

8 Land

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

Soils, landscapes and natural resources (such as water) underpin natural and managed ecosystems. They provide ecosystem and productive services on which we rely for agriculture and forestry and act as a platform for communities, infrastructure, and the national identity on which our culture and tourist trade is based.

Current land uses, intensification, the changing geographic pattern of our land uses, as well as climate change and variability, are putting increasing pressures on our soils, landscapes, and natural resources threatening their ability to sustain the critical functions on which we depend (Landcare Research, 2013).

Land-use decisions balance societies' various calls on this limited resource. It is critical they are informed by good data on the impacts and trade-offs such decisions involve.

Land questions

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

Enduring questions

What are our land cover and land use profiles, how are they changing, what is driving these changes, and what is the consequential impact on New Zealand's soils, and natural and cultural landscapes, including urban environments and conservation lands?

Supplementary enduring questions

- A. What is New Zealand's land use, and how is this changing¹ spatially and temporally?
- B. What is New Zealand's land cover and how is this changing spatially and temporally?
- C. What is driving the changes² in New Zealand's land use and land cover?
- D. What is the current and potential future impact³ of land use and land cover change in New Zealand?
- E. What is the quality⁴ and quantity of New Zealand's soil and how is this changing spatially and temporally?
- F. What is the impact of land use and land cover profiles on Māori and Māori-owned land and how is this changing?
- G. What and where are New Zealand's protected areas,⁵ how are they changing, and what is the environmental protection effort⁶ done?

Notes

1. Changes in land use include land use intensification, change in soil quantity, and potential changes to land use.
2. Changes include market and non-market factors.
3. Impact of land use and land cover in New Zealand can extend to soils, freshwater, greenhouse gas emissions, natural hazards, biodiversity, coastal environments, ecosystem services, and the loss of versatile soils (fertile, well-drained, slopes less than 12 degrees, valuable for food production, and an important natural resource) to urban development.
4. Soil physical quality could be judged against land use, with quality being regarded as meaning 'fit for purpose'. For example, even small patches of soil contaminated from past industrial or agricultural use may be of poor quality for urban residential land use, but of acceptable quality for some industrial use.
5. Protected areas include all lands legally protected for conservation purposes, including amenity areas, conservation parks, ecological areas, fixed marginal strips, government purpose reserves, historic reserves, local purpose reserves, national parks, private covenants (eg Queen Elizabeth II, Ngā Whenua Rāhui), recreation reserves, regional parks, scenic reserves, stewardship areas, wildlife management areas, and wildlife refuges.
6. Environmental protection effort includes remediating environmental damage, resource management, expenditure, areas protected under regulation and legislation, damage avoidance, research, and minimising natural hazards.

Gap analysis

Table 16 summarises how well official information (including Crown research institute data) informs the supplementary enduring questions on land. See appendix 3 for details of the analysis process.

Table 16**How well official data informs supplementary enduring questions on land**

Supplementary enduring question (SEQ)	Question topic	Level at which official data informs SEQ
A	Land use	High
B	Land cover	High
C	Drivers of change	Low
D	Current and potential future impacts	Medium
E	Soil quality and quantity	Medium
F	Impacts on Māori	Medium
G	Environmental protection effort	Low

We scored three datasets as highly informing the supplementary enduring questions:

- Land Use Map
- Land cover database (databases 1,2, and 3)
- National land use and land-use change mapping.

Land initiatives

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

LN1 Improve access to and use of land data (see also LN9 and LN10)

The highest-priority land initiative is to optimise data accessibility and use.

Specific objectives of this initiative include:

- improve overall access and use of existing data and databases by optimising what we have and making it accessible to all users
- improve the existing data by updating, improving, and enabling linkages between existing databases and ensuring land data is up to date
- remove barriers that prevent open access to publicly-funded data.

For the last item above, the Ministry of Business, Innovation and Employment plans to advise Crown research institutes (CRIs) there should be open access to data where that data collection was publicly funded. This will ensure data created from publicly-funded research enters and remains in the public domain.

The approach to achieving this initiative seeks to rationalise the different databases in agencies. Initiative LN9, promote data integration, relates to this initiative with the objective of getting the most out of what exists. LN10, assess data for fitness for use, aims to achieve improved use and usability of land data and databases.

