DOSI
DEEP-OCEAN STEWARDSHIP INITIATIVE

Information Sheet
July 2022

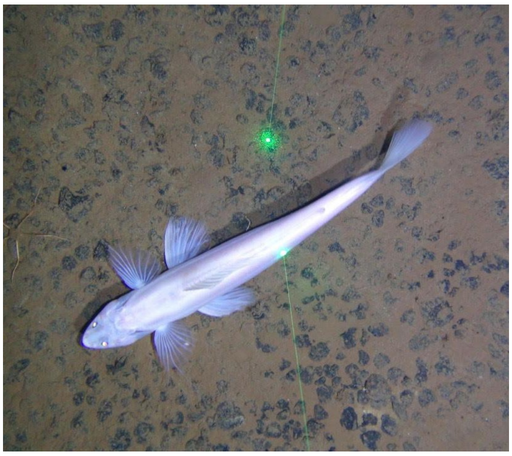
The Purpose and Requirements of Environmental Impact Statements

A Case Study of the NORI Prototype Collector Test

The Purpose of Environmental Impact Assessments and Statements

An Environmental Impact Assessment (EIA) is an important component in any project, as it is a method to assess environmental effects (biophysical, social, etc.) before a project starts. Such risks can then be explicitly analysed to decide whether the project should proceed, and to put in place mitigation strategies to reduce the potential risk and level of harm[1]. Further, an EIA can be used to address uncertainty in our knowledge, incorporate this uncertainty into estimating the risks, and design ways to obtain the necessary data to fill gaps before proceeding following the precautionary approach. The EIA provides an opportunity for consultation and communication between proponents, the regulator, and other stakeholders. In many fora, including at the International Seabed Authority, the EIA process results in a document called the Environmental Impact Statement (EIS). One important component of an EIS for deep-seabed mining is a robust environmental baseline. This is needed to demonstrate the comparability of the proposed monitoring site (PRZ) to the test or activity site (IRZ), so that potential impacts can be measured.

Environmental Impact Statement for the NORI Prototype Nodule Collector Test



On 29th September 2021, the Government of the Republic of Nauru launched a stakeholder consultation for the EIS developed by Nauru Ocean Resources Inc. (NORI) to conduct technical trials of a prototype nodule collector in the Clarion-Clipperton Zone in the Pacific Ocean in 2022. Nauru received numerous stakeholder comments, including from the Deep-Ocean Stewardship Initiative (DOSI), the majority of which pointed to a severe lack of essential baseline environmental data[2]. Subsequently, NORI revised the original EIS to include more environmental data. However, another consultation process was not conducted, with a revised EIS submitted to the International Seabed Authority on 1st March 2022.

Review of the Revised EIS of the NORI Prototype Nodule Collector Test

DOSI undertook a scientific review of the revised EIS from NORI, focusing only on the biological information. DOSI concludes that whilst more interesting data is presented, the EIS is still inadequate because of i) the ongoing nature of analyses, ii) the quality, quantity, and uncertainty of the presented biological information, and iii) thereby its incomplete assessment of the associated risks. Further, the EIS does not adequately show similarity between the PRZ and IRZ (Appendices 1 and 2).

Some Key Highlights include:

- Most benthic and pelagic baseline data were not fully processed or processed at all. Available analyses for several animal groups were often only preliminary. Analyses were also typically performed at high taxonomic levels (phylum or family), and so do not provide the specificity required for the EIS. Small sample sizes also often mean high uncertainty with the data.
- The most consistent metric shown is densities of animal groups, which often do not vary between the IRZ and PRZ. However, similarity in density alone is not an adequate demonstration that the two areas are comparable.
- The results of several statistical tests were presented to demonstrate comparability between the IRZ and PRZ, but the methods were often not described, which prohibits the evaluation of the results and conclusions.
- Many potential impacts were not adequately addressed, e.g., toxicity from metal leakage in both benthic and discharge plumes or noise and vibration impacts. Further, the potential for cumulative effects was only minimally considered.
- No intra- or interannual variation in biological communities is considered, despite the difference between the seasonal timing of the presented data and the expected timing of the collector test. Monitoring impacts will be difficult without an understanding of temporal patterns.
- There are some examples of dominant and common species (foraminifera, macrofaunal polychaetes, and gelatinous animals) that were analysed at appropriate taxonomic levels, showing that overall the test-mining and monitoring sites are comparable. However, foraminifera results show that differences between the IRZ and PRZ likely stem from differences in nodule coverage, suggesting that only specific areas of the PRZ are comparable to the IRZ.
- The importance of ecosystem functions and services provided by rare species in the deep sea cannot be overstated[3, 4], and must be included in the analyses to demonstrate the comparability of the IRZ and PRZ.

