

Deep Sea Mining: Environmental, Legal and Technical Challenges for Developing Countries

Sensitization Seminar 7, Mexico, 2013

Sensitization seminars are organized by the International Seabed Authority (ISA) in partnership with the hosting country and experts from various scientific and legal institutions associated with the 1982 UN Convention on the Law of the Sea (the Convention). In November 10-11, 2013, a sensitization seminar entitled “Deep Sea Mining Opportunities for Mexico on International Waters”, was carried out in Mexico City and organized by the Ministry of Foreign Affairs and the ISA. This was the seventh in a series of seminars convened by the Authority, and the second to be held in Latin America. Previous seminars were held in Indonesia, Brazil, Nigeria, Spain, Jamaica and three in New York in 2012, 2013 and 2014.

In his opening address, the Secretary of the Mexican Foreign Affairs Ministry, Dr. José Meade, stated that sustainable deep sea mining activity should include clear legal framework, sustainable technology and the participation of the private and public sector under strong governance. Dr. Meade added that the exploitation of such resources must be done with respect for the environment in a rational and sustainable manner. Dr. Idelfonso Guajardo Villareal, Secretary-General of the Ministry of Economy of Mexico, in his statement, declared that from 2014-2050 the world’s demand for minerals will be the highest yet observed. He mentioned that the Clarion-Clipperton Zone (CCZ), which extends from Mexico to Hawaii, could account for more than 27 million metric tons of mineral resources, such as, nickel (Ni), cobalt (Co), manganese (Mn) and copper (Cu).

The Secretary-General of ISA, Mr. Nii A. Odunton (*Figure 1*), also addressed the seminar corroborating the fact that such reserves exist, but that they should be exploited under the rules and regulations of the ISA to ensure that undeveloped countries would have fair participation of these natural resources that are the common heritage of mankind. In the same line of thought, Dr. José Narro Robles, President of Universidad Nacional Autónoma de México (UNAM), echoed the statement made by Mr. Meade, by offering its academic platform (scientific and technological capabilities of Mexico) to the Mexican authorities and the private sector to work towards a sound programme of exploration and exploitation of deep sea habitats.



Figure 1: (Top L-R): Mr. J. Rebolledo, Mining Consortium Group of Mexico; Dr. José Narro Robles, President of Universidad Autónoma de México; Mr. Nii. A. Odunton, Secretary-General, ISA; Dr. José A. Meade Kuribreña, Secretary of the Mexican Foreign Affairs Ministry; and Dr. Idelfonso Guajardo Villareal, Secretary of Economy of Mexico. (Bottom) Seminar Participants.

REGULATORY REGIME FOR DEEP SEA MINING IN THE AREA

The legal and administrative framework under which the ISA relates to member States and contractors was presented by the Deputy to the Secretary General, Mr. Michael Lodge.

In his presentation, he explained the structure and functions of ISA as well as the historical evolution of ISA contracts at the CCZ (Figure 2) and the licences given in the Area for cobalt-enriched crusts and massive polymetallic sulphides. To date, regulatory frameworks exist for exploration and prospecting for polymetallic nodules, massive sulphide deposits and cobalt-rich crusts.

The UN Division for Ocean Affairs and the Law of the Sea (DOALOS) presented the scope of the UNCLOS and its institutional bodies: ISA, Jamaica; International Tribunal for the Law of the Sea (ITLOS), Germany; and the Commission on the Limits of the Continental Shelf (CLCS) in the United States of America. Mr. Luigi Santosuoso explained the different roles of each of these institutions.

Mr. Galo Carrera, of CLCS, described the role of CLCS in relation to the implementation of the extended limits of the continental shelf for member States with coastal areas around the world. He mentioned that a total of 67 submissions for extended limits of continental shelf had been received and that a considerable number of new applications were expected. The total area of high seas is about 200.4 millions km², (http://www.gc.noaa.gov/gcil_maritime.html#seas) (Figure 3). This area will decrease after all the applications for the extended limits of continental shelf are granted to member States.

DEEP SEA NATURAL RESOURCES: MINERALS

The environmental aspect of the work of the ISA was presented by the Authority's Head of Office of Resources and Environmental Monitoring, Dr. Sandor Mulsow. He explained the importance of the parallel advances in technologies for exploitation and in the acquisition of valuable environmental data to understand ecological functions as well as biodiversity assessments.

Figure 3: The Area is shaded in dark blue. Light blue represents the EEZ and the light brown represents applications to the CLCS.

