



GSR

Global Sea Mineral Resources

Response to the comment received through the public participation organized by the Belgian Authorities

Vlaams Instituut voor de Zee (VLIZ)



Introduction

On 14 January 2013, the International Seabed Authority (ISA) and Global Sea Mineral Resources NV (GSR) signed a 15-year contract for exploration of polymetallic nodules. Under the contract, GSR will have the exclusive rights for exploration for polymetallic nodules over 76,728 square kilometres of the seabed in the eastern part of the Clarion-Clipperton Fracture Zone (CCFZ) of the central-east Pacific Ocean (GSR contract area is located between 122°W and 128°W longitude and between 13°N and 16°N latitude and an average water depth of about 4,500m).

After the successful trial of the Track Soil Testing Device (TSTD), GSR developed 'Patania II', integrating nodule collection and driving components. This pre-prototype vehicle will be trialled for the first time in the *in-situ* environment of the deep sea in April 2019.

Aligned with the ISBA/19/LTC/8 "*Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area,*" GSR recently submitted the prior EIS to the International Seabed Authority (ISA) and to the Belgian Authorities and decided to publish the prior EIS in the interests of transparency. The prior EIA was open for comment during two months (from 1 July 2018 to 31 August 2018) on the website of the Federal Public Service Economy Government of Economy, SMEs, Middle Classes, and Energy. Five of the received reviews were considered.

The following document includes the official response by GSR to the review by the Vlaams Instituut voor de Zee VLIZ (contact :Hans Pirlet, hans.pirlet@vliz.be). The comments are addressed as written in the document *VLIZ_EIA_GSR_2018.xlsx* (30/08/2018), one by one. The initial remarks by the VLIZ are set out in italics and grey and the response by GSR in non-italics and black to allow contrasts if printed in black and white.

Reviewer Remarks and GSR's Responses

- 1. It is recognised that the collaboration with JPI-OII MiningImpact 2 project provides a significant added value for the planned small-scale test. However, as GSR is closely linked to this consortium, it would add to the transparency to elaborate on the measures that are being taken to preserve the independence and integrity of the involved scientific partners within this project. What kind of agreements were made between both parties in this regard? Also, clear stipulations about the data policy would be appreciated: Will (part of) the acquired data of this test be shared with the wider scientific community (and under what conditions).*

In general, it should be clear who is fulfilling the concerned activity (GSR or JPI Oceans-consortium) and which activities correspond to legal obligations.

GSR agrees that in the prior EIS the distinction between GSR's monitoring and MI2's monitoring was not fully clarified. Therefore, the *Executive Summary* of the prior EIS was updated to enlighten this distinction and sent to the Belgian Authorities. This *Executive Summary* will be part of the Belgian response.

GSR will be monitoring the direct impact (footprint) of the Patania II activity and indirect plume impact on the environment, complying with the requirements of the section IV *Environmental impact assessment* of the *Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area*, issued by the ISA (ISBA/19/LTC/8). In parallel, the JPIO-MI2 consortium

will set up an additional independent monitoring program to optimize the knowledge on impact/effect on the marine environment and support legislation development tailored to nodule mining.

2. *In this part of the text the time period for testing is 4 to 5 days, while in the executive summary it says: maximal 4 days. Please clarify.*

It will be a maximum of 4 working days of equipment in each Contract Area.

3. *Please also indicate the station-location on the map in Figure 3.*

Noted. GSR agrees that it will help the reading of the document.

