



Ministry for the
Environment
Manatū Mō Te Taiao

New Zealand's experiences with adaptive management for seabed mining projects

A submission to the International Seabed Authority to support the development of a regulatory framework for the exploitation of seabed minerals

New Zealand Government

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Introduction

1. This paper sets out the adaptive management provisions in New Zealand's Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act), examines some of the policy thinking that led to adaptive management being included in the EEZ Act, describes how an adaptive management approach was considered in recent marine consent decisions, and discusses challenges with applying adaptive management to seabed mining activities.

What is adaptive management?

- Adaptive management recognises that whilst our scientific understanding of complex environmental systems is incomplete, uncertainty should not necessarily prevent activities from occurring. In keeping with the precautionary approach, however, activities need to be carefully managed and constantly assessed and adjusted in light of the potential environmental impacts.¹
- Adaptive management is a structured process of learning by doing, and adapting management practices based on what has been learned. It has been defined as: ‘...flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process.’²

Figure 1: Adaptive management as a tool for structured decision-making³



- Adaptive management has been used as a natural resource management tool since its inception in the early 1970s (Holling, 1978), and has been applied internationally in many natural resource settings including fresh water, forestry and fisheries. It can assume different forms, both active and passive. Passive adaptive management takes a single conceptual model of system function and improves it over time, while active adaptive management tests multiple competing models simultaneously.
- The New Zealand Biodiversity Strategy defines adaptive management as:⁴

...an experimental approach to management, or “structured learning by doing”. It is based on developing dynamic models that attempt to make predictions or hypotheses about the impacts of alternative management policies. Management learning then proceeds by systematic testing of these models, rather than by random trial and error.

¹ See Sir Peter Gluckman (Chief Science Advisor to the Prime Minister of New Zealand) ‘[The place of science in environmental law and policy](#)’ for a discussion of the adaptive management potential the precautionary principle offers.

² Council, NR. (2004). *Adaptive Management for Water Resources Planning*. Washington DC, USA: The National Academic Press.

³ Figure 1 from ‘Adaptive Management for a turbulent future’ Craig R et al. *Journal of Environmental Management* 92 (2011) 1339–1345.

⁴ See <https://www.biodiversity.govt.nz/picture/doing/nzbs/index.html>.

Adaptive management is most useful when large complex ecological systems are being managed and management decisions cannot wait for final research results.

6. In summary, the New Zealand Government sees adaptive management as a structured, iterative process of robust decision-making in the face of uncertainty, with the aim of reducing uncertainty over time through system monitoring and adapting management practices in response to what has been learnt. The challenge in using adaptive management lies in finding the correct balance between gaining knowledge to improve management in the future and achieving the best short-term outcome, including appropriate environmental protection, based on current knowledge.

Incorporating adaptive management into legislation

Discussion paper on improving regulation of environmental effects

7. Before legislation was drafted, a discussion document was released seeking views on improving regulation of environmental effects in New Zealand's Exclusive Economic Zone (EEZ).⁵ Adaptive management was not specifically referred to in the discussion document. However, a decision-making process that recognises uncertainty and incorporates a precautionary approach was described:

Decisions to approve or not approve activities, or to mitigate or avoid damage, should be made even when there is a lack of information or when information is poor or uncertain.

Uncertainty about the effects of proposed activities needs to be recognised and built into decision-making. There needs to be good information about possible effects, and any approvals with adverse effects need to be within the range where the information provides confidence that the effects are understood and can be managed.

8. The public was asked for comments on how precaution should be incorporated into decision-making and the appropriate balance between precaution and encouraging investment for new activities in the EEZ, given there is little information available. Submitters commented on precautionary decision-making with half supporting incorporating precaution in the new legislation. Those supporting included the fishing industry, environmental NGOs, universities and a regional council.⁶
9. Of the submitters who talked about adaptive management, the majority preferred this approach to a precautionary approach. An industry submitter stated that:

Sustainable development of the EEZ requires a regulatory regime that encourages an exploratory, experimental approach to environmental protection and management issues, and emphasises the value of continuous monitoring and periodic adjustment of management regimes and perhaps consent conditions.

A great deal is unknown about the EEZ and any regulatory regime must recognise there are inherent uncertainties in our understanding of the diverse environment. The application of precautionary principles in this type of environment will without doubt impact the economic development of the EEZ and scientific knowledge of the diverse environments. Industry has to move forward and adjust management techniques and sustainability practices based on continual improvement in our knowledge about complex natural systems.

Effective and continual monitoring is the first step in deciding whether or not to approve an EEZ consent.

⁵ <http://www.mfe.govt.nz/publications/marine/improving-regulation-environmental-effects-new-zealand%E2%80%99s-exclusive-economic-z-13>.

⁶ <http://www.mfe.govt.nz/publications/marine/improving-regulation-environmental-effects-new-zealand%E2%80%99s-exclusive-economic-zone>.