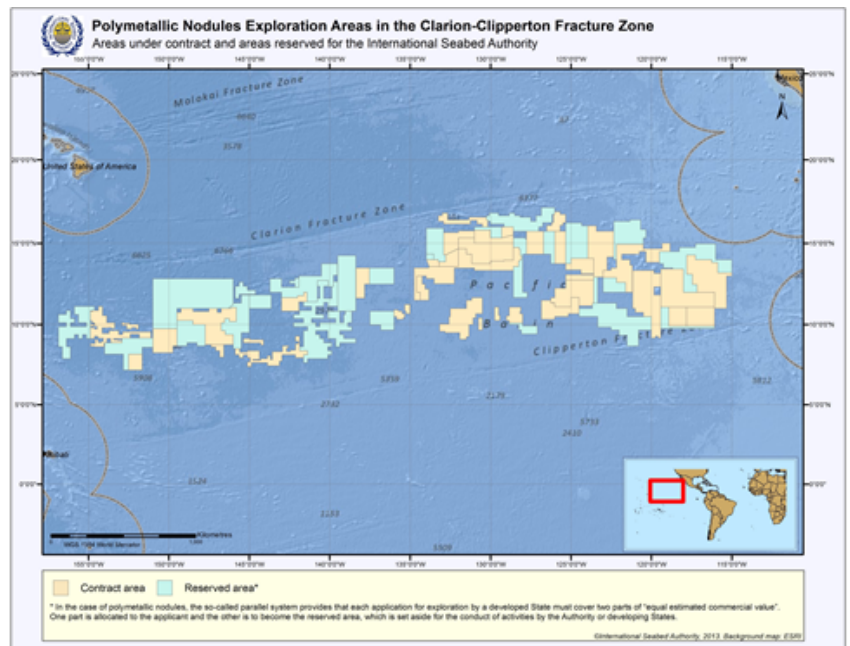
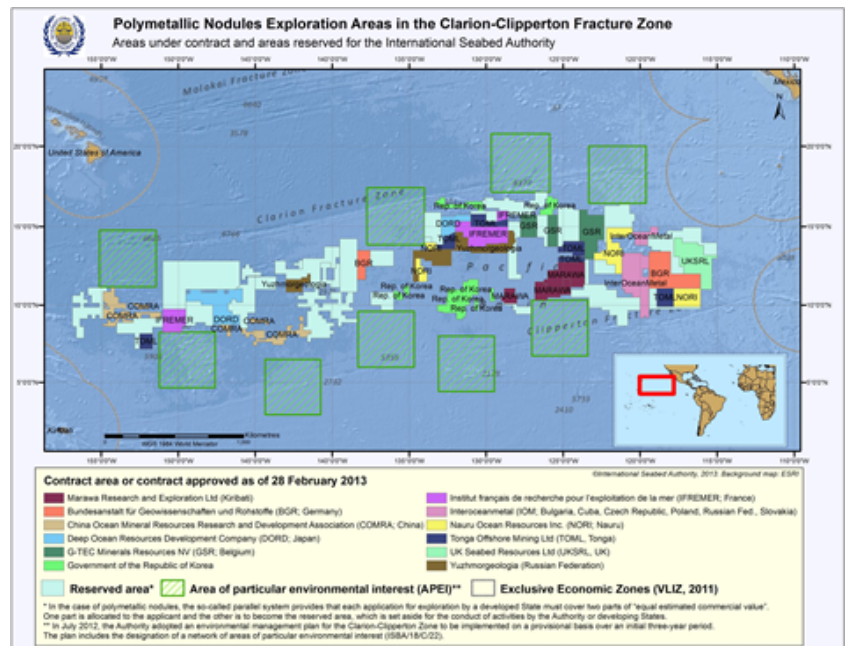
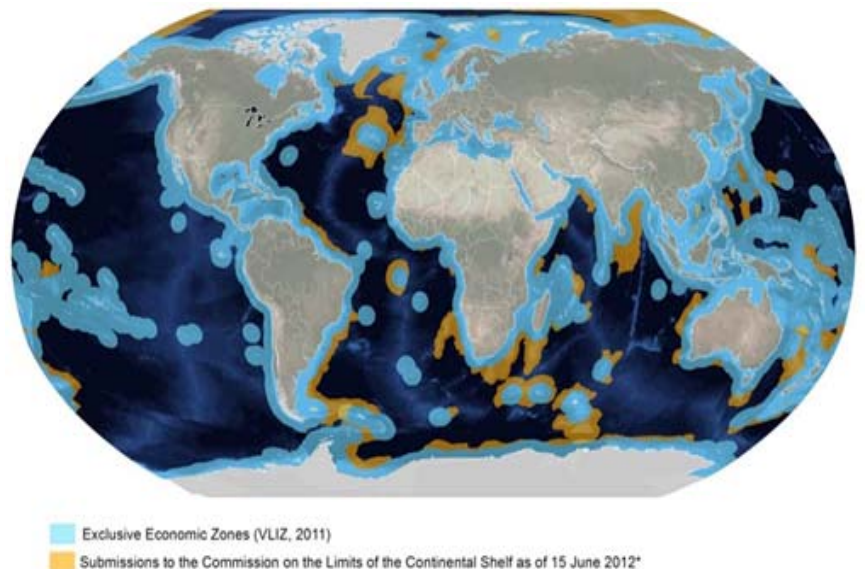
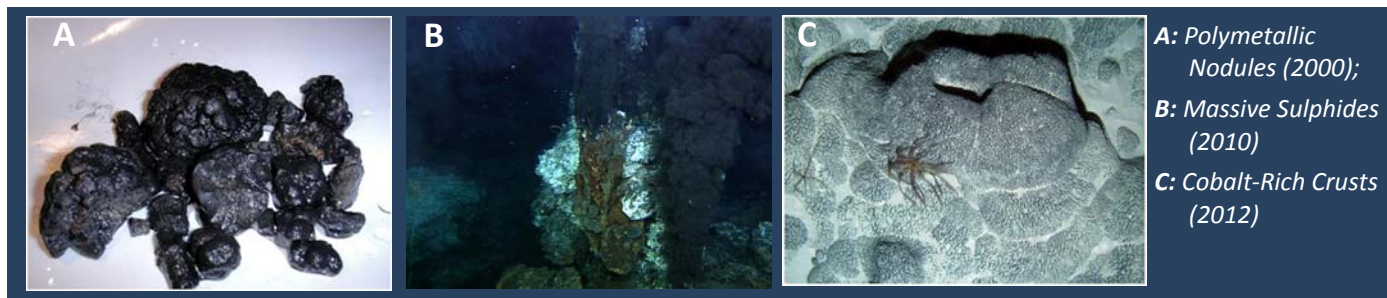