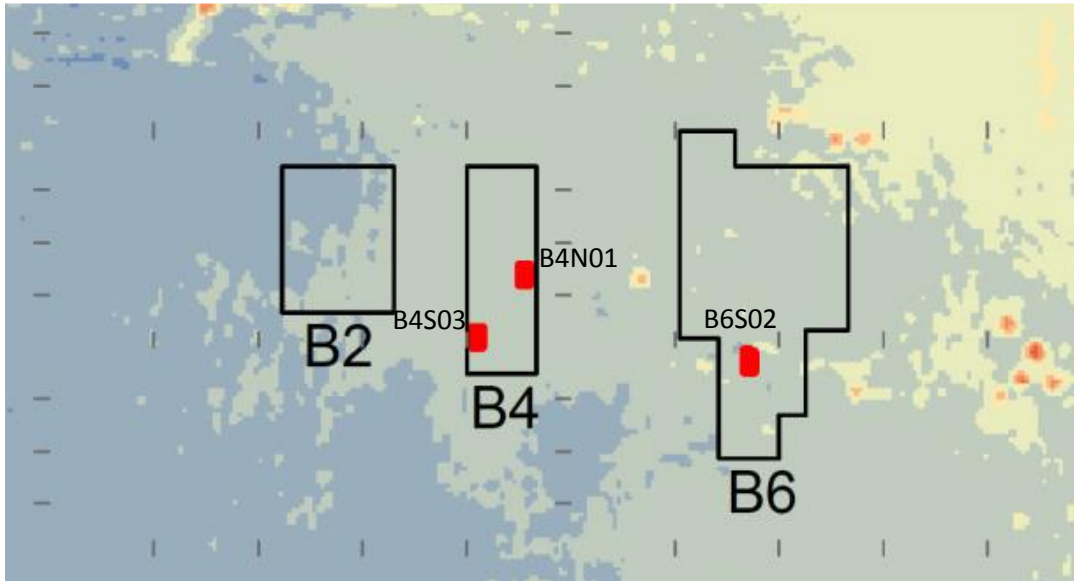


Figure 3 : Close-up on the three domains of the GSR contract area and high resolution stations showed in red

4. *Will this uncertainty be taken on board in the elaboration of the monitoring programme? How will one measure the depth of influence in the seabed? This will be an important parameter to assess the environmental impact (as it also affects the size of the sediment plume).*

For the development of the Patania II, it was decided to use the hydraulic lift concept as tested in the laboratory (Waterbouwkundig Laboratorium in Antwerp). During these tests, it became apparent that the distance between the individual collectors and the seabed has to be controlled and be independent of the bathymetrical irregularities. The systems that control and maintain this 'fissure' are from an operational- and design perspective quite challenging.

The same system that is going to be used for the height control, is being used for the validation of the "depth of influence" of the jets. After the "suction run" (a run where nodules are being collected and stored in the bucket) some time is allowed for the plume to be dispersed and or settled. When visibility returns, a second "measurement run" is performed with the nodule collection system deactivated and an assessment of the impact on the seabed is performed. The technology and data processing techniques used are described below.

- Data processing for height control

We intend to make use of a multibeam that measures instead of only 1 spot, 256 spots over the entire width of the vehicle with a very high update rate. This would give a reading approx. every 1.6cm (inter distance between measurement spots). By using a multibeam for height measurement, the risk of not detecting bathymetrical irregularities or other obstacles is minimized significantly.

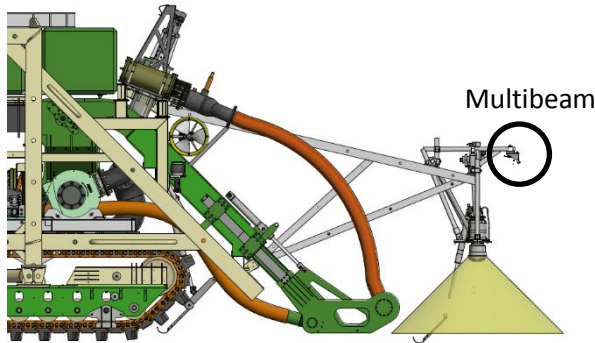


Figure 1: Position Multibeam on PPV Patania II.

