

# Exploration and Exploitation of the Seabed: a Drop in the Ocean?

by

Marie Bertrand, Sorbonne University, Paris

*Driving furiously along the dry seabed of the Red Sea, the chariot wheels came off the best chariot Egypt could produce, and Pharaoh had a few moments to think about his disabled chariot in the midst of sea water looking more and more unstable! (Ex 15:1-21)*

## Abstract :



*After the surface of the earth, Man seeks to conquer the seabed. Seabed is also called the « Area ». Article 1 of the United Nations Convention on the Law of The Sea<sup>1</sup> (UNCLOS), 1982, defines it as:*

*«[T]he seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction ». This paper limits the discussion to ‘the seabed beyond the limits of national jurisdiction’, i.e., High Sea and excludes seabed of continental Shelf and territorial sea.*

Article 136 of the Convention defines the seabed as “*common heritage of mankind*”, and in Part XI, the Convention creates the Seabed Authority, an International Organization in charge of managing the Area. The exploration of the seabed has been increasing. Concerns are growing about its consequent impact on the environment due to the process of exploitation of seabed products. The issue at stake is all the more crucial given that “the deeper the life is, the more vulnerable it becomes”<sup>2</sup>. Man’s intervention in this ecosystem, even minimal, can be dramatic if the consequences are not scientifically analyzed. Prior to the United Nations Convention on the Law of the Sea, no globally agreed rules existed. This is understandable given the fact that technology at that time didn’t permit descent beyond 4000 meters under the sea- average depth of the seabed.

---

<sup>1</sup>The Convention was signed on December 12 1982 in Montego Bay (Jamaica), also called the Montego Bay Convention or UNCLOS.

<sup>2</sup>Interview of Gabriel Gorsky, **director of research at the CNRS in the laboratory of oceanography at Villefranche (France), specialist in the seabed.** Article of Le Monde, Anne-Gaëlle Rico, March, 26th 2012.

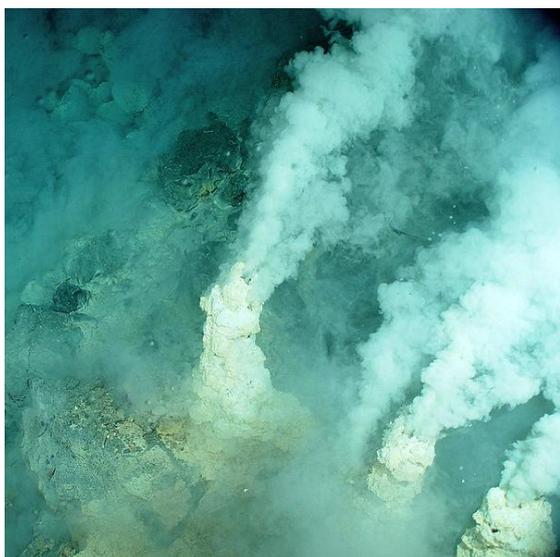
[http://www.lemonde.fr/sciences/article/2012/03/26/fonds-marins-75-des-zones-tres-profondes-restent-inexplorees\\_1676015\\_1650684.html](http://www.lemonde.fr/sciences/article/2012/03/26/fonds-marins-75-des-zones-tres-profondes-restent-inexplorees_1676015_1650684.html)

It is now technologically possible to access the sea bed and explore it. This means that technology has allowed human activity to intervene in a domain where it took tens of thousands of years for flora and fauna as well as minerals to be formed. Environmental impact studies are not able to predict how much time it will take for plants animals and mineral species to reappear after their destruction by the explorations activities.

Resources of the seabed are, indeed, a source of scientific and biological knowledge but they also represent a huge commercial interest for energy, mining and medical applications<sup>3</sup>. It is thus imperative to find a balance between exploration, exploitation and protection of the marine environment. This paper studies the existing regulatory regime for the protection of the seabed. It then goes on to assess the supervision of activities that are carried out down in the Area and examines if protective measures are effective and sufficient.