Figure 2: Nineteen contracts have been issued across three oceans. There are four applications pending approval and three new applications (ISA 2014). There are few reserved areas at the CCZ that developing countries could still apply for.





Both activities are important and are cornerstones for devising environmental impact assessment (EIA) of future exploitation activities in the Area for polymetallic nodules, enriched cobalt crust and massive polymetallic sulphides.

Deep sea mining involves the prospecting and exploration of deep sea habitat to classify the resources in terms of feasibility (cost-production). Dr. Jim Hein, of United States Geological Survey (USGS), examined cobalt-rich crust deposits. He said deep sea mining was a complex process that required sustained and strong investments in technology, metallurgic and environmental assessments. The orogeny of cobalt-rich

crusts not only provided Ni, Cu, Co, Mn and iron (Fe) but also many rare earth minerals, such as tellurium (Te) which is important in photovoltaic cell production. Dr. Hein stated that “finding enough Te is the largest barrier to multi-terawatt use of cadmium (Cd)-Te electricity generation. It is widely regarded as the lowest cost photovoltaic technology with the greatest potential.” Dr. Hein concluded that there were several challenges that needed to be met, such as accurate ageing methods for crusts, definition of processes that increase the presence of platinum (Pt), and rare earth elements in the crust formation, and technological innovation to remotely assess the nature of the crust, (e.g. thickness). He noted that metallurgic process innovation would also be desired.

SUPPLY AND DEMAND

While land-based mining is driven by demand and scarcity of the resources, deep sea mining is driven by supply and demand. Caitlyn Antrim’s presentation provided an extensive analysis of the supply and demand of the major minerals known to exist in the deep sea habitat. She pointed out that four major factors influenced exploitation of minerals in the Area: quality, technology, regulatory regime and commodity markets. She stated that critical mineral security (*Table 1*) was a very relevant topic to look in relation to deep sea mining. In particular, with rare earth elements (REEs) mainly produced by one country (China) and used in many new technological advances worldwide, future demands were expected to be high.

Table 1. Comparative analysis of some mineral commodities (C. Antrim, 2013)

	Net Import Reliance*	Major World Ore Producers	US imports Sources	Fraction of US Consumption in 1 million tons of deep sea minerals
Nickel	47%	Russia, Canada	Russia, Canada, Australia, Norway	10.1%
Copper	35%	Chile, USA	Chile, Canada, Peru	0.6%
Cobalt	75%	DR Congo, Zambia	China, Norway, Russia, Canada	36.9%
Zinc	Metal: 77% Ore: 0%	China, Peru, Australia	Canada, Peru, Mexico	19%
Manganese	100%	Gabon, Australia	Gabon, South Africa, Australia, China	35.8%
REE	100%	China	China	10%

**Import reliance counts secondary recovery (recycling) as domestic production*

It was clear that deep sea minerals are world-class resources of minerals critical to worldwide development and for the industrialisation of undeveloped countries with competition between land-based nickel laterite and porphyry copper caused by declining grade and accessibility of the latter.

