The Solwara 1 Seabed Mining Project in the Bismarck Sea of Papua New Guinea

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By Dr Helen Rosenbaum

DSMC
Deep Sea Mining Campaign

Deep Sea Mining Campaign

dsm-campaign.org

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Author: Dr Helen Rosenbaum

COVER PHOTO: CHILDREN OF MOLOT VILLAGE IN RAMUAINA (DUKE OF YORK ISLANDS) - WILL SEA BED MINING DESTROY THEIR FUTURE? PHOTO: HELEN ROSENBAUM.

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ACRONYMS

CSR	Corporate Social Responsibility
DoY	Duke of York (Island/s)
DSM	Deep Sea Mining
DSMF	Deep Sea Mining Finance
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMMP	Environmental Management and Monitoring Plan
ENB	East New Britain
MRA	Mineral Resource Authority
NIP	New Ireland Province
PNG	Papua New Guinea
SMS	Seafloor Massive Sulphides

Executive Summary

Environmental Impacts Of Deep Sea Mining

The Solwara 1 mining project proposes to extract gold and copper from the floor of the Bismarck of PNG. The Solwara 1 site is bordered on the north by New Ireland Province (NIP) and to the south by East New Britain (ENB), and is situated about 40 km from the Duke of York Islands and Kavieng—within the traditional fishing grounds of both ENB and NIP.

The mining licence was granted in 2011 to Nautilus Minerals to mine metal sulphide deposits created over thousands of years by hydrothermal vents—unusual seafloor formations that release superheated fluids and metals from deep in the Earth.

Solwara 1 is the world's first licensed DSM venture and the first of potentially several sea bed mining projects in the Bismarck Sea. Several other tenements were granted to Nautilus, but when Nautilus filed for bankruptcy in 2019 (leaving the PNG Government with a debt of almost PGK 500 million), Deep Sea Mining Finance (DSMF) acquired the full ownership of interests and rights to Solwara 1, Nautilus' key assets, intellectual property, and subsidiaries.[1]

A business called Sustainable Mining Solutions (SMS) oversees the Solwara 1 Project as a joint venture between Deep Sea Mining Finance Limited (DSMF) and SM2 Limited. The project has been renamed Niu Solwara.[2]

The Government of Papua New Guinea (PNG) has direct involvement in the project by holding 15% equity via state-owned Eda Kopa Ltd.[3] This raises questions about ability of the MRA and the Conservation Environment Protection Agency to oversee and to regulate the project.

Niu Solwara Carries Significant Risks

There is a high level of uncertainty about the likely impacts of sea bed mining to marine environments and to communities who depend on them. Below is a summary of risks that may be expected from mining the seabed of the Bismarck Sea. While research and modelling is required to ascertain the extent of risks, scientific knowledge to date indicates these would be of concern.

Environmental and Human Health Risks

- Destruction of the hydrothermal vents and the unique ecosystems that these support. Such damage is likely to be irreversible and restoration is generally accepted as being technically and economically unviable.
- Possible impacts on ecological and human health due to the dispersion of sediment during the mining process. Such impacts could be significant over the life of the Solwara 1 mine and would be expected to be cumulative if other seabed mining sites are exploited within the Bismarck Sea. Insufficient research has been undertaken to accurately predict the dispersion of sediment plumes, the toxicology of the plumes, and cumulative impacts.
- Metals carried by sediment plumes could contaminate the seafood consumed by island and coastal communities and marine food webs. Relevant toxicological studies have not been conducted. Mining trials in the Pacific Ocean have generated dissolved metals likely to be toxic.

- Alpha radioactive particles are associated with deep sea sediment in the Pacific Ocean's Clarion Clipperton Zone and with hydrothermal vent sediments in other parts of the world.. It is not known whether the seabed sediments of the Bismarck Sea are also radioactive and whether radiation poisoning is an additional risk.

Economic Risks

Local to national level economies may be detrimentally affected by mining the Bismarck Sea floor due to environmental impacts on water quality, fisheries (commercial, artisanal, and subsistence), and tourism enterprises.

The exclusion of access to traditional fishing grounds in the vicinity of Solwara 1 would be expected to have economic as well as cultural implications. This may also be in breach of the PNG constitution.