Initially, this initiative will require:

- identifying the relationships, dependencies, and harmonisation possibilities between databases
- identifying the most valuable datasets
- confirming how current they are
- examining how current they need to be
- examining the types of access required (to maximise usage)
- funding the databases and providing access to them
- owning the datasets
- pursuing lower transaction costs to access and use data
- establishing standards and automation in data access

A benefit to New Zealand will accrue if:

- there is an increase in open data use and availability
- data is shared which increases knowledge and quality of understanding
- we are getting more out of what we have, for example, integrating secondary use and secondary data sources

- we conduct rationalisation of existing land information databases (this could be led by the Ministry for Primary Industries)
- all land-related databases are linked including common geographic referencing.

It is also important to be clear about:

- who uses and should ideally be using databases
- the scale of data and databases
- what state and trend data is available
- spatial and temporal coverage
- end-use such as policy use and implementing regulations.

This initiative's overall objective is to better inform land use and non-use decisions. Reducing barriers to access is also a priority, for example, urging CRIs to comply with the New Zealand Government Open Access and Licensing framework. This makes sure that all can access and use data with agreed and fit-for-purpose quality and standards.

Associated with this is the need to identify and establish enduring governance for datasets. This can be achieved by agencies taking responsibility for either ownership or governance.

LN2 Establish a multi-sector facilitation group

Establish a multi-sector group to facilitate cooperation, coordination, sharing, custodianship, and governance in the land sector.

This initiative needs extensive coordination and agreement among all land sector organisations.

It builds on the activities of a number of agencies in creating a governance group for land, including central and local governments, Crown research institutes (CRIs), Māori, industry, and non-government organisations, to coordinate activity and support data sharing and communication.

Included in this initiative is to complement existing governance, stewardship, and custodianship arrangements to achieve a more cohesive and inclusive form of governance.

Specific proposals could include:

- Ministry for the Environment to establish and run a monitoring, reporting, and coordination forum
- Ministry for Primary Industries to conduct rationalisation of existing land information databases
- Ministry for Primary Industries to facilitate an improved understanding of Māori land, such as understanding its ownership, management structure, and use
- Ministry for Primary Industries to lead the assessment of environmental services flow-data for various land uses
- Ministry for Primary Industries to analyse land use optimisation initiatives by matching land use to land-use capability
- natural resource agencies to conduct a national ecological assessment.

Key participants could include:

- National Land Resources Centre – one of its activities would be to set up a governance group for CRI-managed land data
- Natural Resources Sector – could have a crucial role
- Geospatial Office – set up a national spatial database for complete environmental data.

Regional councils can support this initiative by conducting biodiversity monitoring with a focus on environmental monitoring, ecological integrity, and the impact of environmental protection expenditure for all of New Zealand.

Essential to this initiative is expanding, strengthening, and ensuring engagement with Māori to better identify how existing data satisfies and supports their values and land-management choices.

LN3 Conduct soil assessment (see also LN8)

Ensure we have a full picture of New Zealand's soil quality and quantity. By doing this, we can account for and assess soil stocks, and review developments on soils. Soil is a fundamental resource and a driver of land-use decisions in New Zealand.

This initiative includes conducting a national environmental assessment and baseline survey.

To achieve this initiative, S-Map, the new national soils database, should be sped up to complete the coverage of the whole country. It is important to recognise the creation of an S-map coverage for low land, which is being co-funded by regional councils and Landcare Research.

When completed, S-Map will provide seamless digital soil-map coverage for New Zealand. S-map is designed to be applied at any scale, from farm to region to nation. S-map is compiled by Landcare Research, with maps and other information available on this site from many sources. The information for the country is not as complete, correct, or up to date as desired to fulfil this initiative. This initiative supports the completion and maintenance of the S-Map database (Landcare Research, 2012).

In the future, a focus for this initiative could be to capture temporal and spatial change data, for example, soil quality and land-use intensification.

The Ministry for the Environment is starting a project for the soil health indicator which is likely to look at ecosystem services from soil and target ranges for soil quality to deliver those services. This also relates to LN4.