DEEP SEA HABITAT AT HIGH SEAS: A COMMON HERITAGE OF MANKIND

The Director of the Instituto de Ciencias Marinas y Limnológicas de UNAM, Dr. Elva Escobar put in perspective the complexity and fragility, (*Figure 4*) of the deep sea from the ecological aspect as well as from the logistic challenges. Dr. Escobar stated in her presentation, that any kind of deep sea mining initiative, must be done responsibly and as a joint effort among scientists, miners and the public governance of member States such as Mexico. She pointed out that the deep sea provided both non-living natural resources and living resources. Dr. Katy Juarez of

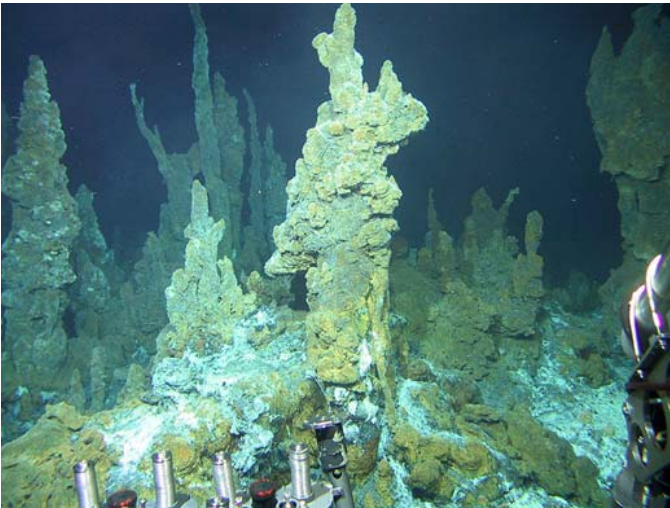


Figure 4: Hydrothermal vent from the Pacific Rise form a natural reserved Area. (Dr. E. Escobar, ICML-UNAM)

UNAM also pointed out that one of the emerging areas from deep sea habitats was bioprospecting. She said that there were several initiatives to prospect the oceans for genomic novelties and named two projects - the *Sorcerer II* and the *Tara Oceans* cruises that were systematically sampling for bacteria and sequencing on a world wide scale from the ocean.

List of Participants

MEXICO

Dr. José Antonio Meade Kuribreña, Secretario, Secretaría de Relaciones Exteriores,
 Dr. Ildefonso Guajardo Villarreal, Secretario, Secretaria de Economía
 Dr. José Narro Robles, Rector, Universidad Autónoma Nacional
 H.E. Ambassador Gerardo Lozano, Permanent Representative of Mexico to the Authority
 Dr. Jose Luis Vallarta, Faculty of Law, UNAM and former Permanent Representative of Mexico to the Authority
 Dr. Elva Escobar, ISA LTC Member, General Director, Institute of Marine Science and Limnology, Universidad Autónoma Nacional de Mexico (UNAM)
 Dr. Katy Juarez, Institute of Biotechnology, UNAM
 Mr. Enrique Cabrero, Director General, Consejo Nacional de Ciencia y Tecnología
 Mr. Rebolledo, Mining Consortium Group of Mexico
 Mr. Max Diener, Legal Consultant of the Ministry of Foreign Affairs of Mexico
 Mr. Hector Bautista, General Director of Port Lazaro Cardenas, Ministry of Transport and Communication

ARGENTINA

Ms. Frida Armas, Coordinator, National Commission on the Outer Limits of the Continental Shelf, Buenos Aires

CANADA

Mr. Galo Carrera, UN Commission on the Limits of the Continental Shelf, Associate Professor to the Marine Affairs Program, Dalhousie University

UNITED STATES

Dr. James Hein, U.S. Geological Survey
 Ms. Caitlyn Antrim, Executive Director, Rule of Law Committee for the Oceans Environmental Security
 Mr. Luigi Santosuosso, United Nations, Office of Legal Affairs, Division for Ocean Affairs and the Law of the Sea, New York

ISA

Mr. Nii A. Odunton, Secretary-General
 Mr. M. Lodge, Deputy to the Secretary-General
 Dr. Sandor Mulsow, Head, OREM

Acknowledgements

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The International Seabed Authority is an autonomous international organization established under the 1982 United Nations Convention on the Law of the Sea and the 1994 Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea. The Authority is the organization through which States Parties to the Convention shall, in accordance with the regime for the seabed and ocean floor and subsoil thereof beyond the limits of national jurisdiction (the Area) established in Part XI and the Agreement, organize and control activities in the Area, particularly with a view to administering the resources of the Area.