Climate Change & Development (CCD) Community, of the Pacific Solution Exchange

Consolidated Reply

**Query: Trans-boundary Environmental Impacts of Deep Sea Mining. E-Discussion**

Compiled by Setaita Tavanabola, Research Assistant

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From Seni Nabou, Greenpeace Australia Pacific, Suva, Fiji

Posted 16 September 2013

Ni Sa Bula Vinaka,

My name is Seni Nabou and I am the Pacific Political Advisor for Greenpeace Australia Pacific.

The deep sea is a place mostly undiscovered and unregulated for biodiversity protection. It is now facing large-scale industrial exploitation – as mining of the deep seabed for minerals becomes a reality. As terrestrial minerals become depleted and prices rise, the search for new sources of supply is turning to the sea floor. This emerging industry, facilitated greatly by advances in technology, poses a major threat to our oceans, which are already suffering from a number of pressures including overfishing, pollution, and the effects of climate change.

A growing number of companies and governments are currently rushing to explore and exploit minerals found in and on the seabed. There are currently 17 exploration contracts for the seabed that lies beyond the national jurisdiction in deep seas of the Pacific, Atlantic and Indian Oceans, compared with only 8 contracts in 2010.

At Greenpeace Australia Pacific our primary campaign focus is on oceans and to that end we have been involved in the regional tuna fishery.

Greenpeace Australia Pacific and a coalition of Pacific Regional Non-Government Organisations are concerned about the rush to deep seabed mining and have called for a halt to it in the Pacific region. We are also concerned about the rushed processes taken to legitimize and fast-track experimental seabed mining exploration as a development opportunity. We acknowledge and support development aspirations of our Pacific Island nations, but we fear that the haste with which these are going ahead are not being firmly guided by the precautionary principle.

Given that deep sea mining operations might be happening soon within sovereign Exclusive Economic Zones, I request Pacific Solution Exchange members to share your thoughts on what would be some trans-boundary environmental impacts of these ventures.
Responses were received, with thanks, from

1. **Hannah Lily**, Deep Sea Minerals Project, Applied Geoscience and Technology Division (SOPAC), Secretariat of the Pacific Community, Suva, Fiji
2. **Sele Tagivuni**, Ministry of Local Government, Urban Development, Housing and Environment, Suva, Fiji
3. **Vinesh Prasad**, Deep Sea Minerals Project, Ocean and Islands Programme, Applied Geoscience and Technology Division, Secretariat of the Pacific Community, Suva, Fiji
4. **Akuila Tawake**, Deep Sea Minerals Project, Ocean and Islands Programme, Applied Geoscience and Technology Division, Secretariat of the Pacific Community, Suva, Fiji
5. **Paul Roughan**, Honiara, Solomon Islands
6. **Jan H. Steffen**, Marine and Coastal Biodiversity Management in Pacific Island Countries (MACBIO), GIZ, Suva, Fiji
7. **Taaniela Kula**, Ministry of Lands, Environment, Climate Change and Natural Resources, Nuku‘alofa, Tonga
8. **Edward Anderson**, School of Maritime Studies, University of the South Pacific, Suva, Fiji
9. **Noelene Nabulivou**, DAWN, Fiji
10. **Save Waqainabete**, WENNA Consultants Partners, Suva, Fiji
11. **Helen Rosenbaum**, Deep Sea Mining Campaign, Project of the Ocean Foundation, Australia
12. **Jeffrey Marlow**, Geological and Planetary Sciences, California Institute of Technology, USA
14. **Hannah Lily**, Deep Sea Minerals Project, Applied Geoscience and Technology Division (SOPAC), Secretariat of the Pacific Community, Suva, Fiji
15. **Jeffrey Marlow**, Geological and Planetary Sciences, California Institute of Technology, USA
16. **Samasoni Sauni**, Honiara, Solomon Islands
17. **Viliame Kaiyabia**, Kadavu Provincial Office, Kadavu, Fiji
18. **Veikila Vuki**, Oceania Environment Consultants, Guam
19. **Tapulolou Tuailemafua**, European Union (EU) Global Climate Change Alliance Project, University of the South Pacific, Apia, Samoa
20. **William Aalbersberg**, Institute of Applied Science, University of the South Pacific, Suva, Fiji
21. **Akuila Yabaki**, Suva, Fiji
22. **Esiteri Kamikamica**, Lami, Fiji
24. **Ferdinand Strobel**, United Nations Development Programme Pacific Centre, Suva, Fiji
25. **Esiteri Kamikamica**, Lami, Fiji

Further contributions are welcome!

**Summary of Responses**
**Comparative Experiences**
**Related Resources**
**Responses in Full**
Summary of Responses

Given that deep sea mining operations might be happening soon within sovereign Exclusive Economic Zones (EEZ), the query sought members feedback on what would some trans-boundary environmental impacts of this venture be.

According to the responses received, no deep sea mining has taken place in Pacific waters and technology to extract minerals commercially remains under development. This environment has hardly been studied making it difficult to predict the impacts without knowing the specific technicalities of the proposed operations and details of a specific site.

However, from what little is known about the deep sea environment a member shared scientists’ predictions stating that direct impacts of seabed mining are likely to be localized to the mining site due to high pressure and low current in the deep ocean restricting sediment dispersal. If this is correct, then direct trans-boundary impacts may be considered unlikely, unless perhaps a mining site is allocated right next to a boundary, then risk of dispute may well pre-empt that. However, the probability of indirect impacts bears further investigation.

A member shared his current understanding of sediment disturbance at 1000 meters below sea level if mining were to occur. He stated that sediment disturbance may likely settle on the same depth due to the stratification behavior of the water column. Depending on the weather, sediments that reach the sea surface may block sunlight discouraging photosynthesis in that area for a few hours or days. However, if sediment is transported to another EEZ in the next 200 nautical miles this will discourage photosynthesis in the neighboring state but most likely at a smaller scale than it began with as sediments will sink back to the seabed.

It is mentioned that deep sea vents are relatively small colonies of extremely unique species evolving separately to life at the surface of the earth. They depend on the earth’s heat for their primary energy source and once mining operations are underway it will not be long before they are all gone.

Research from the University of the South Pacific shows at least two separate environmental issues associated with deep sea minerals extraction. These are near field effects of mining on deep benthos (i.e. community of organisms which live on, in, or near the seabed) and the surface effects may affect fisheries. The existence of Deep Chlorophyll Maximum of about 90 to 150 meters deep in the sea indicates high phytoplankton (also known as microalgae, are similar to terrestrial plants in that they contain chlorophyll and require sunlight in order to live and grow). The Deep Chlorophyll Maximum is the base of a tropic web leading up to zooplankton (i.e. small fish and squids) and tuna and other large predators are known to feed on them at these depths.

Because of the importance of oceanographic characteristics in determining impact, Deep Sea Mining campaign commissioned an independent review of the oceanographic aspects of the Nautilus Solwara 1 Environment Impact Statement by internationally recognized oceanographer Dr. John Luick. The review shows upwelling and currents that could bring communities in New Ireland Province into contact with sediment plumes.

The extent to which metals may exert a toxic effect will be determined by factors influencing concentrations and bio-availability such as distance between deep sea mining operations, currents and upwelling, temperatures and salinity etc. Therefore, an important point a member raised here is how the cumulative impact of several mines will be tracked and the mechanisms put in place to ensure cumulative effect is factored into decisions about any new mines. It will be complicated if licenses are issued by different governments.
Responses also raised the concern of de-watered mine material transferred from a mother ship to a barge in the open ocean or from a barge to land. A member believes that it is almost inevitable spills will occur which can be quite large and contain substances which should not be introduced into the surface marine ecosystem. This will become a problem when the spill occurs within a few kilometers of land as surface currents can rapidly sweep a dissolved fraction of the material to shore and potentially into the food supply.

It is noted that a significant amount of exploratory works need to be carried out in deep sea minerals project before a decision to mine or not is made, however, this demands money, technical expertise and time. The Pacific region will unlikely be seeing many deep sea mining operations in the next 20 years but will most likely have three to four operations in the next two decades or so. This should give enough time for countries to carry out more research and make their decision on how to respond to the venture, and countries with shared boundaries may have enough time to sort issues relating to their maritime boundaries.

Scientists can take an active role is this by communicating the full value of deep sea communities. It is out of sight and outside the daily experience of most people therefore it is hard for the general public to value the deep sea environment. Getting more and better numbers on the goods and services provided by deep sea ecosystems could prove very useful.

The Pacific Ocean is a large area of open waters and mixing/movement in the water column is a complicated process of geophysical fluid dynamic. Therefore, scientific advice to emerge from trials and experimental expeditions of the deep sea environment will undoubtedly help inform policy decisions.

If done properly the industrialization of the deep sea could be a boon to science. Responsible use of these resources would require the need to understand the full ecological impact on hydrothermally derived systems. Characterization expeditions in advance of mining operations could expand the knowledge of certain applied parameters such as mineral deposition rates.

Until the legal framework of mining in international waters catches up to the ‘ready-to-dig’ reality cooperative participation from scientists may be one of the best ways to preserve the most fragile, irreplaceable aspects of deep sea ecosystems.

