Marine Policy 70 (2016) 101–107

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

Exploration of polymetallic nodules in the Area: Reporting practices, data management and transparency ☆

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ARTICLE INFO

Article history:
Received 15 March 2016
Received in revised form
28 April 2016
Accepted 28 April 2016

Keywords:
International Seabed Authority
Polymetallic nodules exploration
Data reporting
Transparency

ABSTRACT

The International Seabed Authority (ISA) regulates the activities related with the exploration and exploitation of seabed mineral resources in the Area, which are considered as the "common heritage of mankind" under the United Nations Convention on the Law of the Sea. The ISA has also the mandate to ensure the protection of the marine environment. The development of good practices for the annual reporting and data submission by Contractors is crucial for the ISA to comply with the sustainable development of the mineral marine resources. In 2015, the ISA issued a new template for reporting on exploration activities, which includes the definition of the format for all geophysical, geological and environmental data to be collected and analysed during exploration. The availability of reliable data contributes to improve the assessment of the ISA on the activities in the Area while promoting transparency, which is considered as a major principle of industry best practices.

1. Introduction

The International Seabed Authority (ISA) is the organization through which States Parties to the 1982 United Nations Convention on the Law of the Sea (UNCLOS [1]) organize and control activities in the Area.[1] The ISA was created in 1994, upon the entry into force of the Convention and following the adoption of the so-called "1994 Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea" [2]. The set of activities in the Area are governed by the provisions settled in Part XI and Annex III of UNCLOS, particularly to administer the resources of the Area.[2] The Area is defined as "the seabed and the ocean floor and subsoil thereof, beyond the limits of national jurisdiction". Spatially, it is constrained by the outer limits of the continental shelf of coastal states as defined in Article 76 and Annex II of UNCLOS.

As can be read from a brochure issued by the ISA,[3] the aims of the international regime are threefold: to encourage the development of seabed resources, to safeguard the marine environment as it may be affected by such activities, and to ensure the equitable sharing of economic benefits between seabed miners and the international community. Therefore, the Authority acts as regulator of the activities related with the exploration and exploitation of seabed mineral resources on behalf of all its members. Moreover, these resources under the Area regime are considered as the "common heritage of mankind".[4] The latter classification coupled with the ISA's mandate to ensure the protection of the marine environment from the harmful effects of activities occurring in the Area poses a major challenge to the ISA whose role and decisions are and will be monitored and assessed by a greater number of stakeholders (Contractors, coastal States, environmental agencies,

☆The views expressed herein are solely those of the authors and do not necessarily reflect the views of the Legal and Technical Commission of the International Seabed Authority.

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[1] In accordance with Article 156 of the Convention on the Law of the Sea of 10 December 1982.

[2] Article 157 of the Convention on the Law of the Sea.

[3] http://www.isa.org.jm/files/documents/EN/Brochures/2014/ISAbrochure.pdf.

[4] Article 136 of the Convention on the Law of the Sea.

http://dx.doi.org/10.1016/j.marpol.2016.04.051
0308-597X/

private companies, NGOs) and individuals from the civil society. This paper aims at contributing to the discussion on how this goal will be achieved and to review the actions already undertaken by the ISA to foster transparency on the development of seabed mineral resources in the Area. Particularly, these actions will be framed with the recommendations issued by the Legal and Technical Commission (LTC or the Commission) in accordance with its role defined by article 165 of UNCLOS. The Commission is a technical advisory organ of the Council, the latter being the executive organ of the ISA.[5]

2. Existing Regulations and contracts for exploration in the Area

In the Area, the most promising mineral resources for future exploitation are polymetallic nodules, polymetallic sulphides and ferromanganese crusts. Nodules can be found only on the floor of the deepest abyssal plains of the oceans (4000–6000 m water depth), sulphides precipitate near hydrothermal vents at the mid-ocean ridges and island arc volcanoes (1000–4000 m water depth) and crusts form on the steep flanks of seamounts from 600 to 2000 m water depth.

Regulations for the prospecting and exploration of these resources in the Area were approved by the Council of the ISA and issued in 2000, 2010 and 2012, respectively, with amendments to the 2000 regulations issued in 2013 to bring all three sets of regulations into alignment. According to the regulations "Exploration" means the searching for deposits of polymetallic nodules, polymetallic sulphides or ferromanganese crusts in the Area with exclusive rights, the analysis of such deposits, the use and testing of recovery systems and equipment, processing facilities and transportation systems and the carrying out of studies of the environmental, technical, economic, commercial and other appropriate factors that must be taken into account in exploitation.

