliferation of locally derived approaches to national issues – several councils felt natural hazards were the latest example of this tendency. Related to this point, was that (mostly regional) councils are footing the bill for collaboration and efforts to drive consistency – many respondents noted this was not fair as the data and information usually value at a range of scales, including national.

Question 16 What are the key opportunities to improve the collection, storage, analysis and sharing/usage of environmental information by local government (either by your council or at a sector level)?

Consistent themes emerged in respect of key opportunities to improve. The most common themes related to the:

- Need for consistency in collection methods and standards
- Need for greater sharing of costs by central government
- Improvement required in central leadership (e.g. council staff commonly noted that many of the advancements in national consistency are being driven by regional councils working together with little guidance from the relevant central government agencies)
- Reduction in duplication of both effort and procurement
- Ensuring experts in domains are engaged in data management and tool design discussions

Councils reported in the survey and interviews that obtaining key data from central government could be very difficult. One example raised was the information the Ministry for Primary Industries holds on the location of carbon forests. Councils can find it challenging to access this information, which would support them to better address risks related to wilding conifers. Council requests for data from CRIs and central government can also attract handling fees which, while not usually significant, do add up across council functions (e.g. NIWA charges \$50 per information request).

Respondents also noted concerns around the concept of collectively purchased tools, including that it would be disruptive to established systems in their council, may default to the 'lowest common denominator' and thus not meet requirements for them, and would not be properly supported by central government. For example, several respondents were circumspect about the merits of Iris Next Gen, as they were concerned that it would not be able to be easily integrated into their operations due to low appetite for customisation and focus on standardisation.

Many councils have expended considerable resources in the development of off the shelf products, customised systems and specially designed apps and other tools. The 'sunk cost' of these is likely to make some councils (or different areas of councils) resistant to collective procurement, particularly where the common tool may not meet their needs or requires adjustments to work programmes. The risk of stranded assets in this context must be considered at a council and team level.

Noting the uneven focus on innovation in the sector, it is important to recognise that small councils with low asset bases, small rateable land areas and limited capacity are going to struggle to do their basic work in respect of managing environmental data and information. Innovation will primarily occur where resources enable the sector to 'lift their gaze'. The size of the council and its associated resources often bears little relationship to the sensitivity and importance of its natural environment. This matter is returned to in the Discussion.

Question 17 What support or change is needed to improve the collection, storage, analysis and sharing/usage of environmental information by local government? Feel free to include ideas that relate to the role of other agencies and organisations.

This question was similar to question 16 but focused instead on what support is needed to bring about the required change. Reducing variation is a key focus for many respondents, a factor that also came through strongly in discussions with councils. There is a clear need for stronger leadership and direction in this area, exemplified by:

- The significant resource shortfalls for some councils despite similar resource management issues
- The labile national direction that many proponents referred to as making knowing what to invest in and on what terms very difficult
- The disproportionate burden on local government generally, and regional government especially, to collect and maintain environmental data and information suggesting a fairer distribution of costs and benefits is needed
- The weak centralised support for collective initiatives (reliance on sector driven consistency on top of existing roles)

The importance of national direction was noted by most respondents, as was the impact of instability and uncertainty in times of policy upheaval. One interviewee noted '*National direction has great power to drive collective outcomes, but uncertainty is hugely impactful on good outcomes too – two sides of the same coin*'. Thus, national direction is most powerful where it is stable and sustained, and central government is open to reviewing it, listening to councils and addressing implementation issues over time.

Question 18 How important are the Open Data Principles to your council in managing data and information?

Councils generally reported that the Open Data Principles³³ were well supported, referred to as variously 'essential', 'high priority', 'key component' and 'very important'. For example, Environment Canterbury noted that the principles were "[v]ery important. If we are unable to access external data or share our data, how can we make good decisions."

Despite the perceived importance of these principles, they are not always implemented. Reservations despite general support included the challenges of managing data that are commercially sensitive, the sensitivity of Mātauranga Māori data and the potential risk of sharing other proprietary information. Council staff noted that providers may be less inclined to provide some information to councils if there was a presumption of sharing. Survey respondents noted that a balance needs to be struck in some circumstances, where the principles of openness need to be weighed against other issues.