Draft legislation

10. Adaptive management was included in draft legislation as it was regarded as a necessary tool for addressing the uncertainty of the marine environment, developing knowledge, and taking a cautious approach. The concepts of adaptive management and caution were regarded as being interdependent.
11. Recognising the information-poor nature of the marine domain, adaptive management was included as a tool for the consent authority (the Environment Protection Authority (EPA)) to use when granting a marine consent where the information available is uncertain or inadequate. It was regarded as being consistent with a duty to take a cautious approach and seeking to avoid, remedy or mitigate adverse effects.⁷ Taking an adaptive management approach is one option available to the EPA but it is not the only one. The EPA can also grant consent without resorting to adaptive management, or, decline an application outright in situations where it is decided the activity would not promote the sustainable management of the resource or the information available is inadequate.⁸
12. The definition of adaptive management included in the draft legislation was not exhaustive – the listed elements were not intended to represent the full extent of what adaptive management could mean. The definition also provided that conditions could be placed on a marine consent, enabling adaptive management of the activity through a process of monitoring, reviewing and varying the activity after the consent has been granted.⁹

⁷ Section 61(2) of the EEZ Act states that if, “in relation to making a decision under this Act, the information available is uncertain or inadequate, the EPA **must favour caution** and environmental protection”. See the Ministry for the Environment’s [response to the Local Government and Environment Select Committee](#) explaining why “favour caution” was used rather than “precautionary approach”. It is clear that it was intended that a precautionary approach be taken to decision making under the EEZ Act.

⁸ See sections 10 and 63 of the EEZ Act.

⁹ See section 64 of the EEZ Act for the full definition of adaptive management.

Adaptive management legislative provisions

Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act)

13. Although adaptive management techniques had been applied in New Zealand for many years, the inclusion of adaptive management in the EEZ Act was the first time it has been expressly referred to in New Zealand legislation. The EEZ Act recognises adaptive management as an open framework or structure and does not prescribe the particular form it must take. The provisions on adaptive management were not altered significantly from the draft legislation.

Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 ¹⁰	
Interpretation	Section 4: In this Act, unless the context otherwise requires, – adaptive management approach has the meaning given in section 64(2)
Purpose of the legislation	<p>Section 10(1): The purpose of this Act is—</p> <ul style="list-style-type: none"> (a) to promote the sustainable management of the natural resources of the exclusive economic zone and the continental shelf; and (b) in relation to the exclusive economic zone, the continental shelf, and the waters above the continental shelf beyond the outer limits of the exclusive economic zone, to protect the environment from pollution by regulating or prohibiting the discharge of harmful substances and the dumping or incineration of waste or other matter. <p>Section 10(2): In this Act, sustainable management means managing the use, development, and protection of natural resources in a way, or at a rate, that enables people to provide for their economic well-being while—</p> <ul style="list-style-type: none"> (a) sustaining the potential of natural resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and (b) safeguarding the life-supporting capacity of the environment; and (c) avoiding, remedying, or mitigating any adverse effects of activities on the environment. <p>Section 10(3): In order to achieve the purpose, decision-makers must—</p> <ul style="list-style-type: none"> (a) take into account decision-making criteria specified in relation to particular decisions; and (b) apply the information principles to the development of regulations and the consideration of applications for marine consent.
Information principles for when regulations are being developed	<p>Section 34(2): If, in relation to the making of a decision under this Act, the information available is uncertain or inadequate, the Minister must favour caution and environmental protection.</p> <p>Section 34(3): If favouring caution and environmental protection means that an activity is likely to be prohibited, the Minister must first consider whether providing for an adaptive management approach would allow the activity to be classified as discretionary.</p>

¹⁰ <http://www.legislation.govt.nz/act/public/2012/0072/latest/DLM3955428.html?src=qs>.

Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012¹⁰

<p>Information principles for marine consent decision-makers</p>	<p>Section 61(1): When considering an application for a marine consent, the EPA must–</p> <ul style="list-style-type: none"> (a) make full use of its powers to request information from the applicant, obtain advice, and commission a review or a report; and (b) base decisions on the best available information; and (c) take into account any uncertainty or inadequacy in the information available. <p>Section 61(2): If, in relation to making a decision under this Act, the information available is uncertain or inadequate, the EPA must favour caution and environmental protection.</p> <p>Section 61(3): If favouring caution and environmental protection means that an activity is likely to be refused, the EPA must first consider whether taking an adaptive management approach would allow the activity to be undertaken.</p> <p>Section 61(4): Subsection (3) does not limit section 63 or 64.</p> <p>Section 61(5): In this section, best available information means the best information that, in the particular circumstances, is available without unreasonable cost, effort, or time.</p>
<p>Decisions on applications for marine consents</p>	<p>Section 62(2): To avoid doubt, the EPA may refuse an application for a consent if it considers that it does not have adequate information to determine the application.</p> <p>Section 62(3): If the EPA grants the application, it may issue the consent subject to conditions under section 63.</p>
<p>Conditions of marine consents</p>	<p>Section 63(1): The Environmental Protection Authority may grant a marine consent on any condition that it considers appropriate to deal with adverse effects of the activity authorised by the consent on the environment or existing interests.</p> <p>Section 63(2): The conditions that the EPA may impose include, but are not limited to, conditions–</p> <ul style="list-style-type: none"> a) requiring the consent holder to– <ul style="list-style-type: none"> i. provide a bond for the performance of any 1 or more conditions of the consent: ii. obtain and maintain public liability insurance of a specified value: iii. monitor, and report on, the exercise of the consent and the effects of the activity it authorises: iv. appoint an observer to monitor the activity authorised by the consent and its effects on the environment: v. make records related to the activity authorised by the consent available for audit: b) that together amount or contribute to an adaptive management approach.
<p>Adaptive management approach</p>	<p>Section 64(1): The Environmental Protection Authority may incorporate an adaptive management approach into a marine consent granted for an activity.</p> <p>Section 64(2): An adaptive management approach includes:</p> <ul style="list-style-type: none"> a) allowing an activity to commence on a small scale or for a short period so that its effects on the environment and existing interests can be monitored: b) any other approach that allows an activity to be undertaken so that its effects can be assessed and the activity discontinued, or continued with or without amendment, on the basis of those effects. <p>Section 64(3): In order to incorporate an adaptive management approach into a marine consent, the EPA may impose conditions under section 63 that authorise the activity to be undertaken in stages, with a requirement for regular monitoring and reporting before the next stage of the activity may be undertaken or the activity continued for the next period.</p> <p>Section 64(4): A stage may relate to the duration of the consent, the area over which the consent is granted, the scale or intensity of the activity, or the nature of the activity.</p>

Considering adaptive management – marine consent decisions

Trans-Tasman Resources Ltd marine consent decision¹¹

14. In Trans-Tasman Resources Ltd Marine Consent Decision (June 2014) (the TTR case), the Decision-making Committee appointed by the Environmental Protection Authority considered the country's first application under the EEZ Act for 'marine consent' for seabed mining. In this instance, the Decision-making Committee declined to grant a marine consent, favouring caution and environmental protection. This decision was unexpected by the mining sector, and gained considerable attention as it came against the backdrop of a worldwide resurgence of interest in seabed mining¹² (Anton, 2015).
15. The proposed project was to be located in a seabed area of around 65 square kilometres in the South Taranaki Bight, at depths of between 20 and 42 metres. Up to 5 million tonnes of iron ore was proposed to be extracted per year, for up to 20 years. The Decision-making Committee considered the sediment plume and accompanying turbidity created by the deposition of the 'de-ored' sediment as a substantive reason for its decision,¹³ as it would have particularly significant impacts on the biological productivity and energy input into the seabed ecosystem.
16. The decision-making criteria in the legislation contain an extensive list of matters, as well as information principles that require the EPA to base decisions on the best available information (that, in the particular circumstances, is available without unreasonable cost, effort or time). In TTR's case, the Decision-making Committee deemed that the information available was too uncertain and inadequate, and in particular the absence of baseline monitoring data was considered problematic. The Decision-making Committee therefore was compelled to 'favour caution and environmental protection'.
17. The next step in the decision-making process was for the EPA to consider whether taking an adaptive management approach would sufficiently reduce the uncertainty and provide adequate safeguards for managing any remaining risk.
18. TTR applied for a full mining consent (for the whole area and duration of the proposed consent) and rejected the option of a scaled or staged implementation under section 64(3). This was because for TTR, 'staging of the activity was not commercially realistic'.¹⁴ The applicant required investment certainty due to the large capital investment required for the proposed mining operations.¹⁵
19. TTR instead proposed a 'risk-based tiered approach', which it argued was in fact an adaptive management approach based on the open-ended definition in section 64(2)(b): 'any other approach that allows an activity to be undertaken so that its effects can be assessed and the activity discontinued, or continued with or without amendment, on the

¹¹ Environmental Protection Authority, '*Trans-Tasman Resources Ltd Marine Consent Decision*', June 2014 (Trans-Tasman decision).

¹² Note: At the time of publication of this paper, TTR is preparing a revised application to extract iron ore in the same area.

¹³ The EPA was also specifically concerned with the benthic effects, consequent ecosystem effects, and the impacts on existing fishing interests.

¹⁴ Trans-Tasman decision para 144.