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https://www.dosi-project.org/wp-content/uploads/NORI_EIS_Case_Study.pdf

References:

[1]Durden, et al. 2018. Marine Policy 87, 194-202.
[2]https://www.eisconsultationnauruun.org/webinar-2-resources
[3]Danovaro et al. 2008. Current Biology 18, 1-8.
[4]Ingels et al. 2021. Nature Ecology & Evolution 5, 27-29

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Appendix 1: An Assessment of the Adequacy of Benthic Baseline Data for the NORI Prototype Nodule Collector Test EIS

IRZ: Impact Reference Zone; PRZ: Preservation Reference Zone

Groups of benthic organisms	Are the test-mining site (IRZ) and the monitoring site (PRZ) statistically similar?	Are potential impacts properly included in the EIS?	Is the data fit for purpose?	Page in EIS
Microbial prokaryotes	Sample analyses have not started yet.	Sediment toxicity effects via metal leakage are not considered. The cumulative effect of different benthic mining impacts and climate change is considered minimally.	No, as there is no data to inform the EIS regarding benthic microbes.	6-53 8-14
Foraminifera	Analyses are still ongoing. Species-specific information is available for one season. The number of taxa and evenness are similar between the IRZ and PRZ, but diversity differs, (IRZ has more diversity than the PRZ). Differences between the IRZ and PRZ likely stem from differences in nodule coverage, suggesting that only specific areas of the PRZ are comparable to the IRZ.	Sediment toxicity effects via metal leakage are not considered. The cumulative effect of different benthic mining impacts and climate change is considered minimally.	No. Temporal data are lacking; 115 from 450 samples were analysed. >25.000 protists were identified, yielding 487 species. Species effort curves have not reached an asymptote (suggesting many more species to be discovered). Statistical methods to support conclusions are not clear and limited to community composition only. Density data alone are not sufficient to suggest the two areas are similar, and that mining impacts can be adequately monitored. Several impacts are not considered or not appropriately considered. Cumulative impacts are mentioned for benthic organisms as a whole group, but these additional effects were not considered for the impact significance and risk assessment (table 7-7).	6-41 6-43 6-44 8-11 8-12 8-13
Meiofaunal metazoans	Analyses are still ongoing, and species-specific and temporal data are lacking. Meiofaunal densities and number of taxa do not differ between the PRZ and IRZ, but community composition (based on higher taxa) does. Within the IRZ there is much variability in density, taxa numbers, and community composition.	Impacts of noise and vibration, stress, alteration of physical sediments and stability, sediment toxicity effects via metal leakage are not considered. The cumulative effect of different benthic mining impacts and climate change is considered minimally.	No. Temporal and species-specific data are lacking. Nematodes analysed to genus level, all other identification to higher taxon levels. Statistical methods to support conclusions are not clear. Density data alone are not sufficient to suggest the two areas are similar, and that mining impacts can be adequately monitored. Several impacts are not considered or appropriately considered. Cumulative impacts are mentioned for benthic organisms as a whole group, but these additional effects were not considered for the impact significance and risk assessment (table 7-7).	6-31 6-32 6-33 6-35 6-36 8-11 8-12 8-13
Macrofauna	Analyses are still ongoing, and the majority of species-specific and temporal data are lacking. Community composition of nodule-associated fauna differs at phylum level (e.g., PRZ has higher relative abundances of sponges than the IRZ). Macrofaunal densities are similar between the PRZ and IRZ.	Impacts of noise and vibration, stress, alteration of physical sediments and stability, sediment toxicity effects via metal leakage are not considered. The cumulative effect of benthic different mining impacts and climate change is considered minimally.	No. Temporal and species-specific data are largely lacking. From >8000 collected animals, 293 individuals have been identified, yielding 106 species of which only 18 are described. Statistical methods to support conclusions are not clear and limited to community composition only. Density data alone are not sufficient to suggest the two areas are similar, and that mining impacts can be adequately monitored. Several impacts are not considered or appropriately considered. Cumulative impacts are mentioned for benthic organisms as a whole group, but these additional effects were not considered for the impact significance and risk assessment (table 7-7).	6-19 6-21 6-25 8-11 8-12 8-13
Megafauna	Analyses are still ongoing, and the majority of species-specific and temporal data are lacking. Sample size assessed is insufficient for quantitative assessment of diversity. Megafaunal densities do not differ between the PRZ and IRZ. Nodule-rich areas contain higher densities than nodule-poor areas.	Sediment toxicity effects via metal leakage are not considered. The cumulative effect of different benthic mining impacts and climate change is considered minimally.	No. Temporal and species-specific data are largely lacking. There is insufficient data available to quantitatively assess the similarity between the IRZ and PRZ for megafaunal diversity and community composition. Density data alone are not sufficient to suggest the two areas are similar, and that mining impacts can be adequately monitored. No statistical methods to support conclusions are presented. Several impacts are not considered or appropriately considered. Cumulative impacts are mentioned for benthic organisms as a whole group, but these additional effects were not considered for the impact significance and risk assessment (table 7-7).	6-5 6-14 8-11 8-12 8-13