The first contracts concerning exploration for polymetallic nodules were granted by the ISA in 2001 in the Clarion-Clipperton Zone (CCZ, Pacific Ocean, Fig. 1(A)). In 2002, the first contract for exploration of polymetallic nodules outside the CCZ was granted to the Government of India in the Indian Ocean. The first contracts contained the plan of work for exploration submitted by six Contractors (Table 1), corresponding to those initially registered as pioneer investors as the result of their investments and work in the CCZ before the Convention entered into force in 1994. Up to date, 27 contracts for exploration have been approved by the ISA covering the three types of seabed resources, which were granted to Contractors sponsored either by developed and developing countries.

According with the regulations (Annex to ISBA/19/C/17 [3]), the plan of work for exploration is approved for an initial period of 15 years. For the six contracts that started in 2001, this period expired between March and June of 2016, depending on the precise date of signature. Normally, upon expiration of a plan of work covering 15 years of exploration, it is expected that the Contractor would be able to proceed with a plan of work for exploitation. However, Contractors may apply for extensions for the plan of work of exploration for periods up to 5 years each. The six Contractors that have signed their contracts in 2001 have all made such applications. The decision on these requests will be taken by the Council of the ISA during the 22nd session in July 2016 based on the recommendations by the LTC.

[5] The Council consists of 36 States, elected on a rotational basis, whilst the Commission is made of up elected experts, nominated by governments, who serve in their individual capacities.

3. Polymetallic nodules exploration and exploitation

The initial total area allocated to a Contractor for polymetallic nodules exploration can not exceed 150,000 km^2. During the first eight years from the date of the contract, the Contractor has to reduce the area by a series of relinquishments to a remaining maximum of 75,000 km^2. The mineral resource deposit is first of all characterized by the nodules abundance, metals grade and physical properties. But the seabed morphology is also a crucial information, since the roughness of the seafloor and the presence of obstacles will direct the design of the mining equipment. Therefore, the seabed morphology must be mapped in great detail. A reasonable resolution (higher than 150 m) of the seabed morphology of the exploration area can be achieved from a hull-mounted full-ocean multi-beam system. The full area of 150,000 km^2 can be completed within 30–50 days of dedicated ship time (excluding transit and downtime due to unfavourable marine conditions, considering a vessel velocity of 8 knots, a swath width up to 6 times the average water depth of 5 km and 30% overlap between adjacent lines) and consequently this is expected to be one of the main products delivered by Contractors during the first stages of exploration activities. However, in order to track the nodule abundance variation and the seabed morphology at a resolution capable of providing sufficient information for the development of a robust mining system, high resolution multi-beam data must be acquired from a system mounted in remotely operated vehicles or autonomous underwater vehicles that can navigate closer to the seafloor. The gathering of these bathymetric data is much more time-consuming compared to hull-mounted systems and implies much higher costs for equipment purchase and maintenance. In addition, the Contractor needs to collect nodules and sediment for chemical and geotechnical analysis from an adequate number of sampling stations, as well as to acquire environment baseline data and develop monitoring programmes to assess the effects of the exploration activities on the marine environment. An exploration contract period of 15 years seems reasonable in order to comply with these commitments before proceeding to exploitation.

The exploitation of natural resources is the use of natural resources for economic growth. In the regulations adopted by the ISA on prospecting and exploration for polymetallic nodules in the Area, exploitation means the recovery for commercial purposes of polymetallic nodules in the Area and the extraction of minerals therefrom, including the construction and operation of mining, processing and transportation systems, for the production and marketing of metals. Nonetheless, the exploitation activity in the Area itself must be also economically sustainable in order to foster the development of a seabed mining industry, which is still absent. The acceptance of this principle poses a major challenge to all stakeholders of the seabed mining. Here we give a specific example applied to polymetallic nodules, but similar challenges (in terms of importance) will be faced by those involved in the future exploitation of polymetallic sulphides and ferromanganese crusts.

As presented by most Contractors in the workshop on polymetallic nodule resource classification promoted by the ISA in 2014 and held in Goa, India, an economic exploitation of this resource is foreseen to be primarily dependent on the capacity of the mining system to retrieve a minimum of 2–3 Mton of dry nodules per year to the surface [4,5]. The latter represent the extraction of 231–347 ton/hour or 5.6–8.3 thousand ton of dry nodules per day. The final technology and collector to be used to comply with these figures are still under development by all Contractors, but the same technology must also avoid causing serious harm to the marine environment, following article 145 of UNCLOS. This concern is mostly related with the compaction of the first meters of the sediment layer during mining, as well as with the creation of