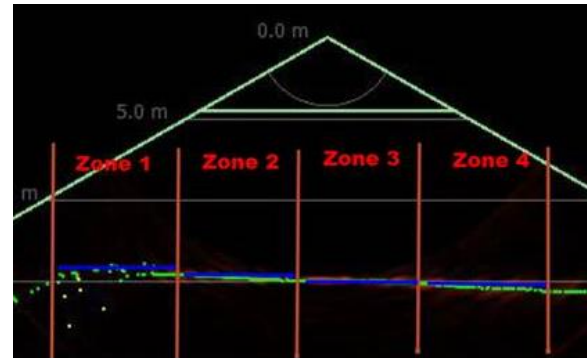


Figure 2 Multibeam swath

If the multibeam monitoring fails (for example because of the excessive turbid environment) a mechanical back-up system is foreseen to measure the height above the seabed. This mechanical concept consists of a ski of which the angle relative to the seabed is translated into a value providing a height measurement. The ski-assembly is foreseen with a hydraulic cylinder, so it can be retracted when the vehicle is manoeuvring over the seabed (turning etc.) or upon landing on the seabed.

5. *It would be good to have a table with an overview of the different campaigns that were undertaken by GSR (with their purpose). In this way one get a good insight in the state of play.*

| Campaign ID | Start | End | Activities | Area(s) |
|-------------|---------|---------|--|-------------------------------------|
| GSRNOD14A | July/14 | Sept/14 | Hull-mounted MBES - Box-core - Dredge Sampling | GSR License areas B2/B4/B6 |
| GSRNOD15A | Sept/15 | Oct/15 | AUV bathymetry - box-core - Multi-core - CTD - GraviProbe | GSR sub-areas B4S03 / B4N01 / B6S02 |
| GSRNOD17 | May/17 | July/17 | box-core - multi-core - CTD - Env. Mooring - Track Soil Testing device Patania 1 | GSR sub-areas B4S03 / B4N01 |
| CIICNOD18 | Feb/18 | Mar/18 | Hull-mounted MBES - Box-core - deep-towed imagery - Env. Mooring | CIIC License areas A1/A3/A5 |
| GSRNOD19 | Feb/19 | May/19 | box-core - multi-core - Env. Mooring - Pre-prototype Vehicle Patania 2 | GSR sub-areas B4S03 / B4N01 / B6S02 |

6. *Will one also make use of the long-term moorings that were deployed in 2017?*

The data recorded by the long mooring will be collected right before the MI2 trial occurs in B4S03. This will represent 2 years of data at the location. It will be sent inshore to run the numerical model with more accurate data. Based on this, the positioning of the array of sensors can be informed.

7. *Given the meso-scale of these eddies, the question at hand is if the monitoring strategy will be adapted to sufficiently measure the wider spatial dispersal of the sediment plume on longer time scales (not only in the vicinity of the impact site). In line with the precautionary approach, it will be of key importance to first have a good understanding of this process (also to validate dispersal models) before moving on to larger-scale activities.*

The eddies can be predicted as they are the consequences of wind jets passing by Mexico, through the mountain chain. The presence/absence of eddies will be assessed beforehand.

8. *The inferred influence of processes which span several years (and even decades) underlines the importance of long-term environmental time series. The current 'two-year moorings' in the context of JPI-Oceans provide a good basis but may not cover a long enough time period to sufficiently measure the driving processes. Please elaborate how this will be taken on in the monitoring programme.*

GSR agrees that the long-term environmental time series is of crucial importance. It is envisaged that more long-term data will be gathered. However, for the current programme of four days, the influence of long-term processes might be minor. The "natural" conditions will be assessed right before the trial. Furthermore, the Southern Oscillation Index (SOI) and the Pacific Decadal Oscillation will be followed up. Nevertheless, we should keep it mind that the CCFZ remains an oligotrophic environment, with reduced nutrient concentrations in the upper layer and reduced vertical fluxes to the seafloor.