¹⁵ *Ibid* para 795.

basis of those effects'. The Decision-making Committee noted that TTR's proposed approach 'changed from one of having quantitative triggers specified to one where a 'process' was prescribed to enable the establishment of those triggers'.¹⁶

20. The Decision-making Committee questioned first, whether this was akin to adaptive management as defined by the EEZ Act, and second, the extent to which TTR had operational flexibility under the proposed approach to make the necessary changes to, for example, the production rate or depth of mining in an adaptive manner.¹⁷ The Decision-making Committee determined that TTR's proposed package of objectives and conditions 'do not provide sufficient certainty, clarity or robustness on which to form the foundation of an appropriate adaptive management approach'.¹⁸ As a result, it was not clear whether the proposed objectives or conditions could or would achieve the goals of the adaptive management approach of 'reducing uncertainty and adequately managing any remaining risk'.¹⁹
21. The Decision-making Committee was ultimately 'not satisfied that the life-supporting capacity of the environment would be safeguarded or that the adverse effects of the proposal could be avoided, remedied or mitigated',²⁰ and decided that the application 'does not meet the sustainable management purpose of the EEZ Act'.²¹
22. To conclude, the Decision-making Committee stated:

Overall, we think this application was premature. More time to have better understood the proposed operation and the receiving environment and engage more constructively with existing interests and other parties may have overcome many of the concerns we have set out in the decision. It is conceivable that at least some of these matters could have been addressed contemporaneously with the other investigative work the applicant undertook prior to lodging the application for consents. Ultimately, the information we had to make our decision, while voluminous, was too uncertain and inadequate, and we did not have sufficient confidence in the adaptive management approach proposed to address that uncertainty to enable the activity to be undertaken.²²

Chatham Rock Phosphate Ltd marine consent decision

23. The second marine consent decision came in 2014, where Chatham Rock Phosphate Ltd (CRP) proposed to mine phosphate nodules from the Chatham Rise. CRP's proposal was to mine at depths of between 250–450m within an initial 820 square kilometre mining permit area for the first five years, and then to mine within a wider area of 5027 square kilometres for up to a further 30 years. The marine consent that CRP sought from the EPA included this proposed expansion, and to mine at least 30 square kilometres of seabed per annum to meet a minimum production target of 1.5 million tonnes of phosphate nodules.

¹⁶ For further comment on TTR's adaptive management approach see its closing submission: http://www.epa.govt.nz/Publications/25_TTR_-_Closing_Submission.pdf.

¹⁷ *Ibid* para 145.

¹⁸ *Ibid* para 850.

¹⁹ *Ibid* para 805. The decision in *Sustain Our Sounds Incorporated v. The New Zealand King Salmon Company Limited* threshold.

²⁰ *Ibid* para 852.

²¹ *Ibid* para 853.

²² *Ibid*.

24. The proposed mining method involved a large bottom trawling vacuum that would suck up a 30–50 centimetre thick layer of the seabed with a 4.5–6 metre wide trailing suction head dredger. The mined material would then be pumped through flexible hoses to a mining vessel where the nodules are separated and stored, and the remaining material released back into the water, close to the seabed, through a sinker and diffuser hose.
25. CRP proposed a range of measures to avoid, remedy or mitigate the potential impacts of its mining operation, which included:²³
- a mining system designed to avoid and minimise potential impacts
 - mining exclusion areas
 - ensuring mining blocks, during the first five years of mining, would be sufficiently separated to avoid sedimentation impacts on other blocks
 - monitoring to assess the impacts of sedimentation
 - evaluating the feasibility and viability of creating hard substrate habitat to enhance recolonisation, and, if viable, creating of such habitat
 - checking a 200 metre radius zone for marine mammals before each deployment of the mining system, and delaying commencement until the area has been clear for at least 30 minutes if mammals are observed
 - vessel lighting mitigation strategies to minimise impacts on seabirds.
26. CRP stated in its application that adaptive management ‘provides for monitoring of the activities and impacts of the mining operation, [using] the results to guide operational practices and policies to minimise impacts on environmental resources’. CRP’s proposed consent conditions included the application of adaptive management practices, namely monitoring of the activities and impacts of the mining operation, and restricting the mining area in the first five years. CRP’s application concluded by saying that its ‘environmental management system is based on the principles of adaptive management, and includes mitigation strategies, a comprehensive monitoring programme, and an environmental compensation package’.
27. As required by the EEZ Act, when considering the application the Decision-making Committee took into account the significant and permanent adverse effects on the benthic environment of the Chatham Rise, along with the effects of the return of waste material to the seabed following processing on the vessel.²⁴ Existing interests included Treaty of Waitangi settlements,²⁵ commercial fishing, marine eco-tourism, customary fishing, and other vessels traversing in the area. Consideration was also given to the effects of the proposal on other marine management regimes, including the Mid Chatham Rise Benthic Protection Area.²⁶

²³ For CRP’s full marine consent application, see http://www.epa.govt.nz/EEZ/previous-activities/notified-consents/chatham_rock_phosphate/the_application/CRP_application_documents/Pages/CRP_application_docs.aspx.

²⁴ Other risks to the environment included: effects on the trophic web, fish and other pelagic fauna, rock lobsters, pua, water quality, and seabirds; effects of mining-related noise; and the risks to biosecurity and human health.

²⁵ A Treaty settlement is an agreement between the Crown and a Māori (indigenous people of New Zealand) claimant group to settle all of that claimant group’s historical claims against the Crown.

²⁶ A closed off area to bottom trawling and dredging fishing methods through the New Zealand Fisheries Act 1996.