**Comparative Experiences**

**Papua New Guinea**

**Nautilus’ Minerals Solwara 1 Project, Bismarck Sea** *(from Hannah Lily, Deep Sea Minerals Project, Applied Geoscience and Technology Division (SOPAC), Secretariat of the Pacific Community, Suva, Fiji)*

An Environment Impact Assessment (EIA) was carried out for seabed mining and its report released, as a result a mining license has been granted to Papua New Guinea however mining operations are on hold as the EIA report requires public consultation before work is to commence. Only one EIA has been carried out so far in the Pacific.

**Fiji**

**Sustainable Harvesting, Suva, Fiji** *(from Vinesh Prasad, Suva, Fiji)*
Like the concept of the Sustainable Forest Management in the Forestry Sector, those in the Deep Sea Mining Sector need a good feasibility study to identify the possibility of harvesting deep sea minerals sustainably.

**Koyo Maru Cruises Sea Research** *(from Veikila Vuki, Oceania Environment Consultants, Guam)*

Students and staff of the University of the South Pacific’s Marine Studies Programme participated in a deep-sea oceanographic expedition on the Koyo Maru, Japan’s deep-sea fisheries research vessel, to develop a manual for the identification of both phytoplankton and zooplankton in Fiji waters as no such manual exists. This is an example of a research study done that is done without incurring much cost.

**Tonga**

**Diversity of biotic recruitment, Tonga to the Great Barrier Reef** *(from Taaniela Kula, Ministry of Lands, Environment, Climate Change and Natural Resources, Nuku’alofa, Tonga)*

Referring to the mobile deep sea sediments, a Tongan seamount gave birth to tons of pumice in 2006; the pumice was transported by winds less than 2.8 nautical miles to the Great Barrier Reef Australia within 7 to 8 months. The pumice bulked like a raft and when it arrived in Australia, 80 species of plants were found on the raft, promoting a diversity of biotic recruitment.

**Japan**

**Fukushima Disaster, Japan** *(from Noelene Nabulivou, Development Alternatives and Women for a New Era, Fiji)*

Months and years after assurances there was no long-term and dangerous oceanic pollution from the Fukushima disaster, research is showing the opposite. DAWN strongly believes a similar scenario could occur for the Pacific if impacts of Deep Sea Mining are not explored thoroughly by experts.

*From Helen Rosenbaum, Deep Sea Mining Campaign, Project of the Ocean Foundation, Australia*

**Africa**

**Namibia announces a moratorium on sea bed mining, South West Africa**

Republic of Namibia in South West Africa announced a moratorium on sea bed mining while scientific studies into impacts are conducted. Minister of Fisheries and Marine Resources, Hon. Bernhard Esau, stressed “seabed mining cannot happen if there is not solid proof that it will not have negative impacts on the environment”

**Australia**

**Communities ban seabed mining, Northern Territory, Australia**

The Northern Territory Government in Australia after hearing from local communities announced a total ban on seabed mining around Groote Eylandt in the Gulf of Carpentaria.

**New Zealand**

**Chatham Rock Phosphate, New Zealand**

Chatham Rock Phosphate wants to conduct its mining operation in one of its underwater national parks; however there is not enough information on the likely environmental impact. Given the value of the fisheries at stake, this may be unacceptably risky. The Chatham Rock Phosphate proposal is soon to be submitted to the Environmental Protection Authority for consideration.
Related Resources

Recommended Documentation

From [Hannah Lily](#), Deep Sea Minerals Project, Applied Geoscience and Technology Division, Secretariat of the Pacific Community, Suva, Fiji

**Template for an Environmental Impact Assessment Report on Deep Sea Mining**


This Technical Guidance Document is intended to assist and guide prospective developers with an intention to carry out mineral exploitation activities in The Area.

**Nautilus Minerals response to the Deep Sea Mining Campaign**

Paper; Nautilus Minerals Niugini Limited; September 2008; Available at [www.cares.nautilusminerals.com/downloads.aspx](http://www.cares.nautilusminerals.com/downloads.aspx);

This is the Environment Impact Assessment report on the Nautilus Minerals Solwara Project 1 where seabed mining license has been granted by Papua New Guinea for seafloor massive sulphide minerals deposits.

**Application of the Precautionary Principal for Deep Sea Minerals**

Information brochure; Applied Geoscience and Technology Division – Secretariat of the Pacific Community; Suva, Fiji;

The information brochure is the Deep Sea Minerals Project’s attempt to summarise what they think the precautionary approach means in Deep Sea Mining terms.

**The Prospect: September 2013 issue of the DSM Project Newsletter**

Book; by the Deep Sea Minerals Project, Applied Geoscience and Technology Division, Secretariat of the Pacific Community; 2nd Edition; September 2013;

Highlights news and developments from the EU-SPC Pacific Deep Sea Minerals Project and its participating member countries.

**Public Participation in Deep Sea Minerals Decision-Making**

Information brochure; by the Deep Sea Minerals Project, Applied Geoscience and Technology Division, Secretariat of the Pacific Community; Information Brochure 14;

This brochure seeks to provide discussion and guidance on the principle of public participation in Deep Sea Minerals developments.

**The International Seabed Authority**

Information brochure; by the Deep Sea Minerals Project, Applied Geoscience and Technology Division, Secretariat of the Pacific Community; Information Brochure 15;
Available at
This brochure intends to provide a brief and basic understanding of the International Seabed Authority, its various organs and functions and the important role it plays.

The DSM Project 2013 Mid-Year Progress Report
This report highlights project activities that were accomplished in the first six months of 2013 in accordance with the three remaining Key Result Areas of the DSM Project.

Deep Sea Minerals: A physical biological, environmental and technical review
Book; Malcolm R. Clark et al; Volume 1 A, B, C; Available at [grida.no/publications/deep-sea-minerals](grida.no/publications/deep-sea-minerals);
It examines the geology and associated biology of three principal deep sea mineral deposit types found in the Pacific; also looking at environmental and technical aspects related to deep sea mineral extraction.

Rapid, Long-Distance Dispersal by Pumice Rafting (from Taaniela Kula, Ministry of Lands, Environment, Climate Change and Natural Resources, Nuku’alofa, Tonga)
It reports on a significant recent pumice rafting and long-distance dispersal event that occurred across the southwest Pacific following the 2006 explosive eruption of Home Reef Volcano in Tonga.

From Edward Anderson, School of Marine Studies, University of the South Pacific, Suva, Fiji

The Deep Chlorophyll Maximum in Fiji Waters
Powerpoint; Anderson E; University of the South Pacific; 2013; Available at [www.solutionexchange-un.net/repository/pc/ccd/Presentation-DeepChlorophyll-byE.Anderson.pdf](www.solutionexchange-un.net/repository/pc/ccd/Presentation-DeepChlorophyll-byE.Anderson.pdf) (PDF; Size: 1.24MB)
The information was presented at the 2013 Pacific Science Inter-Congress explaining the existence of deep chlorophyll maximum 90 – 150 meters beneath the sea indicating high phytoplankton.

The Deep Chlorophyll Maximum (DCM) in Fiji Waters
Paper; Anderson E and Urata K; University of the South Pacific and Saga University; Available at [www.solutionexchange-un.net/repository/pc/ccd/DCMAbstract-byEAnderson&KUrata.pdf](www.solutionexchange-un.net/repository/pc/ccd/DCMAbstract-byEAnderson&KUrata.pdf) (PDF; Size: 302KB)
An abstract on DCM being a consistent feature of tropical oceans in the central basins of both the Pacific and Atlantic; at a station near Kadavu, Fiji they link the DCM to phosphate, a limiting nutrient for phytoplankton growth.

From Noeline Nabulivou, Development Alternatives with Women for a New Era (DAWN), Fiji

Gender Equality, Women’s Rights and Women’s Priorities
Book; Women’s Major Group; September 2013;
This report compiled position papers on different elements of the post-2015 agenda and proposed Sustainable Development Goals written by the Women's Major Group.

DAWN Response to High Level Panel Report on Post 2015 Development Agenda

Paper; Development Alternatives with Women for a New Era;

It raises key related issues about rights and commodification of nature, how corporate and state decisions to mine are often actively and falsely posited as being of higher consideration than the rights of citizens.

From Helen Rosenbaum, Deep Sea Mining Campaign, Project of the Ocean Foundation, Australia

Physical Oceanographic Assessment of the Nautilus EIS for the Solwara 1 Project

Book; Luick J. PhD, Austides Consulting, Adelaide, Australia; November 2012;

It reviews the oceanographic elements of the Nautilus Solwara 1 Environmental Impact Statement. Its focus is on currents and upwelling that may bring pollutants into contact with local populations and marine species.

Moratorium on deep sea phosphate mining

Article; by Deepwater Group; 24 September 2013;

Talks about the Namibian Government being imposed an eighteen month moratorium on a deep sea phosphate mining proposal to mine off the coast of New Zealand.

Is Deep Sea Mining worth the risk? (From Jeffrey Marlow, Geological and Planetary Sciences, California Institute of Technology, USA)

Poster; by 911metallurgist and Neoman Studios;

A graphic explaining both sides of the issue; Deep sea mining is a particularly difficult environmental issue because the consequences are so nebulous.

An Analysis: 2013 Fiji Government Constitution (from Akuila Yabaki, Suva, Fiji)

Book; Citizens Constitutional Forum; September 2013;

The analysis of the current Fiji 2013 Constitution shows that Government can make a case for out of necessity for mining to proceed without consulting customary landowners.