The financial risk for the Government of Papua New Guinea (PNG), and hence also borne by the citizens of PNG are high. This is demonstrated by the bankruptcy of Nautilus Minerals Inc. and Nautilus' own risk assessments prior to that, as lodged with the Canadian Securities Administrators. It is notable that Nautilus did not conduct standard economic assessments. It is unclear what assessments the new licence holder DSMF and SM2 have conducted for Niu Solwara or what due diligence investigations the PNG Government has conducted.

Information provided by PNG Government officials during field research in 2016 indicated that:

- The business case was not assessed by PNG Treasury prior to the PNG Government becoming a joint venture partner with Nautilus in Solwara 1;
- The Memorandum of Understanding (MoU) between the National Government and the company for the Solwara 1 project was likely to provide only a modest level of benefit—not comparable to that typically achieved from land-based mining projects;
- The Nautilus Corporate Social Responsibility (CSR) program created tensions within and between New Ireland Province West Coast communities. Several community leaders interviewed during field research expressed the view that the benefits provided by the company through its CSR did not compensate for the losses they anticipate relating to livelihood, well-being, culture, and way of life.

Concerns About Environmental Management, Governance And Human Rights

Inadequate Regulation

The National Government granted the Solwara 1 mining licence ML 154 to Nautilus Minerals Inc (Nautilus) in December 2011 for a 20-year term. It was granted in the absence of a legislative and regulatory framework and without policies or laws that offer recourse to formal processes, or protection for affected parties from the impacts of seabed mining.

The mining licence also appears to have been granted in the absence of a publicly available environmental management and monitoring plan (EMMP) and an Environmental Impact Statement (EIS) that assesses the full range of impacts likely to result from the proposed seabed mining and meets the requirements of the Regulatory Procedures for Level-3 EIA and EIS.

In the absence of a publicly available revision of the EIS or an EMMP, it is

LOCAL COMMUNITIES IN MIOKO, DUKE OF YORK ISLANDS, DEPEND ON THE OCEAN FOR THEIR FOOD AND LIVELIHOODS. PHOTO: NAT LOWREY

reasonable to be concerned that neither the company, nor National and Provincial Governments have sufficient information to develop plans and capacities to address the range of likely environmental impacts or potential accidents.

Additional concerns are raised by the conflict of interest associated with the dual role of the Government of PNG as both the regulator and a joint venture partner. There is a lack of transparency relating to documents of public interest, hence the long running legal case to obtain documents that are in the public interest.[4]

Even the most fundamental of documents, the Solwara 1 EIS is no longer publicly available. However independent review of the EIS previously accessible on the Nautilus website indicated it failed to document all relevant environmental and social risks with flaws and gaps relating to oceanography. In particular, the EIS lacked rigorous analysis of the spread of pollution generated by mining activities by currents in the Bismarck Sea.

Secrecy Surrounding The 2024 Mining Trial In The Bismarck Sea

From May 16 to July 19 2024, the companies Magellan and Deep Sea Mining Finance tested mining in the Bismarck Sea. The mining activities and interviews with senior government officials are documented in a 3-part PBS News Hour documentary series.[5] The interviews conducted with Mr. Jerry Garry (Managing Director of the PNG Mineral Resources Authority), parliamentarians (eg. Governors Allan Bird and Gary Juffa), and local community members indicated the trial was conducted without the advance knowledge and authorisation of the Mineral Resources Authority and without the knowledge PNG parliament or local communities.

This raises serious concerns about governance, environmental regulation, and management of impacts for an unprecedented operation with unknown impacts. Of particular concern is the lack of transparency and possible lack of due process regarding the granting of a Trial Mining Permit and the inappropriate and possibly illegal use of the EIS and permits granted to Nautilus for an entirely different seabed mining system.

Despite numerous requests, DSMF has not made available the EIS or the permits governing the 2024 mining trial or future mining.

Denial Of Customary Rights

It appears that islanders and coastal communities of the Bismarck Sea are likely to be excluded from a significant portion of their traditional fishing grounds particularly as mining progresses from Solwara 1 to other tenements. Such exclusion would have economic and cultural impacts and may breach of Section 5 of the Customs Recognition Act of the PNG constitution.

1. Environmental And Human Health Risks

1.1 Destruction of Hydrothermal Vents and Unique Ecosystems

The Solwara 1 mining project proposes to extract gold and copper from the floor of the Bismarck of PNG. It is the first of potentially several sea bed mining projects in the Bismarck Sea. Other nearby tenements were granted to Nautilus and are now owned by DSMF upon the bankruptcy of Nautilus.

