



11 Mineral resources

This chapter lists the questions about mineral resources 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 mineral resources information needs.

New Zealand's mainland, combined with its Exclusive Economic Zone and Territorial Sea, houses a variety of mineral resources including oil, gas, coal, and precious metals. These resources are the metaphorical (and in some cases, literal) building blocks of New Zealand's economy.

Obtaining these resources requires prospecting, exploring, producing, refining, processing, and transporting, all of which have a potential impact on the environment. The challenge for policymakers is to build the economy while limiting the environmental impacts to acceptable levels.

Mineral resources questions

This section presents the enduring question and the supplementary enduring questions on mineral resources.

Enduring question

What are New Zealand's onshore and offshore mineral resources, and what is the environmental impact of prospecting, exploration, production, refining, processing, and transporting the resources?

Supplementary enduring questions

- A. What and where are New Zealand's onshore and offshore mineral resources¹?
- B. What are the quantity, quality, and composition of these resources?
- C. What are the environmental constraints on exploration and development?
- D. What and where is the environmental impact of attaining² mineral resources?
- E. What mineral resources exist on Māori land and in tribal customary areas across New Zealand, both onshore and offshore?
- F. What, how, and where is environmental protection effort³ being done to understand, avoid, remedy, and mitigate the environmental impact of attaining mineral resources?

Notes

1. The difference between a resource and a reserve is that a resource has the potential for economic extraction; a reserve is limited to materials that can be extracted at a profit.
2. Attaining includes prospecting, exploration, production, refining, processing, and transporting.
3. 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 22 summarises how well official information (including Crown research institute data) informs the supplementary enduring questions on mineral resources. See appendix 3 for details of the analysis process.

Table 22

How well official data informs supplementary enduring questions on mineral resources

Supplementary enduring question (SEQ)	Question topic	Level at which official data informs SEQ
A	Quantity and location of mineral resources	Low
B	State of mineral resources	Low
C	Constraints on attaining mineral resources	Low
D	Impacts of attaining mineral resources	Low
E	Resources on Māori land	Low
F	Environmental protection effort	Low

We scored one data source as moderately informing the supplementary enduring questions:

- Petroleum Report Library (GNS Science).

Mineral resources initiatives

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

MR1 Accelerate seafloor mapping

This was the highest-scored initiative from the mineral resources workshop. It proposes continuing, expanding, and accelerating existing national seafloor topographic and geophysical mapping and research on seafloor resources. Currently, maps cover about one-quarter of the Exclusive Economic Zone and extended continental shelf. However, only 15 percent is mapped to a standard necessary to distinguish likely benthic environments, such as hydrothermal vents (Ministry for the Environment, 2012).

Most of the mapped environments need more sampling to confirm the data. Increasing this coverage is seen as a high priority.

New Zealand's Exclusive Economic Zone is one of the world's largest and contains a significant proportion of our mineral resources. It is important to understand the geography and geology of the ocean floor so we can evaluate the opportunity and constraints on mineral resource use.

Mapping will also provide biophysical information so environmental baselines can be determined. This need for baselines in the marine environment is highlighted in the coastal and marine environment workshop initiatives, which is the highest-ranked of those initiatives (CM1, identify baseline habitat state). Seafloor maps are produced from a combination of bathymetric and multibeam data.

NIWA and GNS Science could be potential leaders of this initiative. They are currently undertaking an offshore geology research project along the Kermadec Arc (see [Environmental monitoring](#) on the NIWA website).

MR2 Undertake an airborne national geophysical survey

Develop and run an airborne geophysical survey of New Zealand. Such a survey would provide geological information for key users from central government, Crown research institutes, industry, and local government. New Zealand is lagging behind many other mineral-rich countries in the world in having published, detailed airborne geophysical data. Existing airborne survey coverage of New Zealand is piecemeal, using different methods and capturing data to varying levels of detail. A national airborne geophysical survey would provide users with consistent (and accessible) data.

This survey will provide these benefits:

- subsurface information for resource exploration (minerals, petroleum, geothermal)
- subsurface information for evaluating land capabilities, both urban and rural
- monitoring changes, particularly for groundwater
- hazard information.

Such a survey would use an aircraft mounted with geophysical measurement apparatus. Magnetic and radiometric methods are most widely used and New Zealand's existing coverage is poor by international standards. More costly electromagnetic and gravity methods could be of particular value for some regions.

New Zealand Petroleum and Minerals and GNS Science can lead the development of this survey as they have the technical expertise and are potential organisers of funding.

This initiative and initiative MR3, undertake a geochemical national survey, are linked to land initiative LN8, establish baseline soil data.

MR3 Undertake a geochemical national survey

Run a ground-based geochemical survey of New Zealand. This survey will measure the chemical composition of materials throughout New Zealand's land environment. Samples may include:

- stream sediment
- rock
- soil
- river and stream water
- vegetation.

Information collected will provide a baseline overview of the geochemical landscape of New Zealand. Such data is available in many countries, for instance, the Geochemical Atlas of Europe and the British G-BASE survey. The geochemical atlas and the G-BASE survey is used widely – for environmental change mapping, mineral exploration, public health and agricultural research support, and policy-making.

The geochemical survey could be coupled with geological and geophysical surveys to provide in-depth information that would cover many of the gaps identified by this domain plan. Mineral resources question B (the state of our mineral resources) can be answered in more detail if this initiative is undertaken. Knowing the composition of a mineral resource will aid exploration into the appropriate areas.