The paper delivers a comprehensive assessment of the risks attached to the exploration and exploitation. It then advocates practices in light of current knowledge and understanding of these areas.

## 1) History of regulations:



Before the United Nations Convention on the Law of the Sea, there were no specific regulations related to the seabed. In fact, only Conventions on marine pollution existed. One example is the « Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters, 1972 », adopted on December 29 1972 <sup>4</sup>. Another of these would be the MARPOL Convention adopted on the 2<sup>nd</sup> of November 1973<sup>5</sup>, concerned with the prevention of pollution from ships.

But, as far as the Area itself is concerned, there was no global regulation. The principle of freedom prevailed for a long time (e.g. to free fishing) and still does today (e.g. for free shipping). Montego Bay Convention, that came into effect on November 16 1994, created the International Seabed Authority, which aims to control the activities conducted in the

---

<sup>3</sup> Authority's document : « Marine mineral resources » (<http://www.isa.org.jm/fr/documents/technical>)

<sup>4</sup>Also named London Convention, it was one of the first global Conventions to protect the marine environment from human activities. It has been in force since 1975.

<sup>5</sup>The International Convention for the Prevention of Pollution from Ships. This Convention had not yet entered into force and the 1978 MARPOL Protocol absorbed the parent Convention. The combined instrument entered into force on October 2 1983.

Area: « Activities in the Area shall be organized, carried out and controlled by the Authority on behalf of mankind »<sup>6</sup>. The International Seabed Authority is the organization under which all States Parties to the UNCLOS are required to seek permission to explore or exploit the Area.



The UNCLOS is also a framework Convention that leads to more specific Regional Conventions for the protection of marine biodiversity. UNCLOS and its Regional Conventions have led to many regulations on fishing stocks and migratory species. The United Nations Environment Program (UNEP) established the Regional Seas Program,<sup>7</sup> in order to promote a sartorial approach through inter governmental cooperation in environmental matters. The example of the management of the North-East Atlantic is very meaningful because it brings together the global sea Convention (Convention for the Protection of the Marine Environment of the North Atlantic also called OSPAR Convention), as well as various regional fishery organizations and global organizations<sup>8</sup> (International Seabed Authority, IMO, IWC<sup>9</sup>).

OSPAR is a mechanism by which fifteen Governments of the western European coasts cooperate to protect the marine environment of the North-East Atlantic. It aims to take the necessary measures to protect the marine environment from pollution and from any human activity, particularly to preserve and restore marine ecosystems. The seabed falls within the scope of application of the Convention<sup>10</sup>, but only limited to the geographical area of the North East Atlantic and don't include the whole Area.

The Antarctic Treaty System is also a good example of an area where all contracting parties renounce their claim of sovereignty on Antarctica and commit to manage it as a common resource. The Antarctic Treaty system includes the Treaty itself (signed in 1959) and a number of related Agreements, including the Environmental Protocol<sup>11</sup> and the Convention on the Conservation of

---

<sup>6</sup> Article 153 of the UNCLOS, entitled " System of exploration and exploitation ".

<sup>7</sup> The Regional Seas Programme has been launch in 1974. It aims " to address the accelerating degradation of the world's oceans and coastal areas through the sustainable management and use of the marine and coastal environment, by engaging neighbouring countries in comprehensive and specific actions to protect their shared marine environment ". UNEP Website.

<sup>8</sup> P. Ricard, « La gouvernance de la biodiversité marine au delà des limites de la juridiction nationale, approches globales et régionales », 2012, Thèse Université Paris 1 (non published).

<sup>9</sup> International Whaling Commission

<sup>10</sup> Article 1. a) of the OSPAR Convention

<sup>11</sup> Agreed in 1991

Antarctic Marine Living Resources (CAMLR Convention)<sup>12</sup>. In its Article 1 § 3, the CAMLR Convention provides that:

« *The Antarctic marine ecosystem means the complex of relationships of Antarctic marine living resources with each other and with their physical environment* ».