Mining Weekly: Nautilus’ PNG marine mining project to proceed after arbitration decision (from Ferdinand Strobel, United Nations Development Programme, Pacific Centre, Suva, Fiji)

Article; Henry Lazenby; 03 October 2013; Mining Weekly;

Nautilus Minerals, on Thursday said an international arbitrator had ruled in its favour, and compelled the Papua New Guinea government to keep to its end of a joint venture agreement.
Unfair, Unsustainable and Under the Radar
Book; by McDonagh T; Published by the Democracy Centre; 2013;
Available at democracyctr.org/wp/wp-content/uploads/2013/05/Under_The_Radar_English_Final.pdf (PDF; Size: 6.36MB)

It examines conflict between sustainable development and international investment rules; hopes to move and inspire others to join effort to dismantle a system designed to keep activist democracy out of some of the most important decisions of our time.

Recommended Contacts and Experts

Ms. Hannah Lily, Secretariat of the Pacific Community, Suva, Fiji (from Hannah Lily, Deep Sea Minerals Project, Applied Geoscience and Technology Division, Secretariat of the Pacific Community, Suva, Fiji)
Secretariat of the Pacific Community, Private Mail Bag, GPO, Suva, Fiji Islands; Tel: +679 324 9292; Fax: +679 337 0040; Email: hannahl@spc.int;
She joined SOPAC in October 2011 as Legal Advisor to the Deep Sea Minerals Project: advising 15 Pacific-ACP States on the development of policy and law to manage deep seabed exploration and mining.

Recommended Organizations and Programmes

Secretariat of the Pacific Community, Mead Road, Nabua, Fiji; Tel: +679 324 9292 Fax: +679 337 0040; Web: www.sopac.org/dsm
It is helping Pacific Island countries to improve the governance and management of their deep-sea minerals resources through improved legal frameworks, increased technical capacity and effective monitoring systems.

Solwara 1 Project, Papua New Guinea (from Akuila Tawake, Deep Sea Minerals Project, Oceans and Islands Programme, Applied Geoscience and Technology Division, Secretariat of the Pacific Community, Suva, Fiji)
Nautilus Minerals Niugini Limited, Level 1, Deloitte Tower, Douglas Street Port Moresby, Papua New Guinea; Tel: +675 321 1284; Fax +675 321 1685; Web: www.nautilusminerals.com;
Nautilus got the first mining lease known as Solwara 1, in the territorial waters of Papua New Guinea, where it aims to produce copper, gold and silver.

International Seabed Authority, Jamaica (from Jan H. Steffen, Marine and Coastal Biodiversity Management in Pacific Island Countries, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Suva, Fiji)
International Seabed Authority, 14-20 Port Royal St.,Kingston, Jamaica; Tel: 1 876 9229105; Fax: 1 876 922-0195; Web: www.isa.org.jm/en/home;
The Authority is the organization through which States Parties to the Convention shall organize and control activities in the Area, particularly with a view to administering the resources of the Area.

Development Alternatives with Women for a New Era (from Noeline Nabulivou, Development Alternatives with Women for a New Era (DAWN), Fiji)
C/o Women and Gender Institute, Miriam College, Katipunan Road Loyola Heights, QC 1108, Philippines, Telefax: +63 2 434 6440; Email: info@dawnnet.org; Web: www.dawnnet.org;
DAWN has been actively tracking and making interventions/proposals on this issue and wider on climate change, sustainable development and human rights.
Deep Sea Mining Campaign (from Helen Rosenbaum, Deep Sea Mining Campaign, Project of the Ocean Foundation, Australia)
Affiliated with Friends of the Earth, Australia; Web: www.deepseaminingoutofourdepth.org;

The Deep Sea Mining campaign started in response to sea bed exploration in the South Pacific, approximately 1.5 million square kilometers of Pacific Ocean Floor is currently under exploration leasehold.

Recommended Portals and Information Bases

Women’s Major Group on Sustainable Development: Issues, Women Rio20 (from Noelene Nabulivou, Development Alternatives with Women for a New Era (DAWN), Fiji)
Web: www.womenrio20.org/issues.php?PHPSESSID=5708a527c3a9cf150f8b0c97781554f5; Email: info@dawnnet.org; C/o Women and Gender Institute, Miriam College, Katipunan Road Loyola Heights, QC 1108, Philippines, Telefax: +63 2 434 6440;
The link is a portal in the Women’s Major Group Website containing documents on specific issues of sustainable development, paper on extractivism, neo-extractivism, post-extractivism etc

From Hannah Lily, Deep Sea Minerals Project, Applied Geoscience and Technology Division (SOPAC), Secretariat of the Pacific Community, Suva, Fiji

Technical Training: SPC-EU Deep Sea Minerals Project, Suva, Fiji
Web: www.sopac.org/dsm/index.php/technical-training; Email: hannahl@spc.int; Secretariat of the Pacific Community, Private Mail Bag, GPO, Suva, Fiji Islands; Tel: +679 324 9292; Fax: +679 337 0040;
The Pacific Deep Sea Minerals Project has already undertaken a number of activities designed to inform stakeholders about the technical, legal, economic and environmental impacts of deep sea mining.

Resources: SPC-EU Deep Sea Minerals Project
Web: www.sopac.org/dsm/index.php/resources; Email: hannahl@spc.int; Secretariat of the Pacific Community, Private Mail Bag, GPO, Suva, Fiji Islands; Tel: +679 324 9292; Fax: +679 337 0040;
The first workshop (on geology, technology, biology, environmental aspects) includes presentations made by Prof. Chuck Fisher from Penn State University on the different biology associated with each of the three mineral types mentioned in the response.

Responses in Full

Hannah Lily, Deep Sea Minerals Project, Applied Geoscience and Technology Division (SOPAC), Secretariat of the Pacific Community, Suva, Fiji

Dear members,

Greetings from the Secretariat of the Pacific Community-European Union Deep Sea Minerals Project: providing technical assistance to Pacific Island States on seabed mineral issues. You can read more about us here: www.sopac.org/dsm.

In brief we are currently working with a number of Pacific Islands currently to develop draft national seabed mineral policies and laws (including regulatory, environmental management, and fiscal regimes) for consultation; and our next of a series of capacity-building workshop will be
held in Nadi, December 2013 jointly with the Secretariat of the Pacific Regional Environment Programme, on environmental management of seabed mineral activities. We are pleased to have two world-leading deep sea marine biologists to facilitate the event, and will be funding governmental and non-governmental colleagues to attend from across the Pacific region.

Some quick comments from me in response to the question posed – and many thanks to Ms. Nabou for highlighting these important issues.

There are three different types of deep seabed minerals of potential economic interest, and each comes with different types of geology, chemistry, location, associated biology, and proposed extraction technology – so comments about ‘deep sea mining’ can only be generalisations.

No deep seabed mining has ever taken place anywhere in the world, and the technology to extract minerals commercial remains under development. Deep sea environments have hardly been studied (indeed much of what we know, ironically perhaps, is only because of commercial seabed minerals work). So it is difficult to predict impacts without knowing the specific technicalities of the proposed operations, and details of a specific site.

Having said that, scientists apparently predict the direct impacts of seabed mining are likely to be localised to the mining site, due to the high pressure and low current in the deep ocean, which will restrict sediment dispersal. If this is correct, then direct transboundary impacts (i.e. moving from one country’s jurisdiction to another) may be considered unlikely, unless perhaps a mining site is allocated right next to a boundary – and risk of dispute over mineral rights may well pre-empt that. (As you may be aware, many of the Pacific Islands have yet to formally negotiate / declare their boundaries. So this work should also be prioritised before mining licences are issued.) The probability of indirect impacts (e.g. through disruption to a wider ecosystem) bears further investigation.

It is a requirement of international law that any time a specific seabed mining project is proposed there must be a prior environmental impact assessment (EIA) and a permit should only be given where likely impacts are deemed to be acceptable on the basis of independent expert assessment of the EIA report. A recommended template for an EIA report for seabed mining (from one of our workshops) can be found here: www.isa.org.jm/files/documents/EN/Workshops/2011/WG1-EIS.pdf (PDF; Size: 141KB). To date, there has only been one EIA carried out for seabed mining, and this relates to Nautilus’ Minerals Solwara 1 project in the Bismarck Sea, where a mining licence has been granted by Papua New Guinea for seafloor massive sulphide mineral deposits (but mining operations have not commenced, and are on hold). A copy of the EIA report can be found on Nautilus’ website, here: www.cares.nautilusminerals.com/downloads.aspx

An EIA must also involve public consultation. So no seabed mining licences should be given out within a Pacific Island’s waters, without concerned citizens being informed and able to take part in the decision.

Current work on new specialised and robust laws across the region, including a range of measures to ensure oversight, transparency, independent expertise, and public participation combined with capacity building initiatives, and a high level of scrutiny focussed on seabed mineral activities (including from regional campaigns and organisation such as Greenpeace) should all work to uphold appropriately high standards from decision makers and operators in any country who do decide to proceed with seabed mining in the future.

With the work underfoot now by Pacific Island Governments to get regulatory regimes in place, and with the aim to have policies prepared and public debate generated before any mining
occurs (something that unfortunately never occurred for onland mining, fisheries, logging or other extractive endeavours), arguably this /is the precautionary approach in practice. Indeed, seabed mining is one area where the (generally non-legally-binding) precautionary principle has become a binding obligation of international law. The Deep Sea Minerals (DSM) Project has produced an attempt to summarise what we think the precautionary approach means in DSM terms, view here: www.sopac.org/dsm/public/files/resources/Deep_Sea_Minerals_in_the_Pacific_Islands_Region_Brochure_13_Precautionary_Principle.pdf (PDF; Size: 265KB)

Any comments on this would be gratefully received. For this or any questions people may have with regards to our work, I am also happy to correspond directly on hannahl@spc.int

Apologies if this are a little long-winded. But it’s a complex subject and I hope this may be a useful contribution to the debate.