28. The Decision-making Committee stated that, notwithstanding the efforts of the applicant, it was left with a number of uncertainties about both the receiving environment and the adverse effects of the project. The uncertainty was due to the current state of knowledge about the marine environment, that it would be the world's first seabed mining project undertaken at such depths and the heavy reliance placed on insufficiently validated modelling to predict the impacts of the project.
29. With regards to uncertainty, the Decision-making Committee explicitly stated that it interpreted the 'words of legislation to mean that a complete understanding of the environment and absolute certainty about the risks posed by the proposal are not a prerequisite to the granting of the consent'. However, it pointed out that it does need to have 'sufficient, and sufficiently certain, information to identify and evaluate the risks involved' in the proposal. This includes a good level of baseline information so standards, limits, thresholds and triggers can be determined.²⁷
30. In relation to adaptive management, the Decision-making Committee stated it:
- Accepts the argument that the issue is not about uncertainty per se but about what is an acceptable and appropriate level of risk in the gap between certainty and uncertainty. The gap is never likely to close entirely for a proposal of this scale in the environment in which it is proposed. Closing the gap to an acceptable risk-tolerance point is, however critical to the granting of consent under the EEZ Act.²⁸
31. On this basis the Decision-making Committee considered a three-stage adaptive management approach, incorporating a data gathering stage ahead of actual mining. This would essentially impose a requirement to collect sufficient field data to confirm modelling predictions before any operational mining, 'in order to demonstrate the existence beyond the mining application area of significant comparable stony coral-dependent benthic communities, such that the loss of those same communities through mining might be said to be acceptable'.²⁹
32. If it was proven that the communities were not unique, a trial mining stage to validate the plume model over a three block, one-year period (for example) could be authorised. Only then would fully operational mining be permitted. The first two stages would therefore contain a go/no-go trigger, which could effectively terminate the consent if the field evidence was sufficiently contrary to prediction.
33. In line with the response from TTR, CRP said that the Decision-making Committee's proposed three-stage adaptive management approach was economically unviable as well as unnecessary based on risks and effects. The Decision-making Committee found that CRP's proposed adaptive management approach (based on monitoring and restricting the mining area for the first five years of operations), would not resolve the primary question of the adverse effect on the benthic environment without considerable pre-mining research and model validation in situ, which the applicant informed the Decision-making Committee was not a viable option.
34. Ultimately, the Decision-making Committee refused consent as it found that the destructive effects of the activity coupled with the potentially significant impact of the deposition of sediment on the areas adjacent to the mining blocks and on the wider marine environment, could not be mitigated by any set of conditions or adaptive management regime that might reasonably be imposed. Although the conditions

²⁷ Chatham Rock Phosphates Ltd Marine Consent decision (CRP decision) Chapter 13.1.4.

²⁸ *Ibid.*

²⁹ *Ibid.*

proposed by the applicant went some way towards addressing the risks associated with the proposal, they did not allay the Decision-making Committee's basic concern about the adverse effects of the proposal on a distinctive and important marine environment.

35. In summary, the Decision-making Committee's decision focussed on effects as much as uncertainty of information, in particular the uncertainty of effects resulting from unverified modelling and inadequate baseline information. The unavailability of adaptive management as a tool to address the risk was crucial to the decision to decline the marine consent, as the Decision-making Committee saw no other way to address the lack of environmental information and limited understanding of the possible effects of the activity.

Views from other key stakeholders

36. The Ministry for the Environment has collected views from key stakeholders on how the EEZ Act is working in practice – from the perspective of those who have interacted with the legislation. Views about adaptive management follow.³⁰

Uncertainty of information

37. The quality of information required in support of an application has been the subject of considerable debate.
38. In addition to comments made in the TTR and CRP marine consent decisions, the Petroleum Exploration and Production Association of New Zealand has noted the information principles can be inconsistent with encouraging investment due to the emphasis on uncertainty – recognising the likelihood of uncertainty for most new activities in the ocean. The Petroleum Exploration and Production Association of New Zealand has suggested that the information principles in section 61 be reviewed to provide a better framework for dealing with uncertainty. Straterra (the industry representative organisation for the New Zealand minerals sector) has pointed to the absence of a framework for considering the materiality of uncertainty in relation to proposals for managing potential effects on the environment. Straterra suggests that government develop guidance on how Decision-making Committees are to deal with uncertainty, risk and consequence.³¹
39. Various submitter groups to seabed mining applications have cautioned that information provided was uncertain and inadequate and suggested additional information was needed about the likely effects on the environment and existing interests. The Deepwater Group, for example, submitted that the CRP application had information gaps and that the effects of the proposal on the environment and existing interests were uncertain. It noted the application lacked basic information about the proposed mining approach, was reliant on un-validated models, and lacked baseline data.
40. Groups of experts, organised by the EPA, also assess the information provided for applications. In the CRP process, several groups raised concern with uncertainty and adequacy of information.
41. The Environmental Defence Society noted it was a ‘big ask’ to expect CRP to provide all baseline information required in the absence of a national strategic planning framework as to what activities were acceptable and where.

