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NERI Comments:

Conservation and Environment Science Roadmap

Introduction

NERI is in the process of developing an energy research strategy for NZ which has a number of overlaps with the focus of this roadmap - the use of NZ's natural resources. Also the subject matter is the same, focusing on NZ's medium-term investments into applied science.

The following comments address the Discussion Paper from both perspectives. We have separately supplied the team with background information on the NERI strategy.

Scope

The scope of the roadmap is unclear. While the broad domain (conservation and environment), the activities it seeks to inform (medium-term science), and the purpose (supporting government decision-making in terms of policy and management) are all relatively clear, the devil is in the detail.

To begin with the domain seems to be narrower than implied by the definitions of "conservation"¹ and "environment"² contained in legislation. It appears that the intent is to limit to "land, fresh water, and coastal/marine environments" thus

¹ **conservation** means the preservation and protection of natural and historic resources for the purpose of maintaining their intrinsic values, providing for their appreciation and recreational enjoyment by the public, and safeguarding the options of future generations (Conservation Act)

² **environment** includes—

- (a) ecosystems and their constituent parts including people and communities; and
- (b) all natural and physical resources; and
- (c) those physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes; and
- (d) the social, economic, aesthetic, and cultural conditions which affect the matters stated in paragraphs (a) to (c) or which are affected by those matters (Environment Act)

excluding physical and historic resources (and possibly air?), and the status of wider considerations of the values placed on those is unclear (some appear to be in scope, but others, like primary sector use, appear to be out).

The purpose to which the science is directed is even more unclear. First, there is a tension between the purposes of the Conservation Act³ and the Environment Act⁴. Second, there is the question about how far the scope extends into assisting resource management processes by others such as local authorities and from there into resource management activities outside the public sector.

The Discussion Paper notes that where there is an overlap with production then this will be dealt with in the Primary Sector Science Direction. And yet each of the Themes has a dimension that comes from the needs of production⁵, and they cannot be properly considered outside that context.

Further, many of the issues in natural resource management are impacted by production issues that have little to do with the primary sector⁶. Particularly relevant to NERI, it is unclear how the interface between the production and use of energy and natural resources is proposed to be handled.

A simpler way into this (and this maybe the intent, but it isn't clear) is to say the scope is the natural resources (land, water, sea, and air) and the ecosystems they support (perhaps the "natural environment"), and that the science is to help manage this where there are significant competing human uses and/or stresses from natural processes. The science is directed at informing all participants in addressing these "pinch points", whether by way of a policy response or by way of management of the resource.

This approach would place the primary focus on the Environment Act considerations, with conservation and other values being addressed when considering the impacts/interests that are being managed.

This then would give a clearer basis for the scan of current and future influences. The question addressed by the scan becomes: "What are the major trends that are, or look likely to create or exacerbate pressure⁷ on natural resources?" These will often be location/regional specific.

The impact of sector interests can be included by asking them to identify large material trends with natural resource implications. In the case of Conservation the

³ "An Act to promote the conservation of New Zealand's natural and historic resources ..."

⁴ "An Act to - ..."

(c) ensure that, in the management of natural and physical resources, full and balanced account is taken of—

(i) the intrinsic values of ecosystems; and

(ii) all values which are placed by individuals and groups on the quality of the environment; and

(iii) the principles of the Treaty of Waitangi; and

(iv) the sustainability of natural and physical resources; and

(v) the needs of future generations"

⁵ Often conservation is also one of a number of uses that need to be included in the balance.

⁶ Most economic activities involve at least some land, water and air use, hazardous substances etc.

⁷ Sufficient to warrant attention in terms of the priorities on the top of page 18 of the Discussion Paper.

strategic considerations that led to their specific impacts could be incorporated in the Roadmap in some detail while acknowledging a separation of interest between conservation and balanced use.

Challenges and opportunities

The above comments lead to more targeted discussion. The search is for trends that will put pressure on NZ's natural environment. Some suggestions that come to mind for inclusion (not well thought through – more to give a few examples) are:

Demographic changes

While population growth per se is not likely to be a major factor in natural resource use, intensification will definitely be an issue in the Auckland, Hamilton, Tauranga growth triangle. Other factors such as age and cultural composition could mean different pressures.

Economic factors

Just as the intensification of dairy has driven natural resource use changes, so the changing nature of NZ's economic activity will be important. What are the trends looking forward? When will biotechnology challenge meat and milk production using animals? Where will the impacts be felt?

The general economic desirability of a future where all resources get used more productively has implications for natural resource use. Facilitating this has implications for the natural environment.

Transport

The nature of transport/logistics will change over the next 20 years, but whether this presents significant impacts on the natural environment beyond emissions isn't clear. Autonomous transport including drones may change patterns of land and air use.