9. *The formulation that was used in this paragraph seems like an understatement compared to findings in articles such as Vanreusel et al. 2016 (scientific reports) where evidence was found that that epifaunal densities are more than two times higher at dense nodule coverage, and that taxa such as alcyonacean and antipatharian corals are virtually absent from nodule-free areas. Moreover, surveys conducted along tracks from trawling or experimental mining simulations up to 37 years old, suggest that the removal of epifauna is almost complete and that its full recovery is slow.*

The wording of this paragraph might have been confusing. The focus of interest was the difference between areas where nodules are abundant and areas where there are naturally no nodules. Here is an adaptation:

“The nodule-free (defined as areas where natural nodule abundance was low) and nodule-bearing sites (defined as areas where natural nodule abundance was high) sampled at site B4S03 (Figure 64) were characterized by similar sedimentary characteristics, and similar meio- and macrofauna communities. The only statistically significant difference was observed in terms of meiofaunal standing stock, which was elevated in nodule-free sediments. A potential explanation for this divergence is the possibly higher sedimentation rate at the nodule-free site (as observed in the BGR license area, Mewes et al. (2014)) and/or the expected higher epifaunal densities in nodule bearing sites competing for food or preying on endobenthic organisms.”

10. *Indeed, the abundances were higher but not significantly different.*

Noted.

11. *One should add that only one sample was collected. Hence, replication is needed to tell something about the effect of slope.*

The replicate is foreseen for the continuation of work related to habitat.

12. *I want to echo one of the remarks above to clearly list the measures/agreements that will be taken to preserve the integrity and independence of the scientists. It should be clear that this is a collaboration between equal parties and not contract research.*

Please refer to GSR's response to the first Remark of the reviewer.

13. *This demonstrates the importance to define underpinned boundaries which prevent large-scale environmental impact. Will the monitoring-aspect of this small-scale test also look into defining these kind of thresholds? Please note that for larger scale activities the temporal aspect should also be taken into account (stress caused due to plume formation over a longer period of time in a given area)*

This is a fundamental part of this experiment and will be managed by the scientific independent JPI-O MI2 assessment/monitoring, by sampling through the gradient of plume. An important part of the project is dedicated to (1) identify suitable indicators for ecosystem health and (2) define threshold values for harmful effects on the environment. The results will assist the ISA in the further knowledge building and creating a qualitative evaluation framework.

14. There is a recent paper from NOC (Marsh et al. 2018) which reports that mammals occurs in these areas.

GSR did follow up on this paper, which was published after the original prior EIS was submitted. We are developing a noise monitoring program to ascertain if mammals can be detected in the background noise of the ocean in the Belgian Contract Area. Nevertheless, it should be noted that this paper does not directly report occurrence of mammals in the CCFZ, but rather suggests it as an hypothesis.

15. It would be good to add an overview table linking the design measures to the relevant impact(s). In this way, it will be much clearer to what extent environmental mitigation has played a role in the design.

Noted. The comment will be considered and addressed for the EIS of the System Integration trials.

16. There is a lot of information about where the data of the JPI-Oceans consortium will be stored but will it be in line with the FAIR-principles (findable, accessible, interoperable and reusable)? The EIA should be clear on that but I guess that the data policy still needs to be developed? Also, what about the (environmental) data that will be gathered by GSR? Please clarify

From the JPI-O side, it will be handled by Timm Schoening (recently published a paper about data management Plan in *Sci. Data*, Schoening et al, 2018). Everything will be placed on PANGAEA (<https://pangaea.de/>). On the GSR side, the data management plan will be developed by Charles Janssens and Hendrik De Beuf (DEME) to store all our data. All environmental data will be published in the ISA database and become publicly available.

17. I suspect that the dissemination-activities completely frame within the JPI-Oceans project? Again, it should be clear who is fulfilling the concerned activity (GSR or JPI Oceans-consortium) and which activities correspond to legal obligations of GSR.

Please refer to GSR's response to the first Remark of the reviewer.