Sele Tagivuni, Ministry of Local Government, Urban Development, Housing and Environment, Suva, Fiji

Dear colleagues,

Many thanks to Hannah for putting this complicated technical issue in perspective right from the start. I thank Pacific Solution Exchange for accepting this query for some discussion.

My take into this is simple. I would really humbly request technical experts in this field to offer their respective inputs. I am not one of those but I am crossing my fingers that we humbly stick to the technical fruitful exchange that this query deserves rather than indulge into our emotions of what can and will (without technical justifications) be the probabilities of trans boundary impacts.

Again, much thanks Hannah for those initial comments to set a technical tone to this dialogue.

Vinesh Prasad, Suva, Fiji

Vinaka Seni,

A very topical issue and a real threat are what you have mentioned here. However, like other natural resources a good feasibility study is needed and also if exploration report suggests healthy reserve than I guess there is no harm in harvesting it sustainably, just like the concept of Sustainable Forest Management in the Forestry Sector.

Dear Lily,

Thank you. I totally agree with you that it is not fair to predict impact on seabed without conducting a detailed study. It is unfortunate that lots of issues are assumed thus creating unneeded alarm.

Akuila Tawake, Deep Sea Minerals Project, Ocean and Islands Programme, Applied Geoscience and Technology Division, Secretariat of the Pacific Community, Suva, Fiji

Dear members,

In addition to Hannah’s excellent contribution I would like to add a few points.

Mining projects, whether terrestrial or marine, usually have longer gestation periods. The Solwara 1 Project in Papua New Guinea has clearly demonstrated this. Back in 1997 the first exploration
license was issued to Nautilus Minerals Inc in the Bismarck Sea. Eventually a mining lease was granted in early 2011 after the company had engaged in mineral research and exploration, capital raising, full Environment Impact Assessment, etc. for 14 years. Mining is expected to commence at Solwara 1 within the next two years.

Apart from the advanced Solwara 1 Project, some countries mostly industrialised countries are pursuing mineral exploration in Areas Beyond National Jurisdiction (ABNJ) and some may commence seabed mining within the next 10 years. Despite increasing interest in deep sea minerals both in national jurisdictions and ABNJ, there is still enormous interest in terrestrial mining. Deep sea mining will contribute to meeting the increasing global demand for metals but it will not replace terrestrial mining.

Most of the known seabed mineral deposits that occur within national jurisdictions of Pacific Island Countries and Territories (PICTs) are merely mineral occurrence and will not be mined as they are. Significant amount of money, technical expertise and time will be required to find additional deposits (if there are any) on the seabed that may change a mineral occurrence to mineral potential.

A number of seabed mineral deposits in PICTs have excellent potential in terms of the quantity of mineralised rock materials and concentration of metals. These include Seafloor Massive Sulphide deposits in Tonga, Solomon Islands and Fiji; Manganese nodules in Cook Islands; and Cobalt-rich Crusts in the Marshall Islands. However, detailed exploration and feasibility study will be required to determine the viability of any mining operation.

For these countries, it’ll take at least 5 years to carry out the necessary detailed exploration works in order to gain adequate geological knowledge and confidence and perhaps proceed to the mining phase. So in the next 5-10 years we’re probably going to see 1 or 2 seabed mining projects (in addition to Solwara 1) emerging within national jurisdictions of PICTs.

The underlying message here is that significant amount of exploratory works need to be carried out in any deep sea minerals project before a decision to mine or not is made. And that demands money, technical expertise and time. So the Pacific Islands region is not going to see 20 deep sea mining operations in the next 20 years but will most likely have 3 – 4 operations in the next two decades.

This usually longer exploration timeline should give enough time for countries with shared boundaries to sort out issues relating to their maritime boundaries. As pointed out by Hannah, unless the seabed mineral deposit is located at the boundary of two countries, the trans-boundary impacts of deep sea mining based on scientific knowledge is considered unlikely.

Paul Roughan, Honiara, Solomon Islands

Dear all,

I have watched this discussion with keen interest. Is there a mechanism for the Secretariat of the Pacific Community-European Union Deep Sea Minerals Project to address particular questions via research and answered with references? Especially if the answer is: there is no information. For instance, the probability of trans-boundary effects would appear to depend on the nature of deep sea (subsurface) currents. I would appreciate a discussion on whether this is the case or not (and why) and then, what the state of current knowledge is about these currents - where, what speed, what depth etc.
One implication of the long lead time mentioned in the foregoing message is that data deficiency may be addressed in 2 decades, so that more informed decisions can be made by regulators.

We do need to focus on improved information, and prioritise what is the most urgent area to be researched.

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**Jan H. Steffen, Marine and Coastal Biodiversity Management in Pacific Island Countries – MACBIO, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Suva, Fiji**

Dear colleagues,

For nongovernment organisations, other civil society members and Government officials involved in or concerned about processes exploring deep sea mineral resources and mining potential in Pacific Island Countries and the adjacent Areas Beyond National Jurisdiction (ABNJ), the Secretariat of the Pacific Community (SPC)-European Union Deep Sea Minerals Project team is a very good contact point to identify existing information, legislation, scientific studies, etc. A wide range of information is indeed also available on the web, for example among the publications and documents available from the International Seabed Authority at [www.isa.org.jm/en/home](http://www.isa.org.jm/en/home).

The upcoming 'Pacific Deep Sea Minerals Assessment' publication, that has been developed in collaboration between SPC–SOPAC (Applied Geoscience Commission and Technology Division) and United Nations Environment Programme (UNEP)–Global Resource Information Database (GRID) Arendal will aim to answer many related environmental, economic and social questions and has been compiled by globally acknowledged experts in fields such as deep sea biology, ecology, geology, mining technology, regulatory and environmental policy, fiscal regimes, etc.

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**Taaniela Kula, Ministry of Lands, Environment, Climate Change & Natural Resources Nuku'alofa, Tonga**

Thank you Seni Nabou of Green Peace Australia Pacific for raising the subject

Dear colleagues,

The aspects that you've raised are critical and therefore important for everyone, especially decision makers to be informed. If you don’t mind, may I respond to your Query as per quote from top to bottom.

"**Trans-boundary Environment Impacts**"

This phrase alone makes it sound like one country will cause Environmental IMPACTS on another country. But what kind of impacts could be imposed?

- **UNCONTROLLED SEDIMENT PLUMES?** - The current understanding is that sediment disturbance at 1000m below sea level, the sediment plumes is likely to settle down in the same depth by applying the stratification behaviour of the water column. Should sediments reach the sea surface and cannot be controlled; this will block the sunlight discouraging photosynthesis in that area for a few hours or days depending on the weather. But if the sediment is transported to another exclusive economic zone (EEZ) in the next 200NM it will discourage photosynthesis in the neighboring state but most likely in a smaller scale then it began with, because they will be sinking back to the seabed.
• **In comparison**, what I would consider an Environmental Impact is when petroleum tankers leak in the middle of ocean. The oil will stay in that area discouraging life for all or will be transported downwind to the nearest shore, and the impacts are devastating.

• I have not heard of mobile deep sea sediments being transported from one country to another or sediments that stays on sea surface for more than a couple of days. However a Tongan seamount gave birth to tons of pumice in year 2006. The pumice was transported by winds >2.800NM to the Great Barrier Reef of Australia within 7 to 8 months. The PUMICE bulked like a raft. By the time it arrived in Australia, "80 species of plants was found on this raft like material, marine life, facilitated marine life distribution, and the raft promoted diversity of biotic recruitment” Scott Bryan ([www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0040583](http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0040583)).

So the points are:

- Deep Seabed Sediment is denser than water and its primary destination is the seafloor. Its suspension time is depended on the condition of the currents but will have minimum effect on the environment. As the text says...“earth to earth, ashes to ashes, dust to dust”

- If Petroleum Tankers are penalized for leaking petroleum! SO WE SHALL PENALISE COMPANIES WHO CAN’T CONTROLL destructive sediments

- Sediments transporting DOES PROMOTE BIODIVERSITY, only if they float long enough.

"Undiscovered & unregulated for biodiversity protection”

- **Undiscovered**: To undertake habitat mapping and Species Identification of the DEEP OCEAN FLOOR will provide a good baseline for monitoring future changes, and identifying sources of change. All Governments will demand it done. But in reality, most Pacific Islands have not mapped and identified the species on their respective islands they inhabit for the obvious reasons, i.e. “No Resources.” The PICs, Tonga for one will be happy to take up any OFFER by ANY ORGANISATION who wishes to perform Biodiversity Surveys in the DEEP OCEAN for FREE.

- **Biodiversity protection**: The Oceans are 70% of the earth’s surface. Undiscovered and untouched it has continued to increase its diversity for hundreds of millions of years before humans came into existence. Highly diverse environment in a large deep inaccessible environment (accessible only by HIGH COST Equipment), certainly can't be threatened by small scale mining of the size of rugby fields with an average depth of 25m. Pacific Islands is more threatened of being extinct than the Deep Ocean Biodiversity. The Deep Ocean will continue to live beyond our human lives and more diverse than humans will ever be. It is no doubt that biodiversity should be protected, but which is more important than the two?