The Antarctic Treaty is interesting because of its pragmatic approach to the system, by including all marine living resources in the scope of the protective measures.

The Antarctic system is able to implement its regulations mainly through legal agreements. Promotion of the widest possible intergovernmental cooperation, for the rational and peaceful use of resources has also helped.

Therefore, regional regulations, though efficient, don't cover all areas.



It's important to notice that regulations of the International Seabed Authority don't deal with living resources but only with mineral resources. It's a serious weakness in the management of the Area, because living and non-living resources are connected. It seems obvious that when one suffers changes, it has a direct impact on the other. They are biologically related and regulations are artificial, because it's only a legal and fictitious division. It doesn't take into account the reality of the seabed, which is a fragile balance

between marine life and minerals.

We will focus the paper on the exploration and exploitation of the mineral resources, but it's important to keep living resources in mind. The International Seabed Authority is discussing this issue. One hopes that this shortcoming will be dealt with, which would be possible with the existing international legal instruments i.e. UNCLOS. "The mandate of the International Seabed Authority is sufficiently broad to address these and other issues"<sup>13</sup>.

## 2) The UNCLOS regime

As explained above, the Convention has created the International Seabed Authority i.e. the International Organization in charge of managing the Area. This Authority has to manage the Area but also has to protect it. Article 145 of the UNCLOS states:

*Necessary measures shall be taken in accordance with this Convention with respect to activities in the Area to ensure effective protection for the marine environment from harmful effects, which may arise from such activities. To this end the Authority*

---

<sup>12</sup> The CAMLR Convention was adopted on 20 May 1980 in Canberra (Australia) and applies to all Antarctic populations of finfish, molluscs, crustacean and sea birds

<sup>13</sup> <http://www.isa.org.jm/en/efund>

*shall adopt appropriate rules, regulations and procedures for inter alia:*

*(a) the prevention, reduction and control of pollution and other hazards to the marine environment (...)*

*(b) the protection and conservation of the natural resources of the Area and the prevention of damage to the flora and fauna of the marine environment.*

The seabed regime became operational in 2001 when the Authority signed contracts with seven operating companies (sponsored by one or several States) and States<sup>14</sup> that were authorized by the International Seabed Authority to explore the Area for polymetallic nodules<sup>15</sup>. Today, there are a total of 13 contractors for the exploration of polymetallic nodules and 2 for the exploration of polymetallic sulphides<sup>16</sup>. We can note that the majority of the countries (sponsoring States or contracting States) who have signed the contracts are developed countries. .

Annual technical workshops have been convened by the Authority to exchange knowledge and expert advice on specific aspects of seabed resources. For example, a meeting was held regarding the establishment of environmental baselines about seabed cobalt-rich crusts and polymetallic sulphide mine sites in the Area (Jamaica, 2004). Another meeting was held on Polymetallic Nodule Mining Technology (India 2008)<sup>17</sup>.

The International Seabed Authority has multiple roles, including managing the Area, but also protecting it.

The UNCLOS also contains more general provisions regarding the protection of the marine environment, not only confined to the seabed protection. For example Part XII of the UNCLOS is entitled "Protection and preservation of the marine environment". These provisions concern Member States obligations and not the Authority. The first article explicitly talks about the obligation of the States: "States have the obligation to protect and preserve the marine environment"<sup>18</sup>. This provision should be read in conjunction with the next article, which establishes the principle of the sovereign right of States to exploit their natural resources. This part doesn't specifically relate to the Area, but it concerns the entire marine environment.