It was indicated by several councils that further guidance and support on the application of Open Data Principles and relevant exemptions would be useful. In addition, West Coast noted that although very important, implementing such principles may require assistance with resourcing and time required to maintain systems, especially where there are more national rather than regional benefits to implementing them.

Question 19 Any other general comments related to the purpose of this survey?

Councils had raised a significant array of issues by this stage in the survey and not all added comments to this question. Further matters that were highlighted included:

- Recruitment challenges for technical staff in remote and rural areas constraining local government's ability to manage environmental data
- Concerns about further policy disruption and uncertainty constraining progress
- The interest councils had in knowing the collective results of the survey

³³ <https://www.data.govt.nz/toolkit/policies/open-data-policy>

Discussion

Overview

Two key aspects of this research deserve highlighting in the first instance: the first is the expansion in the scope driven by the depth of responses by the local government agencies that participated. The second is to recognise the context in which this research has occurred.

The purpose of this research was to consider what information is collected by local government and why. However, in collecting this information a wide range of strategic issues were highlighted that directly relate to how we manage the environment and the role and function of local government. Once the original questions are addressed the remainder of the discussion is devoted to summarising and considering the key insights gleaned that fall outside this specific scope or is best discussed at a strategic level (i.e. is a symptom not a problem as such).

The management of environmental data and information by local government occurs as one of many competing priorities and role for local government, made more complex by significant churn and change at the time this survey and stocktake was conducted.

It is difficult to separate practical improvements in data and information management from the strategic issues identified in this report, so both are addressed together. The key questions and responses are outlined below, followed by a reflection on the research design to be considered in the planning of future work (especially surveys) in this subject area.

Question 1- What information is currently collected or held by local government entities within each domain?

Key insights

Local government collects a significant range and amount of data and information across land, water, biodiversity and biosecurity, but expends different levels of energy on each.

Of the four areas of data and information explored, biodiversity is least well represented likely due to lower priority, primacy of statutorily driven collection and differing perceptions of roles and responsibilities by staff and leadership.

Regional sector data are heavily relied upon by other actors in the system, but distribution of costs and benefits is uneven (i.e. regional ratepayers primarily fund it).

Central government could better support collaboration and consistency in the local government sector through funding and direction.

Councils rely on data and information from other actors in the system and are vulnerable to changes made in the management of that data.

Councils recognise the importance of Mātauranga Māori data but may need further support in understanding the best ways to support its collection and application to planning in the future.

An enormous range and volume of data and information is collected by local government, particularly regional councils and unitary authorities. Councils expend considerable energy and resources on the collection, storage, analysis and sharing of environmental data and information, supporting a range of national initiatives in doing so.

Across the four domains in scope, the most data and information exist for water, followed by land then biodiversity and biosecurity at some distance. But many sources of data and information have broad pan-domain application (e.g. changes in land use have implications right across the resource management system). While domains have some utility, much data transcends them and forms part of more integrated approaches.

Many of the ways of collecting that information rely on bespoke systems and processes that represent significant investment. Changes to data management at this level of government will need to be mindful of the sunk costs this could entail.

The data and information vary however in the extent to which they are usable. Councils commonly referred to the untapped potential of resource management related data (see case study earlier) which, if extracted and aggregated, would provide useful historic and future insights to support policy development and implementation.

Research reports for instance are rarely centrally managed with effective metadata. Some council staff noted that some reports are impossible to find, and one functional area will procure it but not necessarily consider the other possible applications and share it (or collaborate on procurement of it).

Regional councils and unitary authorities hold most information, and territorial authorities rely heavily on this tier of government to meet their requirements. Other actors in the system also rely heavily on regional level data. Examples of this reliance include:

- Central government to meet reporting obligations under the Environmental Reporting Act 2015
- Crown Research institutes and universities
- Iwi and hapū
- Consultants undertaking assessments of environmental effects
- Lawyers and others engaged in legal processes such as consenting and enforcement
- Communities and local organisations participating in environmental management activities
- Resource users managing their activities

However, while data and information are used by a wide variety of stakeholders, the costs fall primarily to regional ratepayers. Reliance without input into decision making can create system vulnerabilities.³⁴ All councils rely on each other and other entities including the private sector for data.