"advances in technology, poses a major threat to our oceans“

• Advances in technology SHOULD MINIMISE THREATS to our oceans. If any technology is proving otherwise, it cannot be referred to as Advances in Technology. PICs shall only pick up Advanced Technologies.

"threat to our oceans, which are already suffering from a number of pressures including overfishing, pollution, and the effects of climate change.”
I wonder who the MAJOR contributors to these existing pressures are. Who eats so much that are depleting the fish of the Pacific? Who is polluting the Ocean? And who is accelerating global warming and climate change? What are these PRESSURE Contributors doing about this? What are they providing to compensate for the impacts of their existing activities on the Small Pacific Island States? Are they doing enough for PIC?

It’s expensive to buy vegetables and fish for a healthy meal due to high cost of FUEL, if only we had money to run SOLAR powered aquaculture, and greenhouses to farming healthy food at a much lower price. It’s expensive to recycle the waste to reduce pollution. It’s expensive to relocate because from vulnerable area to climate change because governments can’t afford to compensate demanded lands. It is loud and that we don’t have the means to resolve the daily hardships with any available resources. It is a necessity that these issues be addressed at the National Level. Deep Sea Mining becomes the only solution for this.

"17 exploration contracts for the seabed that lies beyond the national jurisdiction in deep seas of the Pacific, Atlantic and Indian Oceans, compared with only 8 contracts in 2010."

This number is unlikely to grow exponentially in the coming years. It may well be several exploration contracts but perhaps by are few Company Owners or Investors. This is yet to be a proven profitable sector, meaning NO DEEP SEA MINING HAS COMMENCED yet, so these companies are just booking seats for a space shuttle that might never get to take off. This buys the PICs a few more years to better prepare ourselves. Increase capacities in all the critical aspects of Deep Sea Mining Development to maximize our benefits.

"...rushed processes taken to legitimize and fast-track experimental seabed mining exploration as a development opportunity”...

- "Rushed processes“ in the sense of not understanding clearly of the impacts on the environment first before undertaking mining? ...yes perhaps. But how long did on-land mining operate before it understood the environmental impacts and what have been done to mitigate the impacts on human habitats? – We have observed from many terrestrial mining in the bigger island and continents, and how these activities impacted HUMAN LIVES and its habitats. So Minerals Mining Legislations was thereafter developed and amended as many more disastrous discoveries were experienced. (Disastrous experience is referred to events that were proved to have a negative impact on the human habitable environment.) Therefore the on land mining operations and legislations are now well versed and understood through several centuries at the cost of several thousands of lives and unsung heroes we will never know.

- In comparison of Deep Sea Mining and On-Land Mining, legislations are already developed with the intent to project the Environment and the Human habitats long before any mining will take place. This is a much logical approach then the commencement of on land mining. On land Mining commenced several centuries before a law was even drafted.

- “Experimental” – in the sense when it is done for the first time, it will be experimental. And Experimental will mean that we will know the impacts of deep sea mining when we actually do it. Once the impacts are known, we are in better positions to make amendments to the legal framework, thus better informed to make the right decision.

- “Development opportunity” – the whole phrase is stated to sound like the SMALL PACIFIC ISLAND STATES are greedy for development opportunities? As a government employee it is the responsibility of the Government to exhaust all development opportunities for the benefit of its people.
"...not being firmly guided by the precautionary principle..."

- The EU-SPC-SOPAC Deep Sea Mineral Project has provided the first step of precautionary principle, which is to develop national legal frameworks.
- The second through the same project, is building capacities of the PICS in this sectors.
- The third will be effective monitoring and administration of the exploration and potential mining activities.
- The fourth will be effective amendments of legislations and regulations to address newly discovered issues to maintain balance between the economic developments and environmental degradation costs.
- The fifth shall be to halt activities if demonstrated negative and uncontrolled degradation to the environment exceeds the benefit, until it’s resolved.

Overall, the impacts of sediment disturbance are minimal but should it be carried to another EEZ, it will promote biodiversity. Tonga will welcome any proposal to undertake baseline surveys of the Deep ocean floor by any International Organisation. Otherwise we will have to use the Mining Company Operation to facilitate the required surveys. It is experimental, but it is the nature of the first step. All activities shall be guided by the precautionary approach. PICs are not rushing any process. Legislation is being formulated prior to any seabed mining. On-land mining was operational for many centuries before a mining act was established. And should anyone have the means to provide development opportunity funds, to lower Tonga’s dependent ratio on Foreign Aid, please call me: +(676)25508 (office) / +(676)7719104 (Mobile)

Edward Anderson, School of Maritime Studies, University of the South Pacific, Suva, Fiji

Dear colleagues,

There are at least two separate environmental issues associated with deep sea minerals extraction. These are the near field effects of the mining on deep benthos, and the surface effects, which may affect fisheries. I can say more about the surface effects, which are often ignored.

The central basins of tropical oceans are nutrient starved. SEAWIFS and MODIS images show this. How can tuna and other pelagic fish, which feed at high trophic levels, exist? I believe the presence of the Deep Chlorophyll Maximum (DCM) may hold the answer. Linked is a power point which was presented to the 2013 Pacific Science Inter-congress.

- [www.solutionexchange-un.net/repository/pc/ccd/DCMAbstract-byEAnderson&KUrata.pdf](http://www.solutionexchange-un.net/repository/pc/ccd/DCMAbstract-byEAnderson&KUrata.pdf) (PDF; Size: 302KB)

The explanation, contained in the presentation is that the deep chlorophyll maximum, which exists at about 90m to 150m, indicates high phytoplankton. The DCM is the base of a trophic web leading up to zooplankton, small fish and squids. Tuna and other large predators are known to feed at these depths.

Noelene Nabulivou, DAWN, Fiji

Hello everyone,
DAWN (Development Alternatives with Women for a New Era) along with many other allies in the region have been actively tracking and making interventions/proposals on this issue and wider on climate change, sustainable development and human rights for quite a while now.

As many of you are aware DAWN and the Women's Major Group (500 of the key women's organisations and social movements in every region of the world) have put out many statements, position papers and research into the Rio+20, Sustainable Development Goals, Open Working Groups and Post 2015 Development Agenda global processes including on extractive industries including Deep Sea and other mining, etc.

While I am not going to reply directly to other emails in this chain, I would like to contribute some input for consideration, and one resource:

1. There was a request in the chain of conversation that this not be an 'emotional discussion' but rather a 'technical one'. As we have said all along as civil society and particularly in the global South, there are no such things as a-political discussions in development. Everything in development involves structural and societal power, geopolitics, the political economy, and we need to consider who/why/how decisions take place, and consider informal and formal politics, changing broader social, economic and environmental conditions, etc.

So therefore, the inference that a discussion about any development issue, extractive industries included, must be free of human emotions - especially when this is about the health of the global commons, the livelihood of our Pacific and other peoples, and especially when we have seen too many examples of land and sea based pollution and extractivism, such calls for 'technical solutions are false arguments, worse they are dangerous. This issue of localised and trans-boundary issues is a critical issue PRECISELY BECAUSE it has impacts on lives all over the world, including in the Pacific.

The people of Madang for example, have been very clear and unequivocal in their resistance to the Nautilus mines mentioned by Hannah Harborrow, as have so many other Indigenous communities around the world. It is also the case that now, months and years after assurances that there was no long-term and dangerous oceanic pollution from the Fukushima disaster, research is showing exactly the opposite.

2. For anyone who would like to better connect with wider discussions of inter-linkages between gender, social, economic and ecological justice (including attention to climate change and ocean acidification) -and including a specific chapter on extractivism (authored by me), please go to this website of the Women's Major Group on Sustainable Development:

On specific issues of sustainable development go to: www.womenrio20.org/issues.php?PHPSESSID=5708a527c3a9cf150f8b0c97781554f5
Please note - the Extractives chapter under 'Issues' is an earlier draft; for the final version of my paper on extractivism, neo-extractivism and post-extractivism, please go to: www.womenrio20.org/docs/Womens_priorities_SDG.pdf (PDF; Size: 696MB)

The publications (free for use with full acknowledgements) are in English, French and Spanish.

For the 13 Chapter publication on, 'Gender Equality, Women’s Rights and Women’s Priorities: for the proposed Sustainable Development Goals (SDGs) and the Post- 2015 Development Agenda' please go to: www.womenrio20.org/policy_statements.php
Note: There are also 8 page and 2 page versions of summary policy recommendations for policy makers and state delegations at the General Assembly, Conference of Parties, and Open Working Group sessions.

3. I would also direct you to DAWN's critique of the High Level Expert Panel Report on the Post 2015 Development Agenda, 'From People's Rights to Corporate Privilege: A South Feminist Critique of The HLP Report on Post 2015 Development Agenda' as it raises some key related issues about rights and commodification of nature, about how corporate and state decisions to mine are often actively and falsely posited as being of higher consideration than the rights of citizens and communities to 'keep the oil in the soil' or in this case, rare minerals and such; The paper can be found at: www.dawnnet.org/advocacy-appeals.php?id=306

Thanks for the opportunity to share resources on this critical and urgent issue for all communities, the Pacific, and the planet.

(DAWN is the Organising Partner (South) of the Women's Major Group (WMG) on Sustainable Development, www.dawnnet.org; more information on WMG at the website)

Save Waqainabete, WENNA Consultants Partners, Suva, Fiji

Dear colleagues,

I’m heavily involved in the Tuna Industry in Fiji more so on the commercial sector and exploring opportunities to maximize its benefit to the Pacific people in this USD3 billion dollar industry.