---

<sup>14</sup> China Ocean Mineral Resources Research and Development Association (COMRA), Deep Ocean Resources Development Company (DORD, Japan), Government of India, Government of the Republic of Korea, Institut français de recherche pour l'exploitation de la mer/Association française pour l'étude et la recherche des nodules (IFREMER/AFERNOD, France), Interoceanmetal, Joint Organization (Bulgaria, Cuba, Czech Republic, Poland, Russian Federation and Slovakia), Yuzhmorgeologiya, (Russian Federation).

<sup>15</sup> « Rock concretions formed of concentric layers of iron and manganese hydroxides around a core ». "Polymetallic Nodules" (<http://www.isa.org.jm/en/documents/technical> )

<sup>16</sup> <http://www.isa.org.jm/en/scientific/exploration/contractors>

<sup>17</sup> "Other activities of the Authority" (<http://www.isa.org.jm/fr/documents/technical>)

<sup>18</sup> Article 192 of the UNCLOS

Regulation on protection of the marine environment exists but the lack of specific obligations for the States to efficiently protect the seabed is inadequate. A sound and efficient legal regime is lacking.

### 3) Status of activities:

The seabed is full of natural resources, which are essential for marine life and for life on Earth. It covers about half the surface of the planet. The water near seabed is cold (about 4 ° C) and low in nutrients. Extremely diverse organisms, mostly invertebrates such as worms and molluscs, live on the seabed, at low densities. These marine communities have learned to survive on the meager waste from species that evolve above them.

Under national jurisdiction, (the marine territory within 200 nautical miles) exploitation of the seabed is happening<sup>19</sup> but these exploitations will not be studied in the scope of this paper as it deals with the Area beyond national jurisdiction.

Explorations beyond territories under national jurisdiction concern mainly three metallic mineral marine resources: polymetallic nodules, cobalt-rich crusts and polymetallic sulphides.

Polymetallic nodules are aggregates of metals (manganese, copper, cobalt), located on average at 4000m of depth. They represent a stock of about 340 million tons of nickel and 275 million tons of copper in the Clarion-Clipperton Zone<sup>20</sup> (currently, the richest zone in nodules). Cobalt crusts are found in the high seas and in the territorial waters. They are mostly present around the Pacific Islands.

Other minerals being explored are the polymetallic sulphides. These are also present on land. On the seabed, they are found around hydrothermal vents. This ecosystem is of great scientific and environmental interest because species live at temperatures around 300 °C and at a depth of 4000 m, where no photosynthesis is possible<sup>21</sup>. This unique biodiversity, and new mechanisms of life systems must be protected.

---

<sup>19</sup> Authority's document: " Marine mineral resources " (<http://www.isa.org.jm/fr/documents/technical>): for example diamond mines are exploited at 200m of depth in the waters off Namibia's coast. Gas and oil are also exploited as marine resources, but under national jurisdiction.

<sup>20</sup> Article of Dorothée Laperche: interview of the leader of the watching and planning unit of the IFREMER, M. Denis Lacroix. (<http://www.actu-environnement.com/ae/news/abysse-minerais-nodules-polymetalliques-marins-cuivre-nickel-cobalt-ressources-15430.php4>)

J.-P. Levy, *Le destin de l'Autorité Internationale des Fonds Marins*, Pedone, Paris, 2002, 236 p.

<sup>21</sup> [http://www.dinosoria.com/fonds\\_marins.htm](http://www.dinosoria.com/fonds_marins.htm)

The hydrothermal springs represent a commercial interest, as their scientific study and the associated findings are useful to the pharmaceutical industry and to the industry of microcomputer components.

In order for a certain area to be declared explore-worthy, it is necessary, according to the International Seabed Authority, to establish a priority map of that seabed's area, for accurate analysis of the area. The extraction can be made if this specific area is rich enough in nodules, crusts or sulphides<sup>22</sup>.

Marine mineral resources require millions of years to be formed. Therefore, the extraction of it is irrevocable and permanently damaged. The exploration and exploitation of these resources must be closely monitored. Non-regeneration of such resources is a strong argument in favour of stopping the exploration of polymetallic nodules, sulphides, and cobalt crusts.