Councils are grappling with a range of challenges including collaboration to achieve consistency and difficulties in sourcing adequate funding. A lack of central government leadership was commonly cited by respondents concerned that limited strategy and a lack of a basis for a joined-up conversation was slowing progress in this area and causing inefficiencies arising from duplication.

Councils rely on information from others. Many nationally available datasets (such as the Land Cover Database) underpin policy development and implementation across the motu. Councils may pay to access that data in some circumstances, but do not control it. This includes having no control over the timing (or frequency) of updates, or maintenance of the interface.

This creates a reliance in the system and means councils are vulnerable to choices made by other agencies to reorient or disestablish their monitoring networks, a matter particularly pertinent when the council cannot afford to fill the gap once it appears (immediately or at all). Councils also report struggling to access some data held by other parts of government (especially central) that are important for management purposes.

The focus of the regional sector given their environmental mandate is commonly rural, leaving areas such as urban biodiversity vulnerable to data gaps or data of insufficient granularity if city councils do not resource it. One city council made the important observation that while regional councils generated significant useful information, it was typically not granular enough to inform their jurisdiction in some respects, thus resulting in overlapping work. Examples include urban biodiversity, where rurally focused information databases may not provide all the basis needed for decision making in built up areas. This will rely on the territorial authority having sufficient capacity and capability to fill this gap.

City councils provided more comprehensive answers than district councils generally, and Tauranga City's stocktake evidenced considerable holdings of data and information. It is possible that the

³⁴ The shrinking of the hydrometric monitoring network established by the Ministry of Works and now administered by NIWA is an example of this. On the West Coast five strategically important sites will be shed from the NIWA network due to cost savings. Councils are trying to take over these sites where possible to protect the continuity of the data and its wider utility.

interplay of a more concentrated and significant rating base and high community interest in nature protection create greater potential for city councils to undertake their biodiversity role.

Councils also generally demonstrate a nascent approach to issues relating to mātauranga Māori data which is challenging on many levels and require support and guidance. Interviews demonstrated that council staff do not necessarily understand or know how to navigate challenges in this area, including data quality. Requiring strict standards of collection/quality assurance can be challenging in contexts where communities are collecting information in place of council staff or contractors.

Councils also frequently noted challenges with the concept of data sovereignty and the ownership of data and availability of it to councils and the community. For example, iwi and hapū being funded by rates to collect information on sites of significance and then choosing to maintain control of that data and not share it in any form. Some councils expressed concern that the expectations of the community to have access to publicly funded data was difficult to navigate, and that it was then harder to draw on the information for policy and planning purposes because it was not made available. Responses generally reflected that councils understood the reasons iwi and hapū did not disclose this information or provided only high-level summaries but found explaining it to the rest of the community and others difficult at times.

Question 2- Why is the information collected? Is it a requirement for legislative, compliance monitoring or enforcement purposes, or is it collected for another function/purpose?

Key insights

Statutory drivers are key to ensuring information is collected, particularly in resource constrained environments.

Councils with very limited resources rely on statutory drivers to justify investment and FTE to manage.

There are minimum specific obligations for data collection by local government, so 'non-statutory' data should not be thought of as spurious or unnecessary.

The most important drivers overall are statutory/legislative, as council staff can secure funding and mandate to undertake these more easily than discretionary projects. Councils identified a range of drivers including statutory obligations (e.g. data requirements for the National Policy Statement on Urban Development), plan effectiveness monitoring under s35 of the RMA and the influence of legally binding agreements with other parties including joint management agreements.

The more sophisticated regulatory requirements in relation to water, land and biosecurity may explain why more data and information is collected in respect of these areas of work. Biodiversity by contrast is less well served at a system level. Possible reasons for this relatively lower priority include limited statutory drivers, differing opinions on roles and responsibilities and the complexity of data collection for things like species and ecosystems.

Statutory drivers are key for councils with very limited resources, as focus will be on them. For example, Tararua District Council provided insights into how these increased statutory obligations

supported the expansion of council effort in water data. Examples of emerging drivers include the reporting and management obligations administered by Taumata Arowai.

Minimum statutory obligations are scant so 'discretionary' should not be thought of as spurious or unnecessary. Most of the critical information to the discharge of council's roles is not mandatory to collect. Councils identified that a range of other drivers were relevant, and they applied differently to different types of data (especially where it had multiple applications). Different drivers may also be relevant across the steps in the data value chain, although views were disparate on this matter.