Interpretations of adaptive management

42. Industry has been critical of how adaptive management has been applied to decision-making for seabed mining proposals. Straterra considers that the staged approach to adaptive management, as considered by both the TTR and CRP Decision-making

³⁰ Ministry for the Environment. Unpublished, EEZ Act User Perspective: A review of the regulatory system from the perspective of its users.

³¹ Straterra has published two papers on the EEZ Act, which both refer to adaptive management. See [Straterra. October 2014. Discussion Paper: Analysis of Trans-Tasman Resources decision on its marine consent application – Towards enabling responsible seabed mining](#) and [Straterra. March 2015. Position Paper: Enabling Responsible Seabed Mining](#).

Committees, does not reflect international best practice and notes it is economically unviable for industry. It understands adaptive management as a ‘learning by doing’ approach, with iterative decisions being made during the project as new information comes to hand. Straterra suggests that guidance on adaptive management needs to be developed by the New Zealand Government, reflecting the above approach.³²

43. Environmental NGO Forest and Bird, in its closing submission on the CRP application, described the purpose of adaptive management as to allow an activity, whose effects may not entirely be understood, to proceed where there was sufficient certainty that unanticipated effects could be managed if they arose. It considered that an adaptive management approach must give reasonable assurance that potential effects of an activity could be adaptively managed. It noted that before an adaptive management approach could be adopted, it was necessary that adverse effects were identified and could be remedied.
44. The framework for assessing the adaptive management approach has been strongly debated. Several submitters on marine consent applications have referred to RMA case law in this context, in particular the findings of the Supreme Court in *Sustain Our Sounds v NZ King Salmon* (see Appendix 1 for a full description of the case). In this important case, the Court held that it is vital to ask whether an adaptive management approach will sufficiently diminish risk and uncertainty. The Court stated that, before endorsing an adaptive management approach, it would have to be satisfied that:
 - there was good baseline monitoring about the receiving environment
 - conditions placed on a consent would provide for effective monitoring of adverse effects using appropriate indicators
 - thresholds would be set to trigger remedial action before the effects became overly damaging
 - effects that might arise could be remedied before they became irreversible.
45. Decision-making Committees have noted the Court’s findings as helpful to their inquiry on seabed mining applications and have referenced them in detail in their decisions.

International and media interest

46. The TTR and CRP decisions were reported widely, including in Australia, Papua New Guinea, the Cook Islands, the United Kingdom, and the USA. Commentary has appeared in industry, legal and policy publications,³³ and there has been considerable attention given in the media to the decisions. See, for example the New Zealand article [There’s another way on seabed mining](#) (Patrick Smellie, *The Dominion Post*). See Appendix 2 for links to other relevant media articles.

³² Ministry for the Environment. Unpublished. EEZ Act User Perspective: A review of the regulatory system from the perspective of its users. Also see [Straterra, October 2014 Discussion Paper: Analysis of Trans-Tasman Resources decision on its marine consent application – Towards enabling responsible seabed mining](#) and [Straterra, March 2015 Position Paper: Enabling Responsible Seabed Mining](#).

³³ See for example Kim RE and Anton DK [The Application of the Precautionary and Adaptive Management Approaches in the Seabed Mining Context: Trans-Tasman Resources Ltd Marine Consent Decision under New Zealand’s Exclusive Economic Zone and Continental Shelf \(Environmental Effects\) Act 2012](#).