There is the possibility for Statistics NZ to produce an ongoing account, possibly based on the System of Environmental-Economic Accounting (SEEA), that will cover soil quantity and quality to identify changes in soil stocks.

LN4 Undertake ecosystem services assessment (see also EB5)

Complete an ecosystem services assessment by undertaking an initial national soils assessment/baseline survey with complete biodiversity monitoring to better understand ecosystem services. This initiative needs to first define information gaps as there are extensive soil maps already in existence.

This is a highly complex initiative that needs extensive analysis. It is important for New Zealand's involvement in the Intergovernmental Panel on Biodiversity and Ecosystem Services.

Leadership from government bodies would help bring together better information at the sector level, specifically:

- New Zealand would benefit from having an ecosystems services account produced by Statistics NZ using System of Environmental and Economic Accounting principles.

Ecosystem services are grouped into four main types:

- provisioning services (eg provision of food)
- regulating services (eg when oceans act as a sink for carbon)
- supporting services (eg nutrient cycling),
- cultural services (eg visitors enjoying marine reserves).

Coastal and marine environment ecosystem services are considered in the coastal and marine environment topic.

LN5 Introduce data standardisation

Introduce data standardisation, interoperability, and access.

This initiative will benefit from initiative LN1, improve access to and use of land data. Both initiatives focus on improving data use and access, and will benefit from support from the Natural Resources Sector.

LN5 includes developing standards for authoritative multi-source databases, and linking all databases with the spatial land-analysis work currently under way by various organisations.

A specific proposal is to integrate the Land Cover Database with Land Use Mapping. This is a complex issue and previous efforts to do this have met significant difficulties, such as having non-compatible definitions, which prevented progress.

This initiative also seeks to identify how data can be standardised, for example, to promote relationships and dependencies between databases, and then improve our knowledge of available data (ie metadata).

A number of objectives were identified to achieve this initiative:

- increase open data use and availability, that is share data more easily and willingly
- increase all participants' knowledge and the quality of their understanding
- lower transaction costs to access and use data (eg through standards and automation)
- increase education on data and database use
- develop the Land Use Database by using multiple sources and conducting a rationalisation of existing land information databases similar to the Land Use Database (this could be led by the Ministry for Primary Industries).

LN6 Produce a SEEA environmental protection effort account

For Statistics NZ to undertake a System of Environmental and Economic Accounting (SEEA) environmental protection effort account.

This initiative will help monitor and report on environmental protection effort expenditure against environmental outcomes. It requires gathering comprehensive environmental protection effort data to analyse the protection expenditure and support the desired outcomes for land. Extensive cooperation from regional councils is needed to collate the data.

Undertaking this environmental protection effort initiative will be valuable to New Zealand in identifying total environmental protection effort, particularly expenditure by Government, households, and industry on Crown and privately owned land.

Included in this initiative is creating a new research programme, led by the Department of Conservation (DOC) and Landcare Research, to better answer the questions around protected areas and their condition. Specifically:

- What data already exists to help answer questions about effort?
- What new data needs to be collected?
- If we measure protection efforts, is this enough to inform ecological integrity?
- If we don't measure protection efforts, what measures, indicators, or proxies could we use to measure ecological integrity?

LN7 Build future skills and capability

Build the future capability of skilled analysts in New Zealand. Gaps around the growing skills and capability relating to land and soil analyses in New Zealand were identified, as those with the greatest expertise are nearing retirement. Carrying out a national strategy to improve these skills is essential to New Zealand's future understanding of land and soils.

This initiative addresses concerns over the future capability of scientists and researchers and subsequent analysis in land and soil (eg. spatial literacy). It seeks to improve the understanding, capability, and skills for data creators, managers, and users.

Increasing skills is essential in ensuring land and soil scientific capability in the future. This focus enables the continuing capture, analysis, synthesis, and interpretation of temporal and spatial change data (eg soil quality and land use intensification) for evidence-based policy-making and monitoring.

LN8 Establish baseline soil data (see also LN3, MR2, MR3)

Establish a geophysical and geochemical baseline of soil data in New Zealand. This initiative involves acquiring new national geophysical and geochemical datasets, using laser imaging detection and ranging (LIDAR) (perhaps even New Zealand could lease access to a satellite) to measure soil data. LIDAR mapping would have multiple uses.