The Solwara 1 site is bordered on the north by the island of New Ireland and to the south by New Britain, and is 50 kilometres north of the town of Rabaul and approximately 40 km from Kavieng and the Duke of York Islands.

The focus of seabed mining in the Bismarck Sea is the deposits laid down over thousands of years around hydrothermal vents which are similar to underwater geysers. Known as Seafloor Massive Sulphides (SMS), these deposits occur at 1.6 km depth at Solwara 1 (Rosenbaum 2011, p 7).

Hydrothermal vents occur in volcanically active areas such as in the vicinity of Solwara 1. Unique ecosystems are produced by the rare combination of superheated highly mineralised vent fluids, cold seawater, and microbes capable of using chemicals as an energy source and a basis for making organic nutrients. The vents provide habitat for thriving ecological communities, with a majority of species remaining unknown to science. Vent fauna are highly endemic (not found elsewhere) and distinct to particular vents because of the special adaptations required to live in such an extreme environment. Thus, destruction of vents could render entire species extinct (Gollner, S et al 2025).

During the mining of SMS deposits at Solwara 1, tens of thousands of active and inactive vent chimneys and all associated organisms would be destroyed. It is expected that this will disrupt venting frequency, vent location, and the flow of water through the sea floor in and around the mined areas. The short and long-term consequences of these impacts are unknown.[6] However, due to the interconnected nature of the sea there is a high likelihood of impacts extending from the deep sea to species that inhabit the mid and surface waters, familiar to coastal and island communities of the Bismarck Sea (Rosenbaum 2011, p 18 and Gollner, S et al., 2025).

It may be relevant to note that the New Zealand Environment Protection Authority has repeatedly rejected applications from Trans-Tasman Resources over the past eight years to mine the seabed within the NZ Exclusive Economic Zone in recognition of insufficient scientific information to identify the scope and significance of impacts on the environment and on existing commercial and community interests (Rosenbaum, H and Grey, F 2015, p9).

According to marine biologists at the Woods Hole Institute, “No two vents discharge exactly the same mixes of fluids, so no two vents are colonized by exactly the same life forms. Researchers continue to find new vent species just about every time they look for more. (...) So little is known about them that if vents are mined, we may never know what species have been lost.“[7]

Furthermore, these same marine experts note that not only species unique to a particular mined vent will be lost, but biodiversity critical to ecosystem resilience as a whole is at risk: "The result could be the subsea equivalent of replacing an old-growth forest with a field of dandelions. (...) Too little research has been conducted to know for sure".[8] The Nautilus EIS (Section 7-35-40) noted it will not be possible to know the full range of species the project will render extinct.

Deep sea fauna populations are thought to have little resilience to vent disruptions as their growth is limited by lack of food supply and low water temperatures. Indeed, many species will be eliminated from the mine site even before they have been identified or described (Rosenbaum 2011, p 18).

According to widely published deep sea ecologist Professor Cindy Lee Van Dover (who collaborated with Nautilus on baseline studies), "Mining of seafloor massive sulphides, where permitted, will be a frontier use of the deep sea, with no precedent for how to monitor, regulate, and minimize habitat loss and degradation or to facilitate mitigation and restoration."[9]

No information exists about the capacity of hydrothermal vent systems to re-establish following widespread vent field destruction. As emphasised by Professor Van Dover, no one can predict the effects of scraping away 5000 years of mineral deposits across a whole vent field.[10] Furthermore, post mining restoration of the disturbed ecosystem may be impossible, impracticable, and economically unviable.[11]

1.2 Potential Impact of Sediment Plumes

According to the information provided in the Nautilus EIS, Solwara 1 will generate clouds or plumes of sediment during the mining process and via the discharge of waste water just above the sea floor. The plumes will travel according to vertical upwellings, horizontal currents, and tides. Sediment pollution may also occur through spills at the surface or leakage from the 'riser' pipes transporting the sediment from seafloor to the surface.

The Solwara 1 EIS did not include comprehensive studies into the bioavailability and the toxicity to marine organisms of the metals that will be carried by sediment plumes, nor how these properties may change with depth and temperature. Without such information, it is not possible to assess the extent to which metals derived from Solwara 1 may poison marine species and the coastal communities that rely on them.