Question 3 - What methodology/standards are followed? Are there quality assurances/quality controls in place?

Key insights

Councils recognise the importance of robust data and information and are likely to adopt standardised methods and quality assurance steps as they become available.

A lack of confidence in the veracity of data or information is likely to constrain its further use.

There is significant sector support for the advancement of projects that standardise data and information management, particularly with centralised funding and support.

Quality assurance and controls were not cited for most data and information listed in the stocktakes provided by each council. This may mean they rely on internal filters, gateways and peer review. There are no standards for many of the types of data and information collected, and quality would be assured or supported via informal means.

A lack of confidence in a dataset will reduce the likelihood that it is used, and improvement of it will be reliant on expertise and resources being available to do so. This would likely be particularly important where the data may demonstrate issues such as over-allocation or other exceedance of environmental thresholds.

Councils appear to be acutely aware of the importance of quality assurance of data and information. Most councils demonstrate a strong willingness to support collective initiatives to improve consistency nationally. Respondents frequently noted in the survey and interviews the value of standardised approaches to data collection, indicating that where direction and mandated methods exist councils will comply with them. This indicates that there is not only opportunity to improve data and information quality, but willingness as well. Initiatives such as NEMS have significant sector support for this reason.

Question 4- How is the data stored, accessed, and distributed? What constraints are there to sharing or accessing information?

Key insights

ICT solutions on the market are seldom fit for purpose, requiring significant and costly customisation to enable usage and to maintain over time.

Innovations include technological improvements but also span ways of working. Improving collaboration and sharing is seen as a key area for improvement and is likely to require additional funding and improved central government participation and leadership.

Systems typically require customisation and ongoing maintenance at significant cost to each organisation. Most systems begin as 'off the shelf' products but the market appears to cater poorly for environmental management functions of councils, particularly regulatory functions. Even where systems have been collaboratively procured such as Iris, significant customisation has occurred within some councils. Councils generally develop their own protocols and systems for the storage of environmental data and information.

Subsequent analysis and sharing are dependent on internal expertise, resourcing and various constraints including privacy and commercial sensitivity. Most councils indicated that they administer multiple and often disconnected systems and struggle to manage and access data and information for its intended and other purposes. Councils report significant information that is held but difficult to access and analyse, and then to apply to decision-making. Several opportunities for improvement arise from this issue, particularly the improved collection, management and aggregation of resource management data.

Councils reported a wide range of innovations and proposed more that would improve the current context. These included the use of artificial intelligence, machine learning, remote sensing and other emerging technologies. The smallest councils with the least resources reported little innovation, focusing first on their core statutory tasks which are proving challenge enough. Innovation is logically more possible once the basics are done, and even collaboration takes additional resources. While technology was cited commonly as an innovation, many innovations related to ways of working and the need to further collaborate at a sector level and across levels of government.

Limitations and reflections on methods and approach

This research project demanded considerable engagement for subject councils. Responses to the questions commonly required collaboration of multiple parts of council. The challenges encountered and queries fielded demonstrated some key issues in the sector and learnings for future work of this nature. These are summarised below.

Topic	Learning	Application for the future
Manual collation	No councils had a readymade metadata list of information that was comprehensive: all lists were manually collated. This increased the burden of work on each agency to complete	Studies of this nature must account for the need for manual collation and ensure sufficient time is available.