I am interested to know more from my colleague Edward Anderson and others on this discussion. What interests me is the issue of tuna in particular. I am a tuna industry stalwart in Fiji and in the last decade illegal, unreported and unregulated fishing has been the major threat to the tuna stocks besides the usual call of overfishing from the licensed fishers. My question to colleagues, will such mining activity affect the tunas? Fiji just considered the Koreans for its intent for deep sea mining. I know Tonga has done the same.

Helen Rosenbaum, Deep Sea Mining Campaign, Project of the Ocean Foundation, Australia

Greetings all,

We thank Solution Exchange for the invitation to participate in this discussion and to Seni for raising the question. I work with the Deep Sea Mining Campaign. We are based in Australia and collaborate with concerned individuals and Nongovernment Organisations in the Pacific and elsewhere in the world.

Deep Sea Mining (DSM) is an unprecedented form of mining. There is great uncertainty about the impacts of any single DSM operation let alone the cumulative impacts of the many deep sea mines that seem likely for the Pacific region. Over 1.5 million square kilometers of Pacific Ocean Floor is currently under exploration leasehold to private and national government companies within both territorial and international waters. Even if only a small proportion of this area is mined, we can anticipate a significant number of DSM operations.
Canadian company Nautilus Minerals Inc. has already been granted a 20 year licence to operate a deep sea mine in the Bismarck Sea in PNG. The basis on which this licence was granted was an environmental impact statement containing many errors and omissions. Our report, Out of our Depth: Mining the Ocean Floor in PNG, highlights significant gaps in the EIS and the many risks that have not yet been properly assessed (www.deepseaminingoutofourdepth.org/report).

Amongst these are the impacts of sediment plumes and of the heavy metals they may contain. The risk here is not only due to the direct physical impact of sediment but to the possibility that metals may bio-accumulate through the food chain to toxic levels.

In order to assess the level of risk that human and ecological communities will face from DSM operations, it is essential to know the oceanographic characteristics of any particular site and the properties of the metals that will be dispersed there. Of particular concern is whether upwelling and currents could carry pollutants up out of the deep sea or from spills and leakages from DSM vessels and equipment into marine food chains. In addition, we know virtually nothing about the chemical forms of the metals that will be released by DSM operations and the extent to which they will find their way into marine species and the seafood eaten by local communities. Risk assessments must also factor in migratory fish stocks, such as tuna that move vast distances through the Pacific and of course are consumed by humans and other predators.

Because of the importance of oceanographic characteristics in determining impact, the DSM campaign commissioned an independent review of the oceanographic aspects of the Nautilus Solwara 1 EIS by internationally recognised oceanographer, Dr. John Luick (www.deepseaminingoutofourdepth.org/report). Worryingly this review shows that there are upwellings and currents that could indeed bring communities in New Ireland Province into contact with sediment plumes. We invite you to take a look at this report. Neither Nautilus nor the consultants who conducted the Environment Impact Assessment have disputed the scientific basis of the review.

The ocean is a continuous medium. The extent to which metals may exert a toxic effect will be determined by factors influencing concentrations and bio-availability such as distance between DSM operations, currents and upwellings, temperatures and salinity etc.

An important question to ponder is how the cumulative impact of several/many mines will be tracked and what mechanisms will be put in place to ensure that the cumulative effect is factored into decisions about any new mines. It will be especially complicated if licences are issued by different governments.

Last week the Republic of Namibia in south West Africa announced a moratorium on sea bed mining while scientific studies into impacts are conducted. The Namibian Minister of Fisheries and Marine Resources, the Hon. Bernhard Esaú, stressed that “seabed mining cannot happen if there is not solid proof that it will not have negative impacts on the environment”. (Further information on this can be found at our web site.)

Perhaps this sends a salient message to our region. Already, questions have been raised in New Zealand about the need for a moratorium on seabed mining there (see www.scoop.co.nz/stories/PO1309/S00258/moratorium-on-deep-sea-phosphate-mining.htm). And as some of you will know, the Northern Territory Government in Australia after hearing from local communities announced a total ban on seabed mining around Groote Eylandt in the Gulf of Carpentaria.

We look forward to reading the thoughts of others on this subject. We also invite you subscribe to our bi-monthly newsletter via our web site for a round-up of DSM news.
Is Deep Sea Mining A Good Idea?

Deep sea mining is coming, even as the debate over its economic, political, and environmental consequences rages on. 911metallurgist (a mining consultancy) and graphic design firm Neomam Studios recently put together a graphic explaining both sides of the issue. Deep sea mining is a particularly difficult environmental issue because the consequences are so nebulous.

When a timber company cuts down a forest, the repercussions are relatively clear: less habitat for other dependent species, less oxygen production, less carbon uptake, etc. But forests are well-studied, seeing as they're conveniently positioned on the Earth's surface; deep sea habitats are ecological black holes and it’s unclear exactly what we would be sacrificing by changing the system.

Is it worth it to compromise an unseen environment we’re not familiar with, or should we stick with the Devil we know? After all, modern civilization demands resources from somewhere...

So take a look and see what you think – www.911metallurgist.com/ocean-floor-mining, is deep sea mining worth the risk?

Web-link: www.wired.com/wiredscience/2013/06/is-deep-sea-mining-a-good-idea/

John Luick, Austides Consulting, Adelaide, Australia

Dear Members,

I am a physical oceanographer, which basically means this is not my expertise. Nevertheless, having been involved in the response to the Nautilus Environment Impact Statement, I have made a few observations which I am happy to share. First I will respond to a few comments in the posts.

I can verify Edward Anderson's point concerning the Deep Chlorophyll Maximum (DCM). This is a useful fact to be aware of in this context.

Akuila Tawake provides an important "context" in describing the long time scales involved and the likely maximum of 3 to 4 projects in the next two decades.

Hannah Lily gives a brief but balanced introduction to the topic. I wish that she had specified the "three different types of seabed minerals of potential economic interest" as I had not seen that stated before. But the point that there are different sorts of seabed mineral extraction, and as such one should be wary of generalisation, are quite correct, and well-taken.

I am basically in favor of extractive industries like mining if it can be done in a safe manner with strict limits of damage to the environment and major penalties for breaches. There are many mines around the world operating in such a manner. However, deep sea mining causes me some serious concerns.

My first concern involves the mining of deep sea vents. These are relatively small colonies of extremely unique species that evolved separately to life at the surface of earth. They depend on the heat of the earth for their primary energy source. I feel that once mining companies start
being allowed to mine them, it won't be long before they are all gone. I don't think these systems should be mined under any circumstances.

My second concern arises when de-watered mine material is being transferred from a mother ship to a barge in the open ocean, or from a barge to land at the harbor. I think it is almost inevitable that spills will occur, which can be quite large and contain substances which should not be introduced into the surface marine ecosystem. This is particularly problematic when the spill occurs within a few dozen kilometers of land as surface currents can rapidly sweep a dissolved fraction of the material to shore and potentially into the food supply.

My third concern is that in my experience, in some countries, the whole Environment Impact Assessment (EIA) process is a sham. They invariably contain high-sounding, hand-on-heart expressions of deep concern for the environment and the welfare of the local people are forgotten the minute the company is granted a license. Then the government fails to enforce whatever feeble conditions they have put in the EIA. The mining company just does whatever it likes.

Hannah Lily, Deep Sea Minerals Project, Applied Geoscience and Technology Division (SOPAC), Secretariat of the Pacific Community, Suva, Fiji

Dear members,

I read with interest John Luick’s clear and helpful response and I noted his comment with regards to my previous post, that I had referred to ‘three different types of seabed minerals’, but had not elaborated.

I am pleased to provide, by way of brief explanation, the following text, which is an excerpt from the Deep Sea Mining (DSM) Project’s Pacific Regional Legislative and Regulatory Framework for Deep Sea Mineral Exploration and Exploitation (the RLRF). The RLRF is a comprehensive multi-stakeholder document, published by the DSM Project last year, which I would recommend to any members interested in further reading on seabed mineral governance issues. The RLRF can be found here: www.sopac.org/dsm/index.php/resources, along with DSM Project information brochures containing further information on deep sea geology and other topics.

More in-depth materials from the regional technical training workshops we have held can also be accessed here: www.sopac.org/dsm/index.php/technical-training. The first workshop (on geology, technology, biology, environmental aspects) includes presentations made by Prof. Chuck Fisher from Penn State University on the different biology associated with each of the three mineral types. We hope these are useful for anyone wishing to read more around the subject.