The limited toxicity testing that Nautilus did conduct indicates that Solwara 1's waste water would be toxic to shallow water species and would need to be diluted 700 times to lose toxicity to these species (EIS Section 9.4). Furthermore, the independent oceanographic review of the Solwara 1 EIS (commissioned by the Deep Sea Mining Campaign) found that that vertical and horizontal water movements around the Solwara 1 site could carry the sediment plumes shoreward towards the west coast of the main island of New Ireland Province and possibly towards the island of East New Britain (Luick, J. 2012).

Seafood forms a significant component of the diet of people living in the villages and towns in the vicinity of the Bismarck Sea. Traditional foods are likely to encompass a range of shellfish, fish, seaweeds, and sea mammals. Organs such as the liver and hepatopancreas in shellfish that concentrate heavy metals and other toxicants are likely to be consumed. This was confirmed during a field trip to the Duke of York (DoY) Island where we were advised by villagers that seafood (fish and shellfish) is the main source of protein for islanders. The

only parts of fish not consumed are the bones. Liver and intestines are a favourite especially with women due to the sweet flavour. This is of concern should heavy metal contamination and bio-accumulation occur (Rosenbaum, H 2016b, p 10).

During a community meeting in Mioko Palpal village on Ramuaina (DoY Island) one participant told the research team that:

"People on the island are born fishing, cooking fish, and eating fish. How will we live if fish are harmed? How will we know if we are eating something harmful? I love my island! My island is the best place to live" (Rosenbaum 2016b Field Report, p 1).

There is currently no capacity at national or provincial level in PNG to accurately test for the bioaccumulation of metals in seafood.

It is essential that prior to the commencement of mining, research is conducted to confirm the seafood component of islander diets, the baseline levels of heavy metals in seafood, and which communities are likely to be exposed to dietary contamination (Rosenbaum 2011, pp 24-25). Until these significant information gaps are closed it is not possible to assess the health risks presented by Solwara 1 to Bismarck Sea island and coastal communities.

Research has recently revealed Alpha radioactive particles in the deep sea sediments and polymetallic nodules in the Pacific Ocean's Clarion Clipperton Zone.[12] Whilst innocuous on physical contact, alpha radiation is considered to be extremely toxic if ingested or breathed in. The ecological impact of exposing marine organisms via gills or ingestion to radioactive particles stirred up in sea water over the life of a mining operation—or over several nearby operations is unknown. Prior to mining or further trials, the proponent should undertake studies to determine if the sediments at Solwara 1 and other tenement sites in the Bismarck Sea are radioactive and to confirm the toxicological behaviour of any radioactivity found.

University of PNG scientists highlighted that neither the Government or Nautilus have conducted social and health impact studies for Solwara 1 and that such studies should have been an essential component of the EIS prior to the Government issuing the licence (Rosenbaum 2016a, p 35).

1.3 Potential Cumulative Impacts

Nautilus held at least twelve Solwara tenements in the Bismarck Sea which it planned to mine as a series of operations. The EIS does not account for the cumulative impact of these. The research presented in the EIS fails to accurately assess and predict the impact of the Solwara 1 mine, let alone the several seabed mines that may eventuate in the Bismarck Sea.

The context in which seabed mining is proposed in the Bismarck Sea is one in which the marine environment and the communities that depend on it are experiencing other ocean stressors, especially due to climate change and population growth placing pressure on fisheries. This is illustrated by views expressed by DoY Islanders, that Solwara 1 would add to the risks they face due to seismic activity, cyclones, and the land loss rapidly occurring due to sea level rise (Rosenbaum 2016b, p 7). During 2024, the Bismarck Sea experienced 143 quakes of magnitudes above 4 and up to 6.9.[13]

In this way seabed mining in the Bismarck Sea would be cumulative relative to other ocean stressors.

2. Economic Risks

Local to national economic spheres may be detrimentally affected by mining the Bismarck Sea floor due to potential environmental impacts.

2.1 Risks To Fisheries

For surrounding coastal communities, the Bismarck Sea underpins local culture and provides food and economic livelihoods. Subsistence fishing provides nutrition for families, with surplus bartered for food crops or sold at local markets contributing to material family needs and the cash economy. No studies appear to have been conducted by the company pertaining to the pattern and nature of subsistence fishing around the Bismarck Sea and the possible effects of the Solwara 1 project on this and family livelihoods (Rosenbaum 2011, p 22).