	the survey and stocktake. ³⁵ Greatest efforts were made in the narrow delivery time of this project to accommodate council resourcing concerns.	
Scale of activity	The sheer scale and complexity of data and information held by some (particularly regional/unitary) councils was underestimated in the design of the survey.	Future surveys should consider more specific questions and tailor the survey to the type of council.
Support required	Considerable input into supporting councils to complete the survey was necessary. However, this support was uneven. While some councils reached out for clarification on requirements, others did not and as a result information is variable.	Future research should also provide repeated offers of support and ensure questions are readily responded to.
Internal disparity	Most surveys were completed by a range of people in a council and responses reflected sometimes limited coordination internally. Councils appear to have some siloed approaches to data management.	More focused analysis where variation will be less may produce more meaningful results.
Ensuring representation	Smallest councils facing the most significant resource shortfalls are also least able to participate in the research. Effort was made to ensure broad representation, but pushback from smaller entities struggling to meet the information request demonstrated that it was likely their perspective would be excluded from research in this space in most instances.	Proactive ways to enable participation should be considered in studies seeking to reflect practice across local government. Not providing for flexible participation can result in the perspective of those entities being under-represented in collective programmes or sector-level research.
Limitations of domains	The four topic areas (land, water, biodiversity and biosecurity) were difficult to tease apart, and many areas of data and information management crossed some or all of them, and councils had a variety of interpretations of scope.	Different questions for each topic area given different levels of activity may be worth exploring or pulling away from domains and focusing on types of data (e.g. continuous monitoring, one-off assessments etc).
Functional areas	The four functional areas focused on (science and monitoring, policy, planning and consenting and compliance) demonstrated very different levels of integration across the sector. The location in the organisation of a functional role is only partly a factor in collaboration and dissemination of data, other things such as informal relationships between individuals are also highly relevant.	Future studies could consider delineating data based on other factors such as purpose for collection, as many underlying purposes serve more than one functional area.

³⁵ Note that the originally proposed method was for the researcher to collate sources, but limited access to systems and the limited amount of metadata made this approach unlikely to be successful. The most fulsome list would be developed by staff.

Sufficiency as a metric	The absence of a clear notion of what ‘enough’ data was a key constraint. The complexity and diversity of council roles confounds an easy way to know when councils have enough of the right types of data and information for the required uses. Instead, an approach was taken that asked questions about ‘sufficiency’. Sufficiency of information was a self-reported metric, with a high degree of subjectivity. Sufficiency was measured with regards to the meeting of day-to-day needs, and the meeting of requirements to make long term decisions. In both cases (and predictably) it provided only loose insights.	Sufficiency is very much in the eye of the beholder, even with qualifiers. Sufficiency may not be the optimal metric, but the absence of clear obligations and standards for data and information make formulating any other kind of baseline for what is ‘enough’ very difficult. Over time and if direction improves, it may be more possible to construct more objective notions of whether councils are collecting what they need to.
Incomplete data	The answers and the data and information sources that are detailed are naturally limited by the knowledge of survey participants charged with completing it. Much data and information in local government is managed by individuals or small teams with limited resourcing. Legacy data and technical information outside the view of those participating is most likely to be missing.	The manual nature of data and information management and the resulting difficulty in forming an aggregated view of assets held means that the overall picture is likely incomplete. ICT and data management innovations over time will support improvement in this area.

Conclusion

This research into the environmental data and information held by local government revealed a wide range of practical and strategic issues. Many of the issues are highly relevant to the broader context of environmental decision-making and what it is based on.

The research revealed that regional sector data and information is heavily relied upon by other actors in the system, but distribution of costs and benefits is uneven (i.e. regional ratepayers primarily fund it).

The level of data and information collection and the likelihood it will be managed adequately appears tightly related to resourcing underlying the functions that administer it. This is important from a systems perspective because of the uneven resourcing in local government.

Significant informal effort is undertaken, especially in the regional sector, and there is much work in progress. Innovations or new ways of working need to be designed cognizant of the implications for the sunk cost of systems and processes and the differential impact of change in different agencies.

Greater collaboration, coordination and leadership was repeatedly noted as a key solution to improve coherence of management, but most respondents were concerned that central government system stewardship was limited and often entailed little resourcing to contribute to nationally important activities.

Overall, councils require more direction and leadership to bridge the gap between central and local government, and improved funding to recognise the devolved mandate of serving national environmental reporting and a range of other key public interest outcomes.”

Appendix 1: Types of information in scope

What environmental data and information should be considered in a broad way. Data about the environment (i.e. water quality) is in scope, but so too is what we know about the effectiveness of policies designed to protect water quality, consenting that affects or could affect water quality, and compliance data on levels of compliance with obligations that relate to water quality.