The general extraction processes for minerals follows a two-fold technique. First, the mineral needs to be detached from the rock to which it is attached. To that end, one can use "the scraping of the surface, excavation, digging a tunnel to access the fields under the surface or drilling of the deposit and its fluidity."<sup>23</sup> Then comes the actual extraction. These large-scale and highly invasive techniques of exploitation and extraction have only been used up to the depths of 200 m. No activity of this scale has yet been performed in the seabed, but now technology permits the exploration even on the seabed.

There are some specific techniques of extraction for the cobalt-rich crusts, that are used in the seabed e.g. by injecting water under high pressure, by leaching, (a chemical process in situ), or by acoustic effect<sup>24</sup> (vibrations enabling the detachment of crusts).

These extractions are coupled with environmental impact studies to assess the effects of these activities on the marine environment. The operating companies and States carry out these studies, in accordance with the Mining Code<sup>25</sup> and with the recommendation of the Legal and Technical Commission of the International Seabed Authority.

The International Seabed Authority adopted a regulation on July 13th 2000, about "Prospecting and Exploration for Polymetallic Nodules in the Area".<sup>26</sup> Part V of it is entitled "Protection and preservation of the marine environment." Article 2§ 2 states, "Prospecting shall not be undertaken if substantial evidence indicates the risk of serious harm to the marine environment".

---

<sup>22</sup> Documents of the International Seabed Authority "Cobalt-rich crust"

<sup>23</sup> "Seabed technology" (<http://www.isa.org.jm/fr/documents/technical>).

<sup>24</sup> "Marine mineral resources" (<http://www.isa.org.jm/fr/documents/technical>)

<sup>25</sup> Short name of the regulation about « Prospecting and Exploration for Polymetallic Nodules in the Area »

<sup>26</sup> <http://www.isa.org.jm/fr/mcode>

Article 31<sup>27</sup> provides that the operating companies and States shall, during the exploration phase, collect "Each contract shall require the contractor to gather environmental baseline data and to establish environmental baselines (...) against which to assess the likely effects of its program of activities under the plan of work for exploration on the marine environment and a program to monitor and report on such effects".

The operating companies and States shall also take all necessary measures to "prevent, reduce and control pollution and other hazards to the marine environment arising from its activities in the Area" <sup>28</sup> and submit an annual report to the General Secretary of the Authority.

Protection of the marine environment seems to have a regulatory regime. However, in terms of its implementation and enforcement particularly, when activities might cause severe or irreversible harm to the environment, there is little measures prescribed for the preventive and corrective actions

#### **4) Present and future impacts on the environment.**

According to the Authority, the exploration itself has rarely a significant impact on the environment. But it considers essential that operating companies and states, before they undertake their exploration campaigns, gather as much information as possible about the state of the environment, in order to establish an environmental profile, that will be used to assess the impact of the exploration on the environment<sup>29</sup>.

The Sanya workshop<sup>30</sup> was responsible for carrying out environmental impact studies and the results show that the effects on the underwater environment are poorly understood. There are three types of impact of mining, which could damage benthic species (i.e. living on the seabed) during the extraction phase in the seabed<sup>31</sup>:

- The crushing of bodies by the passing of the extraction vehicle.
- The burial of organisms by sediment redistribution.
- The physical and chemical changes in the water column through which extractions are lifted (a 4 km column).

---

<sup>27</sup> Article from the regulation "Protecting and exploration for Polymetallic Nodules in the Area", also called Mining Code.

<sup>28</sup> Article 31§3 of regulation on prospecting and exploration for polymetallic nodules in the Area.

<sup>29</sup> Article 31§4 of regulation on prospecting and exploration for polymetallic nodules in the Area.

<sup>30</sup> A workshop held in China, in 1998. It had the task to elaborate recommendations concerning the environmental impact of the exploration of the polymetallic nodules in the Area.