Both the PNG National Fisheries Authority and the East New Britain Provincial Government have invested in local fisheries including support for fishing cooperatives and local fishing groups. Many of these have become self-reliant. Income earned from fishing has allowed cooperatives to expand and individual fishers to improve their living standards. Many fishers question the logic of the National Government supporting them through the NFA while at the same time approving Solwara 1. They fear for the future of their families and the investments they have made in their fishing enterprises should seabed mining proceed (Rosenbaum 2016a, p 35).

New Ireland has productive tuna fishing grounds that provide opportunities for the province to act as a base for commercial tuna developments. Interviews conducted in 2016 suggested a joint venture was under discussion between provincial and national governments and Nui Guini Islands Sea Products to export tuna for sushimi markets in Japan and Korea. (Rosenbaum 2016a, p35).

The Solwara 1 site lies along the migratory path of tuna and within the fishing grounds shared by DoY Islanders, ENB coastal communities, and west coast NIP communities. Fishing grounds are expanding with population increase and pressure on fish stocks resulting in the need to travel further to catch large fish. Deep water fish such as tuna are caught at the Solwara 1 site and reef fish are caught at nearby reefs such as Paradise Reef (Rosenbaum 2016b, pp 10-11).

There is no documentation in the public realm indicating that the National Government or the proponent have assessed the risks to the existing fishery economies of the Bismarck Sea and determined how these would be managed. It is unclear if a social impact assessment has been conducted and if it investigated these risks.

There appears to be no policies or laws in PNG protecting the rights of fishing interests against restrictions to access to their fishing grounds resulting from seabed mining, their fish stocks being reduced by seabed mining, or their seafood being contaminated by seabed mining.

2.2 Risks To Tourism

The National Government has promoted Kokopo as a national tourism hub since 2013.[14] The PNG Tourism Promotion Authority identifies East New Britain and Milne Bay as the country's high-potential provinces.[15]

Businesses in Kokopo and Kavieng offer marine based eco-tourism experiences that contribute to the economies of those townships as well as coastal and island communities. For example, the Kokopo Beach Bungalow Resort provides dolphin experiences and day trips to the DoY islands for swimming and snorkelling, while surfing tourism is provided near Kavieng.[16] In addition, there are village-based, family-run guesthouses hosting visitors who use these as bases for fishing, diving, and snorkelling excursions (Rosenbaum 16a p 36; Rosenbaum 16b p 12).

There is opportunity for these environmentally sustainable forms of tourism to expand in NIP and ENBP with benefits to both the small and large-scale operators.

Perceptions of marine environmental health have been found to be important for sustaining such tourism. A study conducted in Fiji found that sea bed mining would be a deterrent to visitors returning. The research recommended that Pacific Island countries consider this when formulating their seabed mining policies.[17]

Field research indicated concern about impacts of seabed mining on dolphin populations and consequent loss of income for town and village-based eco-tourism operators (Rosenbaum 16a, p36).

It is unclear if a social impact assessment has been conducted and if it adequately investigated these risks.

2.3 Financial risks and the Government of PNG Duty of Care

Solwara 1 is the first seabed mining project worldwide to be granted an operating licence. It is a novel project with uncertain financial costs and returns as well as impacts.

The risk assessments in the three Annual Information Forms (2015-2018) submitted by Nautilus to the Canadian Securities Administrators warn of significant exploration, mining, and recovery risks "given that no economic SMS deposit has ever been proven". These also advise that a low level of confidence should be placed in the company's projections of ore grades and yields, and consequently in estimates of future revenues, cash flows, royalties and development and operating expenditure.

The Annual Information form for 2017—the final form submitted by Nautilus—advises 'Such variances may be material' and that insurance for the operation may not be available or be prohibitively expensive.[18] Regarding the latter it is notable that several international insurance and re-insurance companies now deny insurance to deep sea mining operations.[19]

These risk assessments highlight the potential for equipment damage, mechanical failure, and operational failure. In these, Nautilus also declares it hasn't completed pre-feasibility or feasibility studies and it foreshadows the company's difficulties in accessing finance. Indeed, the company's subsequent insolvency indicated a lack of investor confidence (Rosenbaum 2016a, pp 17-18).