Type of data/information	Examples
State of the environment monitoring	Includes council's regular monitoring of land (e.g. soil indicators), water (water quality and water quantity indicators); species and ecosystem data and pests/ weeds occurrence
Ecological surveys	Surveys of species and ecosystems that may or may not be linked to SOE monitoring and may be one off (e.g. SNA surveys)
Information on resource use	Information on the 'stocks' of resources and their use. This includes information to inform planning and policy, setting objectives, limits and targets, determining resources use conditions and any other information
Spatial and cadastral data	Large scale datasets of spatial/cadastral data (e.g. flood modelling, vegetation cover) and environmental aspects of property/lot data
Property information data	Environmental information related to a property unit, including that related to rates
Conservation funding data	Output and outcome monitoring of funding for community groups and other non-regulatory initiatives
Administrative information	Any other information relevant to environmental matters (e.g. registers of FSC certified forests)
Plan/policy effectiveness monitoring	Data intended to capture the outcomes/results of policy interventions at a project or jurisdiction scale – includes regulatory and non-regulatory interventions (including s35 monitoring)
Mātauranga Māori	Any embedded or separate programmes of analysis and collection of data and information for cultural purposes, including regional or district level operationalisation of Mātauranga frameworks etc
Consent information	Information related to consents applied for and issued, individual and aggregated
Consent information – post granting	Data and information relating to the exercise of consents including that collected by the council, provided by the applicant or any consultant in their employ
Compliance data about regulated community collected by council staff	Information on the behaviour of the regulated community (individual and aggregated) from the regulator's perspective
Compliance data (self monitoring by regulated parties)	Data and information submitted by regulated parties for compliance reasons
Regulator performance monitoring	Data and information on the performance of the regulator in compliance monitoring and enforcement

Appendix 2: Survey questions

Background information

This survey is concerned with land, water, biodiversity and biosecurity **data and information** collected by local government agencies. We are interested in understanding more about environmental data and information across the data value chain from collection through to usage and impact. The survey is being undertaken by several regional, unitary, city and district councils including yours.

A subset of the councils asked to complete the survey will also be the subject of a stocktake of their data and information. The purpose is to collate a spreadsheet of sources of data and information and the collation of key attributes about those sources.

Navigating this survey

It is expected that the answers to this survey will be found in various parts of council organisations and the survey may need to be distributed through different teams and groups to be completed. It is understood that the arrangement of work programmes and responsibilities will look different for each organisation.

Part 1 is concerned with an overview and the sufficiency of the data and information sources council holds (or relies upon) across **the key topic areas**.

Part 2 focuses on the sufficiency of different types of data and information across **different functional areas** (however they are arranged in your council)

Part 3 is concerned with the sufficiency, drivers and barriers of **data and information management** (including collection, storage, analysis and sharing/usage).

Part 4 addresses the **linkages and relationships** in the management of data and information

Part 5 looks to **the future**, inquiring about innovations underway and possible, including support needs for improvement.

Your council's answers to these questions will be aggregated and compared so please do not modify the wording of questions and please answer all of them succinctly and clearly.

Score scale

All questions in this survey relate to a single score scale below (Table 1). Please refer to this when asked to provide scores.

Rank	Explanation of sufficiency (based on meeting day to day needs)
0	Does not exist.
1	Poor or very limited
2	Below par – lots of gaps but a few areas where it is fit for purpose
3	Adequate – has some gaps but is mostly fit for purpose
4	Good – some highlights and other areas that need more work
5	Comprehensive – consistent and effective

Table 1 Score scale

Topic areas

The survey concerns the **four topic areas**, appreciating that there will be overlap between them and with other data and information sources. The table below provides a brief description and some examples. Data and information not in these topic areas is outside the scope of the survey.

Topic area	Explanation and examples
Land	Environmental data and information related to terrestrial areas such as land use, erosion susceptibility etc. including assessments of the effectiveness of management interventions including policy and planning approaches and compliance data.
Water	Environmental data and information related to water including infrastructure, quality and quantity, assessments of the effectiveness of management interventions including policy and planning approaches and compliance data.
Biodiversity	Environmental data and information related to state and trend data for indigenous species and ecosystems, including assessments of the effectiveness of management interventions including policy and planning approaches and compliance data.
Biosecurity	Environmental data and information related to state and trend data for invasive species, including assessments of the effectiveness of management interventions including policy and planning approaches and compliance data.