[Excerpt from RLRF, chapter 2, page 3-4]

"DSM is minerals that occur in the deeper-water parts of the ocean, deposited on the surface of the seabed or within the sub-soil by natural processes. Deeper-water parts of the ocean are generally considered as areas below the photic zone, deeper than 400 meters, beyond reefs and traditional fishing grounds, where hydrostatic pressures require specialist equipment. Three major deposits, identified to have potential for future development, are considered here: (1) Seafloor Massive Sulphides (SMS); (2) Ferromanganese Nodules; and (3) Ferromanganese Cobalt-rich Crusts. These seabed mineral deposits are composed predominantly of metals. The rare-earth elements (REEs) have recently been added to the list of possible target metals contained within some DSM deposits, owing to recent coverage of reports of potentially rich REE resources in the Pacific Ocean, coupled with increasing global demand for these elements.
Seafloor Massive Sulphide (SMS) deposits are formed by processes that occur around and beneath active hydrothermal vents. The deposits are formed by tectonic plate movements including volcanic activity and faulting that cause fracturing of the seafloor. Seawater that infiltrates the cracks in the earth’s crust is heated from an underlying heat source (the magma) and returns to the seabed through a vent, at a very high temperature, mixing with cold seawater at the bottom of the ocean, and depositing minerals that are rich in metals. Active seabed hydrothermal vents ejecting mineral-rich black fluids that have accumulated deep beneath the seabed are also known as “black smokers” (or those ejecting sulphate-rich white fluids: “white smokers”). Hydrothermal vents give rise to interesting benthic biological communities, with high biomass and endemism (and this biology also gives rise to interest from the pharmaceutical industry). In some places, the vents are inactive, leaving cold SMS deposits on the seafloor, where they start to oxidise. SMS deposits are found predominantly in water depths ranging from 1,000 to 5,000 meters. The target metallic minerals for SMS deposits are copper, gold, silver and zinc. It is most likely that inactive vents only would be targeted for mining.

Ferromanganese nodules are metal-oxide rock materials that occur on the seafloor. These are predominantly found, often with a wide distribution, in ocean basins at 4,500 – 6,500 meters deep on abyssal plains, where sedimentation rates are low. Nodules are characterized by concentric millimeter-scale layers that grow in aggregate from <1 to >5 centimeters in diameter around a core (a rock fragment, shell or shark tooth). The growth rates are very slow at only millimeters per million years. Target economic minerals in nodules are nickel, copper, manganese, molybdenum, lithium, rare-earth elements and possibly cobalt.

Cobalt-rich crusts are found predominantly on the flanks of submerged volcanic islands and on submarine ridges and seamounts throughout the world’s oceans at 400 – 4,000 meters depths. Cobalt-rich crusts form at the rate of 1 – 6 millimeters per million years. Crust-bearing seamounts can be huge – some as large as mountain ranges on land. The target economic minerals for these crusts are cobalt, nickel, manganese, tellurium, rare earth elements, niobium and possibly platinum. Only a few of the estimated 50,000 seamounts that occur in the Pacific have been mapped and sampled in detail.”

Jeffrey Marlow, Geological and Planetary Sciences, California Institute of Technology USA

Dear colleagues,

Deep-sea mining is poised as a major growth industry over the next decade, as large developing-world populations drive consumer demand for metal-containing products, climate change makes previously inaccessible regions like the Arctic Ocean seabed attainable, and improved extraction technologies turn previously uneconomical rock into pay dirt.

Cindy Van Dover is a Professor of Biological Oceanography at Duke University and a leading voice in the development of policy and management strategies for deep-sea extraction activities. Van Dover has studied the ecology of hydrothermal vents for years, and she takes a measured, pragmatic approach to the coming industrialization of her study sites. If mining is going to happen – an event that the more strident faction of the environmental movement will no doubt contest – “we need to work with industry to make sure we do it right,” says Van Dover.

One place for scientists to take an active role is in communicating the full value of deep-sea communities. “Because it is out of sight and outside the daily experience of most people,” explains Van Dover, “it is hard for the general public to value the deep-sea environment. Getting
more and better numbers on the goods and services provided by deep-sea ecosystems could really be useful.”

Indeed, if done properly, the industrialization of the deep-sea could actually be a boon to science. Responsible use of these resources – and to be clear, our metals must come from somewhere – would require that we understand the full ecological impact on hydrothermally derived systems. Characterization expeditions in advance of mining operations could vastly expand our knowledge of certain applied parameters such as mineral deposition rates and “how to maintain critical population levels to ensure the survival of species that naturally occur in a region,” as Van Dover puts it.

Until the legal framework of mining in international waters catches up to the ready-to-dig reality, cooperative participation from scientists may be the best way to preserve the most fragile, irreplaceable aspects of deep-sea ecosystems.

Recent developments have highlighted the rapidly moving nature of this expanding frontier, and all parties – scientists, miners, and conservationists – will need to keep up. “Deep-sea conservation is something I never thought I’d have to deal with in my career,” admits Van Dover. “I assumed human activities and impacts in the deep sea were decades, if not centuries into the future.”

Samasoni Sauni, Honiara, Solomon Islands

Bula colleagues,

A tricky subject area and of course a balanced approach is paramount considering key pillars of conservation and development amongst others, of sustainable development.

That said, I can only point to other examples of major anthropogenic undertakings to exploit natural resources in the marine environment such as offshore oil rigs/drilling, deep sea dredging and others to name a few. The magnitude, severity, and historical background of these undertakings offer practical comparative examples and scenarios with respect to impacts on fisheries (ecological, biological, social, economic and political).

As scientists trials and experimental expeditions are needed in order to collect and analyse datasets required to answer certain questions. The scientific advice to emerge will undoubtedly help inform policy decisions. There is also the precautionary, ecosystem and related principles that we need to be mindful of with respect to the approach taken for such major developments. As policy makers we need to take in all the available information in our decision making to make informed decisions.

The Pacific Ocean is a large area of open waters and mixing/movement in the water column is relatively pronounced let alone complicated processes of geophysical fluid dynamic.

Will deep sea mining have an impact on fisheries, yes if the conditions around point source is not able to control the dispersion and dilution of particles and other pollutants emerging from the activity itself thereby causing direct or indirect impacts on the food web (and fish) specific to immediate areas around the activity. However, we can equally say there will be no impact if the reverse happens.
Pacific Island Countries have for far too long been relatively living below or around the United Nations poverty line index and therefore sustainable development that focuses on non-renewable (deep seabed minerals) and renewable (fish) resources are, in my view, possible to cushion that gap. Back to your original reference that “balanced approach” is very much needed, which I agree and we should not shy away from being upfront to say no when it is detrimental to both ecosystem and livelihood of our people (economy), or say yes when there is chance to address the multi but competing high level objectives of our Pacific Island societies via maximum economic returns, sustainable resources, avoid environmental/ecosystem damages, improve livelihoods etc.

These are my initial thoughts.

Viliame Kaiyabia, Kadavu Provincial Office, Kadavu, Fiji

Bula vinaka colleagues,

This subject is not new as some of the explorations made in Fiji in the past don't seem to go through due to cost consequences on the part of international companies. What needs to be done is a full assessment and not only an environmental assessment as the member from DAWN had alluded to earlier.

I feel that we need to tread very carefully as there are grave consequences on the impact it will have on marine resources. Whatever is done on land will eventually settle on the sea bed and conversely whatever threat is done on the seabed will also impact on land resources. Globalization, whether economic or technological has its negative consequences as well and we seem to be only been fed with positive impacts.

Veikila Vuki, Oceania Environment Consultants, Guam

Dear members,

I have read with interest the discussions on deep sea mining. I would like to include some of my thoughts.

There are more interests now on seabed mining because of the increase in global demand for metals and limited global resources. Deep sea mining is therefore man's new frontier.

There are more positive aspects of the new interest in deep sea mining for the Pacific in my mind. Some Pacific countries have developed or are now developing their capacity for environmental protection, legislation and policies for deep sea mining (DSM).

The Applied Geoscience and Technology Division (SOPAC) of the Secretariat of the Pacific Community have also worked hard to conduct workshops on deep sea mining awareness in the Pacific Island countries in the past years. The DSM legislation for the Pacific Region was also developed by SOPAC in consultations with the countries. The United Nations Environment Programme and SOPAC have undertaken extensive research, data compilation, reviews and analyses of research cruises and literature from the Pacific.

At the same time, we have also seen environmentalist groups, nongovernmental organizations, and various groups work extremely hard to bring the environmental issues concerning deep sea mining to the limelight.

For example, the "ACT NOW", a local nongovernmental advocacy group in Papua New Guinea
(PNG) launched an email petition targeting Pacific Island governments to a "Stop Experimental Seabed Mining in the Pacific" Campaign. The Pacific Council of Churches has also spoken out against deep sea mining in the Pacific. Women's groups and other nongovernment organizations have actively campaigned against making decisions on deep sea mining without consultations with relevant stakeholders.

As we continue with the discussion, I think there is an urgent need for Pacific Island countries to build its capacity on deep sea research. The University of the South Pacific (USP), the Pacific Island countries regional university should establish a deep sea research center to train Pacific Islanders. It can also lead to deep sea research in the region with the help of other nations. The Koyo Maru Cruises conducted jointly by USP and the Japanese Government in the past years provided a glimpse of what can be done without incurring much cost to the University. The study undertaken by Ed Anderson was from one of those cruises.

The Pacific will also have to decide whether we will have to focus on conservation or extracting activities, whether extracting forest products, or extracting minerals from the deep. Many Pacific countries are signatories to the Convention on Biological Diversity and have an obligation under this convention to protect the deep sea marine biodiversity. A special protection should be done for biologically sensitive areas such as the hydrothermal vents. While some of the Pacific Island countries are engaged in the Coral Triangle, where there is high biodiversity of corals, we also need to understand that all ecosystems are linked. We continue to destroy our coral reefs because of our inability to control and manage land activities effectively. How then can we manage the deep sea mining effectively? Should we have a moratorium on deep sea mining for the countries within the Coral Triangle?