Information obtained during field research indicated that business case was not assessed by PNG Treasury prior to the PNG Government becoming a joint venture partner or granting permits—as would have been prudent for such an unprecedented and high-risk project.

Due to a lack of transparency regarding decision-making over every aspect of the Solwara 1 project, it is impossible to know what, if any, due diligence measures were undertaken by the Government of PNG to safeguard the interests of its citizens and to ensure careful management of their

YOUNG BOYS FISHING IN MIOKO, DUKE OF YORK ISLANDS. PHOTO: NAT LOWREY

natural resources and state finances—in line with the fourth goal of the PNG National Constitution.

Furthermore, the extent to which local communities and other citizens of PNG will benefit from mining the Bismarck Sea is unclear. The Memorandum of Understanding between the National Government and Nautilus for the Solwara 1 project apparently provides a level of revenue lower than that typically achieved from mining projects. Local communities are not treated as beneficiaries or impacted communities in agreements, as their sea rights are not recognised. Opportunities for local employment and business are expected to be limited with an anticipated workforce of only 180 on the support vessel (Rosenbaum 2016a, p 23).

The Nautilus Corporate Social Responsibility (CSR) program has fuelled uncertainty and tensions within and between NIP West Coast communities. Field research found community members were divided about whether to support Solwara 1. Community leaders expressed the view that the benefits provided by the company through its CSR did not compensate for the losses they anticipate relating to livelihood, well-being, culture, and way of life. In addition, villagers living outside Nautilus' coastal area of benefit worry that they will experience impacts from Solwara 1 but are not eligible for any assistance (Rosenbaum 2016a, pp28-9).

It is unclear whether the Government of PNG has enacted its duty of care to its citizens in assessing the high risks of mining in the Bismarck Sea.

Two points are particularly noteworthy in this regard and also in consideration of the fourth goal of the PNG National Constitution:

- that much economic risk would be borne by the coastal and island communities of the Bismarck Sea while most financial benefit is likely to be reaped by the company. It is unclear how much the national government stands to gain; and
- the metals sought on the floor of the Bismarck Sea are already available from PNG's terrestrial reserves at lower risk and in locations that offer the opportunity for more effective environmental management.

3. Risk To Customary Rights

The Solwara 1 site lies within the fishing grounds of the East New Britain and west coast NIP villagers, and along the migratory route of tuna. If mining in the Bismarck Sea proceeds, the extent to which access to fisheries will be denied access is unclear.

Field research confirms that connections with the sea remain strong for the people of Madang, West coast NIP and DoY Islands. Islanders spoke many times of their knowledge and familiarity of both their inshore environments and the deep sea. They repeatedly expressed that for them, marine and land environments are a continuous whole. According to one New Irelander:

"It is the same plate that we stand on that stretches into the sea. How can they tell us we are not owners or custodians of the sea? As custodians we watch over our sea ..." (Rosenbaum 2016 a, p34; 2016b, pp 7-8).

The NIP tradition of shark calling is a powerful expression of the spiritual relationship with the sea. The rituals associated with it ensure the safety of the shark callers, their success, and the social cohesion that results when the catch is shared.

Scientists at UPNG confirmed the detailed knowledge that islanders of the Bismarck Archipelago have of the deep sea, including around the Solwara 1 site. The scientists described that that islanders recognise and have names for different deep water zones which they have traditionally accessed, even in dug-out canoes (Rosenbaum 2016 a, p34).

Customary rights over access and benefit sharing may also be a relevant consideration in relation to the genetic resources of deep sea specimens that the company (or associated scientists) have already taken out of PNG or may take out in the future.

The PNG Constitution confers the rights of maritime communities over water, reefs, and seabed under Section 5 of the Customs Recognition Act. This section states:

custom may be taken into account in relation to ... the ownership by custom of rights in, over or in connection with the sea or a reef; or in or on the bed of the sea or of a river or lake, including rights of fishing; or the ownership by custom of water, or of rights in, over or to water (see National Assembly of Papua New Guinea, 1975)

Is the National Government and the company in breach of the Customs Recognition Act by denying communities the rights this Act affords?