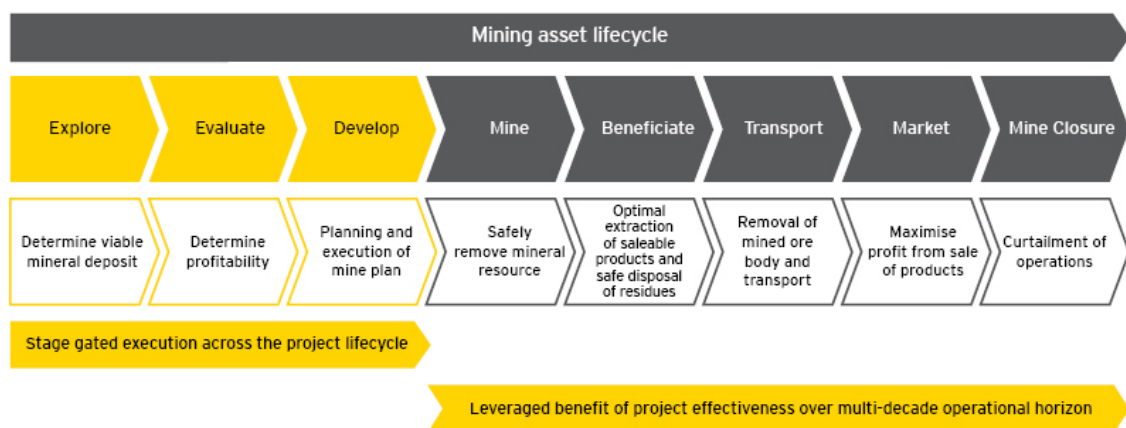
Key challenges and issues

47. In the New Zealand context, courts and decision-makers have generally demonstrated a good understanding of adaptive management. However, it has proven a greater challenge to work out how adaptive management can be applied, particularly for the recent applications for seabed mining in the EEZ.
48. As these two applications were declined, adaptive management may be perceived as a double-edged sword to prospective mining companies. Whilst there is a clear theoretical benefit to a ‘learning by doing’ approach, in that consents may be more likely to be granted where there is uncertainty but a process is proposed for reducing that uncertainty and managing associated risks, it is clear that adaptive management cannot compensate for a lack of baseline environmental data or inadequate modelling. In the words of the King Salmon Board of Inquiry, some information gaps cannot “be simply filled by invoking adaptive management”.³⁴

Environmental uncertainty vs investment uncertainty

49. The flexibility of an adaptive management process comes at the cost of having to monitor, assess, and potentially alter management techniques. This requirement highlights an important conflict in that iterative, adaptive management frameworks are necessarily cyclical (see figure 1 above), and that traditional business models are linear (see figure 2). Generally speaking, the more direct, streamlined and linear a business model is, the more profitable the venture will become, whereas when you look back or take backwards steps, you may learn more but at greater cost.

Figure 2: A traditional, linear business model for mining³⁵



³⁴ Board of Inquiry *New Zealand King Salmon Requests for Plan Changes and Applications for Resource Consents*, 22 February 2013 at [438].

³⁵ ‘Effective mining and metals capital project execution’: Focus on stage gated delivery and early intervention <http://www.ey.com/GL/en/Industries/Mining---Metals/Effective-mining-and-metals-capital-project-execution---Focus-on-stage-gated-delivery-and-early-intervention>.

50. In general it could be considered that there is a conflict between the cyclical adaptive management model and commercially viable linear business models. This is particularly true when high levels of initial investment are required, and where an external decision-maker has the ability to alter or stop an activity if it does not meet the parameters of an adaptive management plan.³⁶ Despite this conflict, we do not consider that adaptive management and commercial viability are mutually exclusive, but that considerable effort must be given to the design of both projects and decision-making processes if they are to be compatible.
51. For example, it is important for the role of operators and decision-makers in proposing an adaptive management approach to be clearly described in the regulatory framework. Operators are best placed to design their adaptive management approach, as they will have undertaken an environmental impact assessment and therefore should have the best understanding of the impacts of the activity, as well as the technology and methods being used. They will also be able to describe any uncertainties in the information they have provided, and how they intend to manage those uncertainties.
52. The role of the decision-maker will then be to respond to the proposed adaptive management approach and negotiate suitable conditions. To do this, the decision-maker must have a good understanding of the principles of adaptive management and the particular context of the proposed activity.

Learning from case studies

53. A number of useful international case studies of successful integration of adaptive management in dredging projects suggest that it will be possible to apply adaptive management in the novel context of seabed mining. Central Dredging Association drafted a position paper in March 2015, which detailed five major dredging projects from around the world using various adaptive management techniques.³⁷ For example, the Øresund Fixed Link dredging contract aimed to join Denmark and Sweden with an underwater tunnel. As this project was conducted in a unique and sensitive environment, strict spill parameters and environmental boundaries were agreed upon, whilst still allowing for flexible management. In this instance the adaptive management responsibilities were split, with the contractor being responsible for adhering to the spill budget, and the owner being responsible for executing the 'feedback' monitoring.³⁸

³⁶ Note that in the New Zealand context, both TTR and CRP are relatively small companies with all of their capital raising focused on a single seabed mining project. This fact constrained their ability to accept adaptive management proposals which imposed additional costs or risked the investment potential of the project.

³⁷ CEDA Position Paper: Integrating Adaptive Environmental Management Into Dredging Projects. March 2015. Available at: https://www.westernredging.org/phocadownload/WODA/2015-01-ceda_adaptive_environmental_management_into_dredging_projects.pdf.

³⁸ Jensen A & Lyngby JE. 1999. Environmental management and monitoring at the Øresund fixed link. *Terra et Aqua*, [Online] 74, 10–20. Available at: <https://www.iadc-dredging.com/ul/cms/terraetaqua/document/0/7/8/78/78/1/terra-et-aqua-nr74-02.pdf>.

Project management

54. As seabed mining is a cutting-edge industry (and particularly deep-sea mining), innovative and differing management techniques need to be considered, shared and ideally, tested. Similarly, as the environment in which seabed mining will occur may be relatively poorly described and understood, applying an adaptive management approach early in the life-cycle of the project (rather than close to the beginning of production) will be crucial to ensuring both economic viability and acceptable environmental outcomes.