We have an obligation to the future generations and to the local people in the Pacific Island countries to protect our natural resources. The projected benefits of deep sea mining far outweigh the level of risk to the marine environment. The PNG government’s estimated taxes and royalties from the Solwara I project is about US$41 million. Should we then place more emphasis on the protection of our marine biodiversity within the Coral Triangle region instead of focusing on the deep sea mining?

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**Tapulolou Tuailemafua, European Union (EU) Global Climate Change Alliance Project University of the South Pacific, Apia, Samoa**

Talofa from Samoa,

My name is Tapulolou (Tapu) Siuli Tuailemafua and I am presently coordinating the University of the South Pacific (USP) European Union (EU) Global Climate Change Alliance Project in Samoa. There are about 15 of us around the Pacific.

*Is Deep Sea Mining a Good and Great Idea?*

I am a science student and have great respect for the environment and its conservation whether it is the sea (oceans) or land (terrestrial). We cherish where we live, a place we call home by taking care of it like great custodians of the planet; a planet that exists to give life to all its inhabitants and with it everything is considered balance.

I believe all governments in the Pacific should look at this and provide a collective voice to the world arena and provide studies and research looking at the pros and cons of the issue, and the repercussions this might have on the fish and sea food that Pacific Island people depend daily.
NASA has discovered a plethora of mineral ores and more metal on Mars. It is time to concentrate mining from above us instead of ruining our planet and then trying to save it. We need world leaders with great visions and love. We need leaders committed to saving the planet.

I suggest the University of the South Pacific be involved in a feasibility study covering all the Pacific Islands. Questions to be asked could be:

Is this worth the risk?
What positives are there for all Pacific Island Countries?
What are the negativities?
Are there any long term problems once these are conducted on our Pacific waters?
What does everyone in the Pacific communities think about this development that will affect their lives in the long run?

Asking every Pacific Government to hold on and be strong and not yet give the green light to the deep sea mining ventures. They must have reports to ensure they are not signing a death warrant for the people and marine species dependent on these deep sea minerals.

While it is important to provide resources for the world as some places are depleting, I support the conservation of ocean beds. We have no idea about the significant links between life forms in that environment which we should respect. It may even be the very place left that is giving us ‘balance’.

We have no idea how the bottom of the sea and all its life forms are connected to all life forms on land and vice versa. We definitely need more studies.

William Aalbersberg, Institute of Applied Science, University of the South Pacific, Suva, Fiji

Hello,

Your passion and interest are to be admired Tapulolou. As you know different regional agencies are responsible for different aspects of issues in the Pacific and the deep-sea mining one has been handled by SOPAC i.e. the Applied Geoscience and Technology Division now part of the Secretariat of the Pacific Community. They have published a number of position papers on the topic and, if there is need for added research, the protocol is that the country members should request this through the annual SOPAC work planning meeting.

Should there be appropriate expertise at the University of the South Pacific (USP) then I am sure USP would be willing to assist SOPAC if asked. Given where the work is done actual research of effects would be incredibly expensive; to my mind the best that can be done is (like the Intergovernmental Panel for Climate Change) to get a synthesis of the best existing research in this topic and pass it on to regional and national decision makers. This is a very important topic and I imagine international groups like the International Union for Conservation of Nature (IUCN) and the World Wild Fund (WWF) and World Resources Institute (WRI) may have done this kind of summary.

Akuila Yabaki, Suva, Fiji

Bula Veikila et al,

As a response to your article I think lawyers should be made aware of their responsibility as regards to extractive industries. The Citizens’ Constitutional Forum Analysis of the current Fiji
2013 Constitution shows that Government can make a case for out of ‘necessity' for mining to proceed without consulting customary landowners.

Esiteri Kamikamica, Lami, Fiji

Dear Veikila et al,

Thank you for an interesting discussion on deep sea mining. Your suggestion Veikila to have a research center on the subject is good. I feel that once we disturb the sea bed through deep sea mining activities we will upset the ecosystem and may not be able to control the damaged caused.

I am aware that companies are now exploring the sea bed mining in Bligh Waters and feel that once they are permitted to mine the effect of the activities it will damage our marine life particularly the coastal areas of Vanualevu and Viti Levu and the groups of islands nearby.

Hannah Lily, Deep Sea Minerals Project, Applied Geoscience and Technology Division - Secretariat of the Pacific Community, Suva, Fiji

Dear Colleagues,

Please be advised of the following new publications by the Deep Sea Minerals (DSM) Project – and many thanks to those of you who have contributed to these or feature in them.

- **Prospect (2)** –the September 2013 issue of the DSM Project Newsletter
  Available here: www.sopac.org/dsm/public/files/DSMP%20Newsletter%20The%20Prospect%20Issue%202%20September%202013.pdf (PDF; Size 5.73MB)

- **Information Brochure 14: Public Participation in Deep Sea Minerals Decision-Making**

- **Information Brochure 15: The International Seabed Authority**

- **The DSM Project 2013 Mid-Year Progress Report**

Hard copies are available upon request, and will also be distributed by the DSM Project at the SOPAC (Applied Geoscience and Technology Division) Annual Meeting 2013, next week in Rarotonga.

Finally, although the official launch will take place later this year, we are delighted to now be able to offer a sneak preview of the first volume of the Deep Sea Minerals Assessment Report compiled by the United Nations Environment Programme Grid-Arendal and the DSM Project, working with a network of some 60 of the world’s best experts. At the following link you will find a pre-publication copy of:
These chapters examine the geology and associated biology of the three principal deep sea mineral deposit types found in the Pacific Region. They also look at the environmental and technical aspects related to deep sea mineral extraction. Volume 2 “Deep Sea Minerals and the Green Economy” (to follow soon) looks at the socio economic, legal and fiscal aspects of the emerging deep sea minerals industry. It provides a green economy context for examining how deep sea mining could be profitable, sustainable and meet the needs of Pacific Island people without sacrificing cultural heritage, community values or the health of ocean ecosystems.

Ferdinand Strobel, United Nations Development Programme Pacific Centre, Suva, Fiji

Hi ccd-pc-seers,

The excerpt below just came in the news today:

**Nautilus’ PNG marine mining project to proceed after arbitration decision**

TORONTO, 04 OCTOBER 2013 (MINING WEEKLY) --- Nautilus Minerals, which proposes to mine copper and gold at the Solwara 1 deep-sea mining project in Papua New Guinea (PNG) territorial waters, on Thursday said an international arbitrator had ruled in its favour, and compelled the PNG government to keep to its end of a joint-venture agreement. Former Chief Justice of the High Court of Australia, Murray Gleeson, declared that PNG was in breach of the state equity option agreement, which the parties signed in March 2011, in failing to buy a 30% interest in the project on November 7, 2011. Gleeson compelled the State to comply with its obligations under the agreement to buy the 30% interest in the project and pay its share of all project expenditure incurred to date within a reasonable time. Nautilus said it expected a payment of about $118 million, and that it had issued the State with a notice requiring the transaction to be complete by October 23.

Although I do not know the details of the case and this particular one may well be not related at all; I cannot help think about the increasing trend faced by mineral rich developing countries being sued by big corporations. This is rendered possible by the growing web on trade and investment agreements that contain what many think are skewed provisions that give the rights to corporations to take legal action when public policies (be it health or environmental) affects their profits. Not only actual profits but what they could have potentially earned from these investments over decades. Arbitrations are done by three judges of a World Bank-based court the ICSID. This trend is increasingly well documented.

UNCTAD (the Trade Development arm of the United Nations) recognizes that “the settlement of disputes between investors and the States in which they operate have been increasingly used in recent years”. This is in fact an understatement. It is an explosion they are talking about; from a handful of cases in the 1990s to over 500 today. UNCTAD noted that in 70% of the cases, investors’ claims were accepted and last year the highest such compensation in history was awarded to Occidental, in the case *Occidental vs. Ecuador* – a case arising out of a unilateral termination by the State of Ecuador of an oil contract. That is a hefty compensation and US$ 1.77 billion of public Ecuadorian money that does not go to the development of Ecuador, one of the poorest Latin American countries. For those interested in this subject I recommend the aptly named report by the Democracy Center: *“Unfair, Unsustainable and Under the Radar”*. Sustainable development inevitably clashes with the interests of big corporations, especially those involved in ‘extractive industries’. Oceans are being raped and trashed senseless from overfishing
to oil drilling, atomic bomb testing to heavy metal dumping. The ocean floor is the last frontier (on earth), they are going for it, and there is no reason to believe that seabed mining will be any different. While we are being distracted by the technicalities of scientific imperatives and arbitration courts and pay lip services to ‘green economy’ we may well miss the creeping shift of power and governance from public to private. What has happened to the precautionary principle?

Esiteri Kamikamica, Lami, Fiji

Thank you for your email Tapulolou.

Personally as a social scientist and interested in preserving our environment I believe we should not do deep sea mining even without researching. Any research conducted should be directed at discovering the resources present and collecting information for development purposes. I agree with you that all Pacific Islands should stop any deep sea mining. Perhaps a petition be organised and I would be interested in putting together an awareness program aimed at stopping deep sea mining altogether because of the damage it will cause as mentioned in your email.

Many thanks to all who contributed to this query!

If you have further information to share on this topic, please send it to Solution Exchange for the Climate Change and Development Community in the Pacific at ccd-pc@solutionexchange-un.net with the subject heading "Re: [ccd-pc-se] QUERY: Trans-boundary Environmental Impacts of Deep Sea Mining. Additional Reply."

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