Table 2 Topic areas of interest (land, water, biodiversity and biosecurity)

Part 1 Sufficiency of data and information across topic areas

Question 1 Overview

Please provide a very brief description of the data and information you hold relating to the following areas, including a couple of key examples

1A Land

1B Water

1C Biodiversity

1D Biosecurity

Question 2 Common types of data and information and scores for your council

For the common types of data and information noted below, please rank the adequacy of your data (as per Table 1). If you do not hold any data and information that is relevant, please put zero. You are also welcome to add any top-of-mind information (that is not captured in the table) in the dedicated blank rows below.

Topic	Question	Score
Land	Data on land use including proportions of jurisdictions under different types	
	Impervious surface data to measure extent of built environment	
	Data and information on erosion susceptibility	
	Data and information on land use change over time	
Water	Data and information on water quality for recreation purposes	
	Data and information on water quality for drinking purposes	
	Data and information on water usage	
	Data and information on sea level rise (including forecast)	
	Data and information on effectiveness of water policy	
Biodiversity	Data and information to inform the state and trends associated with species and ecosystems (collected for or by the council)	
	Data and information on the effectiveness of conservation interventions for indigenous species and ecosystems	
	Spatial prioritisation basis or system for directing conservation management interventions	
	Data and information on significant natural areas (potential or identified)	

	Data and information on consented land clearing	
	Data and information on biodiversity policy effectiveness	
Biosecurity	Data and information on the extent of invasive plant species	
	Data and information on the extent and impact of invasive mammals	
	Data and information on the extent and impact of ungulates	
	Data and information on the extent and impact of invasive species not already mentioned	
	Data and information on the effectiveness of management interventions for invasive species	

Table 3 Common types of data and information and sufficiency score

Question 3 Are there other data and information sources not owned by council that you consider to be particularly important in these areas - describe some examples.

Question 4 Please provide a general overview of the extent to which Mātauranga Māori data and information are collected, stored, analysed or shared/used by your council across land, water, biodiversity and biosecurity topics supporting a range of council activities?

Question 5 In respect of the data and information your council presently holds across the topic areas, what level of confidence do you have in its sufficiency for long-term decision making? Please use score as per Table 1 in the below.

Topic area	Score	Explanation
Land		
Water		
Biodiversity		
Biosecurity		

Table 4 Question 5 table to complete

Question 6 Any additional comments about sufficiency of data and information across topic areas

Part 2 Sufficiency of data and information to support functional areas

Question 7 Data and information in functional areas

Councils require data and information for a range of purposes. We consider there are at least four key functional areas that are important:

- Science and monitoring (understanding ecological state and trend and the health of the environment)
- Strategy and policy (understanding policy effectiveness and what interventions are changing on the ground)
- Consenting (understanding nature and extent of resource use)
- Compliance (including bylaws) (understanding risk, compliance rates and feedback loops)

Please put a score of 1–5 (as per Table 1) in each box in accordance with the question in the left-hand column related to the topic area along the top row focused on the extent to which the data and information is sufficient to meet day to day needs.

Area	Question	Land	Water	Biodiv	Biosec
Science and monitoring	How sufficient is the science and monitoring data and information your council has about the following areas				
Strategy and policy	How sufficient is the data and information your council has, to develop policy or understand the effectiveness of policies related to the following areas				
Planning and consenting	How sufficient is the data and information your council has about the planning and consenting information related to the following areas (including permitted activity monitoring)				
Compliance	How sufficient is the data and information your council has about the compliance and enforcement outcomes related to the following areas (including permitted activity monitoring)				

Table 5 Sufficiency of data and information across functional areas

Part 3 Data and information management stages: sufficiency, drivers and barriers

Data management stage	Explanation
Collection	The gathering of information passively or actively by internal or external parties
Storage	The way data and information are stored for later analysis and use (e.g. notebooks, hard copy files, databases, spreadsheets)
Analysis	The way data and information are treated to understand what they mean
Sharing and usage (including providing access)	The creation of access to the data, active distribution to enable usage or direct usage by the council

Table 6 Data management stages

Question 8 Sufficiency of data and information management for present and future needs.

This question is split over the four key stages of data and information management and ask questions about the current sufficiency of approaches to these stages and whether long term decision making will be supported. Please use score as per Table 1 in the below.