<sup>31</sup> "Seabed protection" (<http://www.isa.org.jm/en/documents/technical>)

Once the mineral is out of the water, only the relevant mineral to the operator is kept (3 to 30% of a sample), the rest being discarded back into the sea, and this may cause<sup>32</sup>:

- Turbidity.
- Oxygen depletion.
- Release of trace metals (metals can be assembled in small quantities spilled in the sea).
- Disruption of biotype<sup>33</sup> filter feeders<sup>34</sup>.

The Seabed Authority wants to establish the impact of increased intensity and frequency of exploitation of the seabed on the surrounding environment. But, before the Authority completed its gathering of environmental impact studies conducted by operating companies and States, a project of regulation is discussed within the Authority.

## 5) Recommendations

### An ecosystem approach:

As we have seen above, living resources are not included in the International Seabed Authority regulations. This clearly does not reflect the reality. A regulation on this issue, within the Authority, is essential. The Antarctic Treaty should be an example to follow, because it includes all marine living resources in the scope of the protective measures.

### Precautionary principle:

This principle states that if an action or an omission has a potential risk of causing harm to the environment, in the absence of scientific consensus on the potential risk, the burden of proof that it is not harmful falls on those taking the action or omission. Decision-makers may be held liable.

Seabed exploration could be considered as risky activities. The Rio declaration<sup>35</sup> was the first international document to deal with the concept of the precautionary principle. The declaration and the principle are non-binding, but they have an international scope and as the Rio declaration states:

« Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation ». This is an important argument and NGOs have to use this principle. Indeed, they can ask to the

---

<sup>32</sup>*Idem*

<sup>33</sup>*All of biochemical characters by which different groups are defined within one species of bacteria* (definition on French dictionary Larousse).

<sup>34</sup>“ Seabed technology ” (<http://www.isa.org/jm/en/documents/technical>)

<sup>35</sup> The Rio Declaration on Environment and Development was a document adopted in 1992 by the Conference on Environment and Development under the auspices of the United Nations.

operating companies and States to provide evidence of the absence of risk for the marine environment.

Only exploration and no exploitation:

Seabed activities, even exploration, are invasive and can cause instability in the overall ecosystem. The impact of the exploration on the 4 km water column above the exploration zone is unknown, as is the scale of the disturbance of animal species, which lived on seabed and on the water column<sup>36</sup>. It appears more reasonable to stay in the exploration phase and to not go further than the existing activities as long as the impact of the exploration isn't assessed more clearly.

Regarding the exploration currently carried out in seabed, it appears crucial to multiply environmental impact studies.

Public awareness:

The operating companies, the States, and the Authority itself, take advantage of the lack of accessible information about exploration and exploitation of the seabed. Activities are conducted in the Area and general population is not aware.

Industrial lobbies have an interest to leave public opinion in the dark. Seabed is a complex field, dealing with technology, thereby making access to information difficult.

Given economic and environmental issues surrounding the seabed, the lack of transparency must be solved. Ensure improved accessibility to information about seabed activities must be a major concern.

Better monitoring of the implementation of existing regulation:

As mentioned previously, there are a lot of existing impact studies, most of them binding thanks to regulation. It seems crucial to take steps to ensure better monitoring of the implementation of the existing regulation.

Keeping in mind the butterfly effect risk attached to changes, even minimal, of such an unknown, deep, inaccessible and fragile ecosystem, Man should show restraint in his mad rush to conquer new spaces. **END**

---

<sup>36</sup>“ Seabed protection ” (<http://www.isa.org.jm/en/documents/technical>)

About Author: Marie BERTRAND is Master in international law at the Sorbonne University in Paris. She has expertise in international public law and particularly international environmental law. She conducted research project on the maritime terrorism and the law of the sea. Her other papers dealt with international organizations and on “*soft law*”, including environmental law. She has closely worked with Rajendra Shende , Chairman TERRE Policy Centre to develop this policy paper.