LOCALS AT A ROADSIDE FISHING STALL IN KOKOPO, EAST NEW BRITAIN. PHOTO: HELEN ROSENBAUM

DEEP SEA VENTS ARE BRIMMING WITH LIFE. PHOTO: STEPHEN LOW PRODUCTION

4. Concerns About Trial Mining In The Bismarck Sea

From May 16 to July 19 2024, the vessel MV Coco was chartered by a company called Magellan to extract ore from the Bismarck Sea in the vicinity of the Solwara 1 site. The tracking data below was published by Mongabay in an article entitled Not merely 'exploration': PNG deep sea mining riles critics & surprises officials.[20]

As documented by the PBS News Hour video (Part 1) filmed on board the MV Coco in the Bismarck Sea,[21] the purpose of the 2-month exercise was:

- to trial new sea bed mining equipment (a 12-tonne claw grab device and remotely controlled vehicle) and methodology to mine the SMS deposits around the hydrothermal vents (at 5 min 10 sec in the news video); and
- to extract samples of SMS deposit for laboratory analysis in Australia.

The news video describes the exercise as occurring "24/7" over the two-month period (at 4 min 15 sec), with most of the ore stockpiled on the sea floor (at 3 min 20 sec).

Personal communications with the PBS Special Correspondent, Mr. Willem Marx also conveyed the understanding that:

- the stockpiles were created to enable ready collection of those confirmed by laboratory analysis to be of high value;
- the company plans to use the 20-year mining licence granted to Nautilus to quickly transition to full scale commercial mining.

According to Magellan's Offshore manager James Holt, this exercise occurred under a 'trial mining permit' (at 4 min 40 sec in news video). As documented in the PBS News Hour video Part 3,[22] the approval of the trial mining came as a surprise to Mr. Jerry Garry, Managing Director of the PNG Mineral Resources Authority (MRA) (at 5 min 13 sec) and a shock to Governor Allan Bird (at 6 min, 28 sec) who also expressed concern over the licencing process.

The extent to which active and inactive hydrothermal vents and their associated ecosystems have already been destroyed by the trial mining and ore stockpiles is unknown. The short and long-term consequences for ecosystem and human health of such destruction and the dispersion of sediment by the trial mining are unknown.

The mining trial is underscored by an attitude that the Bismarck Sea should serve as a living experimental laboratory for the seabed mining venture, rather than the company resourcing credible, methodical, and comprehensive research in advance of commercial seabed mining.

5. Questions About Governance

The seabed mining trial in the Bismarck Sea raises serious questions and concerns about governance, environmental regulation, and management of impacts. These include:

- What process and procedures did the National Government follow to approve this exercise? The company did not observe due process - it failed to detail its activities to appropriate National Government Authorities (such as the MRA) for approval prior to the commencement of trial mining. It also failed to inform local communities of its trial mining exercise.
- The trial mining permit appears to be in addition to those allocated to Nautilus. It appears to have been granted without public consultation, public disclosure, or discussion within the PNG Government. An additional concern is the quality of the scientific or other information that underpinned this secretive approvals process.
- The basis of the Nautilus EIS and the permits granted to Nautilus was a different seabed mining system. The Nautilus EIS and Nautilus permits are therefore inappropriate for the mining equipment and methods trialled during the two-month exercise in the Bismarck Sea. This mining system would be expected to have significantly different impacts – some harms may be reduced but others increased or new compared to those of the mining system proposed by Nautilus.
- The EIS requires revision to be relevant to the impacts of the new mining system trialled and to provide a meaningful basis for the EMMP. Revisions of the EIS should also address the problems highlighted by independent reviews (Steiner, R; 2009; Luick, J 2012).
- An EMMP is a pre-requisite to commercial scale mining. Given the unprecedented nature of the operation, and in line with regulatory process (ie. public review and submissions as per Level 3 Project requirements), the EIS and the EMMP should be made publicly available and incorporate input from scientists and other stakeholders independent of the seabed mining project.
- There is a conflict of interest in the Government of PNG being both regulator and equity partner in the project.

MARINE LIFE IN THE BISMARCK SEA WILL BE THREATENED BY DEEP SEA MINING. PHOTO: ADOBE STOCK

6 Project Compliance With PNG Regulatory Procedures

The Solwara 1 seabed mining project is a Level-3 activity under the PNG Environment Act 2000 for which an EIS is required. An Operational Manual sets out the Regulatory Procedures for Level-3 EIA and EIS including a Guideline establishing the content of the EIS (DEC Publication: GL-Env/02/2004).

The Guideline states "The developer must submit an Environmental Impact Statement that provides a full documentation of all environmental and social issues and committing to the employment of relevant mitigation measures in relation to the development activity. The Environmental Impact Statement should substantially comply with this Guideline."