Sharing information

55. Uncertainty will be a factor in many seabed mining projects and applications, but as more projects are researched and considered, more information will become available on the environment and the effects of the activity, and so decision-makers will have greater certainty about environmental effects when making decisions. Sharing information and experiences will be a vital component of improving adaptive management practices, which is one reason that New Zealand intends to continue to engage with the International Seabed Authority and others about seabed mining.
56. Uncertainty is never going to be eradicated, and part of the purpose of adaptive management is to enable activities to continue despite the presence of uncertainty. In the highly uncertain world of seabed mining, operators may have to accept a greater degree of commercial risk by undertaking adaptive and flexible management, to give the decision-maker the required confidence that adverse effects will be effectively avoided, remedied or mitigated.

Conclusion

57. The commercial and environmental risks and uncertainties associated with seabed mining are significant, and simply proposing adaptive management as a solution will not suffice unless it is clear how it will be implemented. We recommend continued engagement with stakeholders so the implications of including adaptive management in the International Seabed Authority's exploitation regulations are fully understood. Once the regulations are in place, guidance on the meaning and possible applications of adaptive management in the Area would be valuable for both contractors and decision-makers.

Appendix 1: Resource Management Act 1991 (RMA): Sustain our Sounds Inc v The New Zealand King Salmon Company Ltd [2014]

Adaptive management is not specifically provided for under the Resource Management Act 1991 (RMA) but is a concept that has developed in case law. The most detailed and relevant court decision on adaptive management is *New Zealand King Salmon Requests for Plan Changes and Applications for Resource Consent*.³⁹ As a condition of consent for managing the effects of salmon farms in the Marlborough Sounds, the Board of Inquiry that considered the consent described adaptive management as:

A precautionary technique that provides a pragmatic way forward, enabling development while securing the ongoing protection of the environment, in complex cases where there are ecological or technological uncertainties as to the effects of the proposal.⁴⁰

The Board outlined four requirements that must be satisfied for adaptive management to be an acceptable approach to managing environmental effects of activities:

- a. There will be good baseline information about the receiving environment;
- b. The conditions provide for effective monitoring of adverse effects using appropriate indicators;
- c. Thresholds are set to trigger remedial action before the effects become overly damaging; and
- d. Effects that might arise can be remedied before they become irreversible.⁴¹

The decision was appealed through to the Supreme Court in *Sustain our Sounds Inc v New Zealand King Salmon*.⁴² The Court dismissed the appeal, saying the Board was entitled to consider that the adaptive management regime, as reflected in both the plan and the consent conditions, was consistent with a proper precautionary approach. In its reasoning, the Court considered two important questions:

1. what must be present before an adaptive management approach can even be considered
2. what an adaptive management regime must contain in any particular case before it is legitimate to use such an approach rather than prohibiting the development until further information becomes available.

On what pre-conditions are necessary before adaptive management can be considered, the Court said:

There must be an adequate evidential foundation to have reasonable assurance that the adaptive management approach will achieve its goals of sufficiently reducing uncertainty

³⁹ Blenheim, 22 February 2013 at [179].

⁴⁰ *Ibid.*

⁴¹ *Ibid.*

⁴² [2014] NZSC 40.

and adequately managing any remaining risk. The threshold question is an important step and must always be considered. As Preston CJ said in Newcastle, adaptive management is not a “suck it and see” approach.

Regarding what is required for adaptive management for it to be a legitimate alternative to a declined consent, the Court said:

The secondary question of whether the precautionary approach requires an activity to be prohibited until further information is available, rather than an adaptive management or other approach, will depend on an assessment of a combination of factors:

- a. The extent of the environmental risk (including the gravity of the consequences if the risk is realised);
- b. The importance of the activity (which could in some circumstances be an activity it is hoped will protect the environment);
- c. The degree of uncertainty; and
- d. The extent to which an adaptive management approach will sufficiently diminish the risk and the uncertainty.⁴³

The overall question the Court turned to was whether any adaptive management regime can be considered consistent with a precautionary approach. The conclusion the Court came to was case specific:

In this case, given the uncertainty will largely be eliminated and the risk managed to the Board’s satisfaction by the conditions imposed, it was open to the Board to consider that the adaptive management regime it had approved, in the plan and the consent conditions, was consistent with a proper precautionary approach.⁴⁴

The Board of Inquiry, along with the Court of Appeal in this case provides a very thorough insight into how adaptive management is to be considered under the RMA. Although it will be possible to distinguish aquaculture or marine farming cases from seabed mining, it is likely that the theory and line of this judgement will be persuasive to future decision-makers or guidance on adaptive management.

⁴³ *Ibid* at [129].

⁴⁴ *Ibid* at [140].

Appendix 2: Media articles

Media articles commenting on the Trans-Tasman Resources Ltd and Chatham Rock Phosphate Ltd marine consent decisions include:

- [Chatham Rock Phosphate 'aghast' mining consent refused, James Weir stuff.co.nz](#)
- [New Zealand Rejects Mining Project on Pacific Seafloor, New York Times](#)
- [Seabed miners vow to try again after setbacks, Patrick Smellie NBR](#)
- [CRP considers reapplying for a marine consent, Chatham Rock Phosphate Press Release.](#)

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