This baseline data could be taken from a national geochemical baseline survey on a multi-element 4km grid. This could improve the measurement of environment public health, agricultural health, and mineral outcomes.

The Ministry for Primary Industries could lead in assessing environmental services flow data for various land and soil uses.

This initiative reflects a common theme in this domain plan, which is to create a baseline understanding of an essential aspect of the environment.

One good example of a national mapping database is the British Geological Survey's G-BASE regional geochemical atlas series.

LN9 Promote data integration (see also LN1 and LN5)

Initiative LN9's objective is to integrate data. This begins with determining the relationships between the datasets, databases, and the enduring questions through a data-integration exercise.

This initiative more closely examines the relationships between datasets and data, and strongly links to initiative LN1, improve access to and use of land data.

Specifically, this initiative aims to:

- identify the relationships and dependencies between databases
- lower transaction costs to data access and use
- integrate secondary data use and secondary data sources
- improve compatibility between databases through standards and automation

The objective is to get more out of what we already have.

The Ministry for Primary Industries could lead the rationalisation of existing land information databases.

LN10 Assess data fitness for use (see also LN1)

Assess the data available and its fitness for use against current and known future needs.

This initiative aims to examine data and its fitness for use against scale, resolution, and data coverage.

It also addresses initiative LN1, improve access to and use of land data, by reviewing fitness for use against all parameters and data requirements.

LN11 Establish Māori land management needs

Address Māori land management needs, specifically to engage with Māori at iwi level, about their land management needs and how best to meet them.

This initiative relates to initiative LN2; establish a multi-sector facilitation group, as effective and inclusive governance will be essential. Much consultation, communication, coordination, and a high level of agreement are needed to successfully achieve this initiative.

Essential to this initiative is expanding, strengthening, and ensuring engagement with Māori to better identify how existing data satisfies and supports their values and land management needs.

LN12 Identify the drivers of land-use change

Identify the drivers of change in land use.

To understand what the drivers of change are, this initiative aims to conduct a meta-analysis of the drivers for land use change across all sectors and locations.

This initiative is complex and requires extensive data and high analysis capability. It will also most likely need a substantial amount of time and resource.

LN13 Optimise land-use mapping

To map and assess land use to achieve land-use optimisation.

This initiative relates to initiative LN1, improve access to and use of land data, and is part of initiative LN5, introduce data standardisation, which includes the Land Cover Database and Land Use Mapping.

Land initiatives table

Table 17 lists the land initiatives by priority, estimates of their complexity, and the supplementary enduring questions they address.

Table 17

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

Initiative number	Initiative name	Priority	Complexity	Helps inform which SEQ
LN1	Improve access to and use of land-use data (see also LN9 and LN10)	Entire LN1 group is ranked 1	Complex	All
LN1.1	Optimise data accessibility	Group is 1	Moderate	All
LN1.2	Improve existing databases	Group is 1	Moderate	All
LN1.3	Open access to publicly funded data	Group is 1	Moderate	All
LN1 group total	LN1 group total	Group is 1	Complex	All
LN2	Establish a multi-sector facilitation group	2=	Highly complex	All
LN3	Conduct soil assessment (see also LN8)	2=	Highly complex	A, D, E
LN4	Undertake ecosystem services assessment (see also EB5)	4	Highly complex	D
LN5	Introduce data standardisation	5	Highly complex	All
LN6	Produce a SEEA environmental protection effort account	6	Complex	G

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Table 17 continued

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

Initiative number	Initiative name	Priority	Complexity	Helps inform which SEQ
LN7	Build future skills and capability	7=	Complex	D
LN8	Establish baseline soil data (see also LN3)	7=	Highly complex	E
LN9	Promote data integration (see also LN1 and LN5)	7=	Complex	All
LN10	Assess data fitness for use (see also LN1)	10	Complex	All
LN11	Establish Māori land management needs	11=	Highly complex	F
LN12	Identify the drivers of land-use change	11=	Highly complex	A, C, D, F
LN13	Optimise land-use mapping	13	Highly complex	A, C, D, F