The Guideline further notes that "the Environmental Impact Assessment process and the Environmental Impact Statement are key inputs, together with comments received from referral bodies and other stakeholders, that will be used by DEC to assess whether or not a proposal is recommended for approval."

Independent reviews of the Solwara 1 EIS (Steiner R, 2009; Luick, J 2012) and the information provided in this paper demonstrate that many significant issues are inadequately addressed. Thus, the Solwara 1 EIS cannot be considered to meet the requirement of providing full documentation of all environmental and social issues and committing to the employment of relevant mitigation measures in relation to the development activity.

Some key issues not adequately addressed in the EIS are:

- Sea water pollution from spills of oil or ore slurry from vessels at the surface, leakage and sediment plumes generated during the mining process and through the return of the discharge water;
- Seismic events or storm surges causing spills, breakages, and leakage (143 quakes of magnitudes above 4 and up to 6.9 experienced in the Bismarck Sea during 2024).[23]
- Vertical (upwellings) and horizontal currents transporting sediment plumes particularly into contact with marine food chains;
- The bioavailability and toxicity to marine species of DSM generated radioactive particles and heavy metals contaminating marine water;
- The contamination of marine and human food chains resulting from sea water pollution and associated health impacts for coastal communities;
- Impacts on subsistence, artisanal and commercial fisheries and on marine based tourism and associated economic and social implications including for local food security, cultural practices, and livelihood opportunities;
- Light and noise under water and on the ocean's surface generated by the seafloor mining equipment and vessels and the physiological effects on marine species and sea birds;
- The destruction of unique and endemic ecosystems at hydrothermal vents. This is of particular concern as limited information exists about the capacity of, or timescale, for hydrothermal vent systems to re-establish following widespread vent field destruction, and whether

any new vent systems will be as biologically diverse.

- The cumulative impacts of the several tenements held by Nautilus, and now DSMF, in the Bismarck Sea and these in combination with other ocean stressors.
- The long term nature of many impacts.

The Physical Oceanographic Assessment of the Nautilus Environmental Impact Statement for the Solwara 1 Project reviewed the data and analysis of physical oceanography, sediment deposition and plume dispersal as presented in the Nautilus EIS.

It found that each of these aspects of the EIS suffers from a lack of rigour with regard to the modelling, presentation and analysis of data. It found serious omissions and flaws in information presented in the EIS about surface currents, the speed and direction of currents at different depths, and about tides. These deficiencies mean that several important risks to the marine environment and to local communities cannot be determined.

These include the risks of pollution from spills from vessels at the surface, leakage from pipes, and of upwelling dispersing metals from the mining activity or from the discharge water. The implications of these risks—especially for the people of New Ireland and possibly also East New Britain Province—demands that a thorough and independently verified analysis of currents be conducted as a basis for a comprehensive risk assessment (Luick, J 2012).

Due to lack of transparency, it is not possible to determine if the Government and the company adhered to the Regulatory Procedures for Level-3 EIA and EIS stipulated in the Operational Manual. This alone suggests Public Review and Submissions on the EIS were inadequate and did not occur in accordance with the Regulatory Procedures.

Given that the Government of PNG granted permits and licences to Nautilus based on inadequate EIA and EIS, it cannot be considered to have satisfactorily assessed the Project against the Fourth Goal of the National Goal and Directive Principle (NGDP) under the PNG National Constitution, as required by the Information Guideline. In addition, due to a lack of transparency regarding decision-making, it is impossible to know what, if any, due diligence measures were undertaken by the Government of PNG to safeguard the interests of its citizens and to ensure careful management of their natural resources and state finances.

The fourth goal states:

We declare our fourth goal to be for Papua New Guinea's natural resources and environment to be conserved and used for the collective benefit of us all, and to be replenished for the benefit of future generations.

WE ACCORDINGLY CALL FOR:

1. *wise use to be made of our natural resources and the environment in and on the land or seabed, in the sea, under the land, and in the air, in the interests of our development and in trust for future generations; and*
2. *the conservation and replenishment, for the benefit of ourselves and posterity, of the environment and its sacred, scenic, and historical qualities; and*
3. *all necessary steps to be taken to give adequate protection to our valued birds, animals, fish, insects, plants and trees.*

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