Area	Question	Present needs	Long term needs
Collection	How sufficient is the collection of data and information in your council for:		
Storage	How sufficient is the storage of data and information in your council for:		
Analysis	How sufficient is the analysis of data and information in your council for:		
Sharing/usage	How sufficient is the sharing/usage of data and information in your council for:		

Table 7 Sufficiency across data management stages

Question 9 What are the key drivers of data and information management?

Question 9A Do the drivers differ between collection, storage, analysis and sharing/usage and if so, how?

Question 10 What are the key barriers to the effective management of data and information?

Question 10A Do the barriers differ between collection, storage, analysis and sharing/usage and if so, how?

Part 4 Linkages and relationships

Linkages and relationships between the different functional areas of councils and other organisations helps ensure best use is made of environmental data and information.

Question 11: Use the score scale (as per Table 1) to rank the quality of the linkages or relationships between these different types of data and information for your council.

Using these V To inform this >	Science and monitoring	Policy implementation and effectiveness	Planning and consenting	Compliance and enforcement
Science and monitoring				
Policy implementation and effectiveness				
Planning and consenting				
Compliance and enforcement				

Table 8 Linkages between functional areas

Question 12 What would improve or maintain the efforts made currently to link data and information within your council, from one area of council to another?

Question 13 What are the most important linkages and relationships for environmental data and information outside your council (external relationships) and why?

Part 5 Innovation and opportunities

The local government sector has a range of initiatives recently completed or already underway. Please consider this section as an opportunity to highlight them from your council's perspective and feel free to link them to the previous questions if in your view they will resolve significant gaps in practice or availability of information once completed.

Question 14 What innovations is your council most proud of in terms of the collection, storage, analysis and sharing/usage of environmental data and information across the topic areas?

14A Land

14B Water

14C Biodiversity

14D Biosecurity

Question 15 What current innovations (in the planning stage, in progress or complete) have been most effective at improving the management of environmental data and information by local government (either by your council or at a sector level)?

Question 16 What are the key opportunities to improve the collection, storage, analysis and sharing/usage of environmental information by local government (either by your council or at a sector level)?

Question 17 What support or change is needed to improve the collection, storage, analysis and sharing/usage of environmental information by local government? Feel free to include ideas that relate to the role of other agencies and organisations.

Question 18 How important are the [Open Data Principles](#) to your council in managing data and information?

Question 19 Any other general comments related to the purpose of this survey?

Question 20 Please provide contact details for key people to follow up on any aspect of this survey if required (such as clarifications or further detail). Feel free to divide across topic area or functional area.

Appendix 3: Taxonomy for information sources for the stocktake

Attribute	Explanation
Unique identifier	Project specific unique identifier comprised of (council number – database/info source number)
Title	What the data base or information source is referred to as whether formal or informal
Council ID	Unique identifier relevant to the council to demonstrate provenance
Owner (within organisation)	Unless otherwise stated the council is assumed to be the owner – this question relates to where internally it is administered.
Owner/Manager (if external)	
Description	A more detailed description of the database or information source including potential scale
History/whakapapa	Historic matters to consider (e.g. previously established for a different reason) if relevant
Reason for collection (purpose)	Why the data/information is collected (can be multiple reasons) – what is the purpose of the data
Statutory linkage	The statutory basis for collection (if relevant)
Demonstration	What does the data show – what does it reflect?
Methodology for collection	How is the data collected including any relevant protocols
Quality assurance processes/standards relevant	How the quality of the data and information is assured or cleaned once it arrives in the council (if this occurs) or at any point before sharing/usage
Storage	How the data are stored – what system (hard copy in file boxes at the main office)
Frequency of update (continuous, annual etc)	How is the data or information managed relative to time. Is it a long-running time series dataset, or is it collected as needed or in response to particular drivers
Accessibility	How is the data or information accessed once stored (internal and external)
Sharing/usage including being made accessible - INTERNAL	Is the data regularly disseminated internally– describe how
Sharing/usage including being made accessible - EXTERNAL	Is the data regularly disseminated externally – describe how
Readability	Whether or not its reasonably understandable (acronyms/units of measure) or needs further treatment to be used
National dataset	Is the data part of a national dataset that is centrally curated?
Time lags relevant	Age/timing of update/collection v dissemination/updating
Linking	Whether the information is linked to or from any other source
Link if available externally	http....
Potential applications	For report analysis – this will highlight where data and information are not used or used in full and what potential there is to change that