New Zealand Petroleum and Minerals and GNS Science are well placed to lead the development of this survey.

This initiative and MR2, undertake an airborne national geophysical survey, are linked to initiative LN8, establish baseline soil data.

MR4 Compile regional council data

Create a coordinated database of regionally collected data around environmental impacts (on air, soil, water, and probably wider). Regional, district, and city councils collect information through consents and applications under the Resource Management Act 1991. This information will be powerful if compiled into a national picture.

Impacts assessments can be made which will provide guidance for developing policies that affect New Zealand's environment. There will also be a greater level of oversight at the national level as impacts currently tend to be site-specific.

The Ministry for the Environment could be the potential lead agency for this initiative. Initiative EN6, collate consents information, from the energy topic is similar to this initiative.

MR5 Compile resource exploration data

Collect exploration data about minerals on privately-owned land.

Privately-owned lands have a lot of mineral resources (eg aggregates). However, we have little information about these as there are no regulations for reporting them, and thus we have limited information of mineral resources on private land. To have access to this data would cover a significant gap in our knowledge.

This initiative will need regional councils to change their reporting requirements so they can capture information on Crown and privately-owned land. The issue of confidentiality will have to be dealt with as much of the information will be commercially sensitive. Consultation with affected parties at an early stage would be essential.

Both initiatives MR4, compile regional council data, and MR6, develop a mineral resource stock account, could benefit from the undertaking of this initiative.

MR6 Develop a mineral resource stock account

Build a System of Environmental and Economic Accounting of New Zealand's stock of mineral resources. This account will capture the opening, closing, and changing stocks over time for key mineral resources. It will be part of a suite of SEEA accounts on the environment and economy produced by Statistics NZ with data providers. This specific account will be done by Statistics NZ and New Zealand Petroleum and Minerals.

This initiative relates to other initiatives, particularly to CM6, produce a SEEA account of coastal and marine mineral and energy resources, from the coastal and marine environment topic.

MR7 Collate multiple impacts data

Collect and collate multiple impacts data. Multiple impacts refer to the impacts from disturbances, such as mining or building in a particular area.

The initiative is split into two parts – onshore and offshore.

MR7a, onshore data, received no votes in the mineral resources workshop. Impacts data may already be available onshore.

MR7b, offshore data, scored highly in the workshop implying we have limited knowledge of offshore impacts data.

Examples of offshore disturbances include mineral mining, bottom trawling fishing, and marine research. Building disturbances include oil platforms, aquaculture structures, and cable laying.

Multiple impacts data, both actual and potential, will be important to different groups, ranging from policymakers to explorers. These impacts can be addressed, evaluated, and mitigated if they are understood.

Crown research institutes, industry, and central and local government departments can keep multiple impacts data. This data would need to be collated, standardised, and maintained by a governance group.

MR8 Develop information portal

Improve access to subsurface resources data by forming a single portal for all publicly-funded research and information on mineral resources.

The idea of having a single portal for accessing data is not a new one and in some topics (such as land) it already exists. The need for such a portal is reflected in many environment domain plan initiatives.

MR9 Expand LINZ cadastral database

Expand on the Land Information New Zealand (LINZ) cadastral database to include mineral ownership in current land ownership mapping. This initiative also seeks to map Māori land with mineral resources. LINZ could assume the lead role for this initiative.

MR10 Model validation in environment domain plans

Include model validation in future environment domain plans. Specifically, a set of criteria will be developed for modelled data to ensure it is of an adequate standard.

MR11 Determine onshore environmental baseline

Determine the onshore environmental baseline through methods such as mapping. This initiative may provide a platform for other initiatives.

MR12 Create governance group

This initiative expresses the need for ocean governance so offshore mineral resources information is brought together. Doing this initiative will fill some of the data gaps identified by this domain plan (especially in the coastal and marine environment).

MR13 Develop an environmental protection expenditure account

Build a System of Environmental and Economic Accounting that details the environmental protection expenditure in New Zealand. Statistics NZ will expand on existing work, with the New Zealand Petroleum and Minerals as a potential partner and key user of the information.

Mineral resources initiatives table

Table 23 lists the mineral resources initiatives by priority, estimates of their complexity, and the supplementary enduring questions they address.

Table 23

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

Initiative number	Initiative name	Priority	Complexity	Helps inform which SEQ
MR1	Accelerate seafloor mapping	1	Complex	A, B
MR2	Undertake an airborne national geophysical survey	2=	Complex	A, B, E
MR3	Undertake a geochemical national survey	2=	Complex	A, B, C, E, F
MR4	Compile regional council data	4=	Complex	D, E, F
MR5	Compile resource exploration data	4=	Highly complex	All
MR6	Develop a mineral resource stock account	4=	Complex	A, E
MR7	Collate multiple impacts data for onshore and offshore	4=	Complex	D
MR8	Develop information portal	8	Complex	All
MR9	Expand LINZ cadastral database	9	Complex	E
MR10	Model validation in environment domain plans	10=	Moderate	All
MR11	Determine onshore environmental baseline	10=	Complex	A, B
MR12	Create governance group	10=	Complex	All
MR13	Develop an environmental protection expenditure account	10=	Moderate	F