Appendix 2: An Assessment of the Adequacy of Pelagic Baseline Data for the NORI Prototype Nodule Collector Test EIS

IRZ: Impact Reference Zone; PRZ: Preservation Reference Zone

Groups of pelagic organisms	Are the test-mining site (IRZ) and the monitoring site (PRZ) statistically similar?	Are potential impacts properly included in the EIS?	Is the data fit for purpose?	Page in EIS
Microbes	Analyses are still ongoing, and no temporal data are available. Microbial richness is higher in the PRZ than in the IRZ, but evenness is similar between the two areas.	No plume impacts are considered for pelagic microbes. The cumulative effect of different pelagic mining impacts and climate change is considered minimally.	No. Temporal data are lacking. There is uncertainty for the plume impacts associated with the plume model regarding spatial and temporal impacts. Cumulative impacts are mentioned for pelagic organisms as a whole group, but these additional effects were not considered for the impact significance and risk assessment (table 7-7).	6-73
Zooplankton	Analyses are still ongoing, and species-specific and temporal data are lacking. Midwater biomass was similar between IRZ and PRZ, but other metrics have not been analysed yet. Community composition of zooplankton just above the seafloor differs between the IRZ and PRZ (there are more chaetognaths and polychaete larvae in the IRZ), but no statistical tests were presented to support this.	Physiological responses from sediment plumes, diurnal vertical migration and other behavioural changes, and sediment toxicity effects via metal leakage are not properly considered. The cumulative effect of different pelagic mining impacts and climate change is considered minimally.	No. Temporal and species-specific data on many metrics are lacking. Biomass data alone is not sufficient to suggest the two areas are similar, and that mining impacts can be adequately monitored. There is uncertainty for the plume impacts associated with the plume model regarding spatial and temporal impacts. Cumulative impacts are mentioned for pelagic organisms as a whole group, but these additional effects were not considered for the impact significance and risk assessment (table 7-7).	6-86 6-87 6-91 6-93 8-17 8-18 8-19
Gelatinous animals	Temporal data are lacking. Animals have a patchy distribution, which complicates the analyses. It is stated that species diversity does not differ between the IRZ and PRZ, but the supporting data and statistical analyses are not presented, and the conclusions cannot be verified.	Physiological responses from sediment plumes and sediment toxicity effects via metal leakage are not properly considered. The cumulative effect of different pelagic mining impacts and climate change is considered minimally.	No. Temporal data are lacking. Density data alone is not sufficient to suggest the two areas are similar, and that mining impacts can be adequately monitored. There is uncertainty for the plume impacts associated with the plume model regarding spatial and temporal impacts. Cumulative impacts are mentioned for pelagic organisms as a whole group, but these additional effects were not considered for the impact significance and risk assessment (table 7-7).	6-100 6-112 8-18 8-19
Micronekton	Analyses are still ongoing, and species-specific and temporal data are lacking. Fish abundance varied between the IRZ and PRZ (IRZ has higher abundances), but not for squid or crustacean abundances, but no statistical methods were presented to support this. Community composition for vertically migrating and resident fauna in the upper oxycline (70 to 450m) and resident fauna in the oxygen minimum zone (450-700 m) differs between the IRZ and PRZ. Diurnal vertical migration differs between the PRZ and IRZ (PRZ has stronger and deeper migration in the PRZ).	Physiological responses from sediment plumes, diurnal vertical migration and other behavioural changes, and sediment toxicity effects via metal leakage are not properly considered. The cumulative effect of different pelagic mining impacts and climate change is considered minimally.	No. Temporal and species-specific data are lacking. Density data alone is not sufficient to suggest the two areas are similar, and that mining impacts can be adequately monitored. There is uncertainty for the plume impacts associated with the plume model regarding spatial and temporal impacts. Cumulative impacts are mentioned for pelagic organisms as a whole group, but these additional effects were not considered for the impact significance and risk assessment (table 7-7).	6-115 6-116 6-122 6-127 6-128 8-15 8-16 8-18 8-19
Sea birds, sharks, turtles, marine mammals	The data are presented for the whole of NORI-D and no comparisons between the IRZ and PRZ or temporal comparisons are made. Mammals were sighted and frequently detected using hydrophones.	The cumulative effect of different pelagic mining impacts and climate change is considered minimally.	No. No spatial or temporal comparisons are made. Cumulative impacts are mentioned for pelagic organisms as a whole group, but these are not assessed to change the impact risk or effects.	6-157 6-158 6-161 6-162 8-3 to 8-11