Energy

From the work NERI has done, a future that sees more geothermal and wind looks desirable and some biofuels will increase in importance. This may be all managed under business-as-usual as far as the natural environment is concerned, although large scale biofuel production and growth in exploitation of geothermal resources may both have material impacts. Internationally there have been concerns about large scale deployment of wind turbines due to their visual and turbulence impacts.

The influence of changing the types of energy used in industrial processes may have other upstream impacts on the natural environment. The effect of this on the food supply chain in particular may have a significant consequent impact on the natural environment.

Other Technologies

Remote sensing, big data, biotechnology, and the advanced natural resource management techniques these enable, will have an impact. There will be others.

New hazard risks presented by new materials: (bio)technologies and new organisms (including imports) require consideration of the detection, protection and elimination/management of these risks.

Significant and unforeseen natural hazards

Are the impacts of earthquake, Tsunami and volcanic risks on the natural environment adequately understood?

GHG emissions and climate change

The emissions are a discharge to air with adverse consequences, while the changing climate produced by GHGs will impact on the natural environment.

In the Roadmap these two are combined, however they are rather different issues with distinct impacts. They are perhaps best separated.

Ecosystems and species at risk

Some identification of specific material areas of risk (current and potential) and their importance would seem to be possible and an essential part of the roadmap. This would include the anticipated specific biosecurity risks.

The Themes

The objective should be to identify Themes that are centred on the work necessary to meet the Challenges (i.e. manage the risks) and realise the Opportunities. The Themes, as currently structured, deal with the means (the types of science and science activities) and the resources (ecosystems), rather than the outcomes sought.

If the Roadmap can be recast to specify the latter it will be much stronger, both in building a consensus and in terms of managing progress to those outcomes. It is likely that the outcomes will be about how to resolve the pinch points within the constraint of balanced use.

For example, drawing on the NERI work, one could have as a theme (or subtheme) to reduce GHG emissions and air pollutants from the energy sector while meeting NZ's energy needs and reducing costs. The means could include, for example:

- Switching fuel use to electricity and lowering the cost of clean geothermal and wind.
- Improve the energy productivity of our food sector and use clean production to add value to our products.
- Develop low energy alternatives to transport, etc.

This leads to a programme of research, much of which is not about the natural environment per se, but is instead about the interface issues that if better understood and managed will have the direct impact of improving it.⁸

⁸ We'd also note in respect of the "emerging ideas" section of the Climate Change Theme it was our judgement that NZ science had limited competitive advantage when it came to conventional carbon

In following a focus on outcomes, the nature and specificity of the themes change. Other examples might be:

- Growth in the AHT triangle occurs while the balance of values placed on the natural environment is enhanced and the risks to it are understood and managed;
- The value produced from food production is increased while the use of natural resources and the impact on the natural environment are diminished;
- The advance and expansion of biotechnologies occurs while their impacts on the natural environment are managed;
- Priority databases and stocktakes of natural resources and environments are built up and maintained in anticipation of likely future needs;

From the conservation end we might have outcomes like:

- Predator-free NZ is achieved;
- No new species are threatened and XYZ species are removed from the list.

As noted in respect of GHG emissions a focus on outcomes will mean that many of the science questions may lie up the value chain from the specific natural resources and their eco-systems.

For example, behavioural, social and economic changes and technological developments may all be part of the solution, sitting alongside an understanding of the natural environment and its responses. A focus on the desired outcomes (based on anticipated pinch points in the natural environment) gives a common context within which the directed, multi-disciplinary science occurs.

By characterising the themes by *means* and *resources* in the Discussion Paper, rather than by *outcomes*, this context gets lost. The Discussion Paper has introduced “cross-cutting themes” without context, because of this. Further, the science risks getting biased towards studying the natural resources, rather than their interaction with the factors that are looking for value (of any kind) from them and the balance between them.

Conclusion

The future of NZ’s energy sector will have impacts on the environment that may require public investments in science to address them. Unfortunately the nature of this investment is difficult to identify in the Discussion Paper in its present form. To help overcome this we suggest:

- The scope of the Roadmap be clarified by:
 - Clearer definition of the target domain. We have suggested it should explicitly be the natural resources (land, water, sea, and air) and the eco-systems they support (together the “natural environment”);

capture and storage, and that we should be a fast follower in CCS rather than a significant investor in it.

- Separating more carefully the different respective roles of conservation and environmental management under NZ's law, and focus in the first instance on Environment Act considerations, with conservation and other values being addressed as part of the impacts/interests that are being managed;
- Target the work on trends (and the current situation) to identify matters that will put pressure on NZ's natural environment, and the Challenges and Opportunities that arise; and
- Recast the Themes so that they identify the priority (and enduring) medium-term Outcomes that the science will be required to support.



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