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**Key Issues on the Commercial  
Development of Deep Seabed  
Mineral Resources**

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# Key Issues on the Commercial Development of Deep Seabed Mineral Resources

Seong Wook Park\*

## Abstract

This paper examines key concerned factors for establishing commercial mining regimes of deep seabed minerals including systems of payment, production policies, problems of application of plans and approval process, reporting obligations, protection and preservation of marine environment, transfer of technology, and issues relating to Enterprise.

## I. Introduction

The development of seabed and subsoil regions beyond national jurisdictions as well as the marine mineral resources in the Area attracted considerable global attention when the United Nations Convention on the Law of the Sea (hereinafter “UNCLOS” or “the Convention”) was adopted in 1982. However, the Convention did not secure universal approval, and many advanced coastal nations did not join the Convention because it included a number of non-market policies, including setting limits for seabed production. In the early 1990s, as the effective date of the Convention approached, it became necessary to modify the overall deep seabed regime as well as the controlled production system, which had been identified as a key component in the former deep seabed regime.<sup>1</sup> Reflecting this situation, the Agreement relating to the implementation of Part XI of UNCLOS of 10 December 1982 (hereinafter referred to as the “Agreement on Implementation”) accommodated the free-market economic systems of the advanced western nations, who were, in fact, the principal developers of the deep seabed. Since then, the Convention has secured

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<sup>1</sup> The controlled production system in this paper refers to the concept as opposed to free access to the high seas and to other natural resources than minerals. The system is based on the principle of the common heritage of mankind stipulated in Part XI of the UNCLOS.

universal approval because a considerable portion of Part XI, the Deep Seabed Regime of the Convention was revised.<sup>2</sup>

After the establishment in November 1994 of the International Seabed Authority (hereinafter referred to as the “Authority”) to supervise mining in the deep seabed “common heritage” for the common benefit of humankind the Authority implemented the following actions: 1) approval of the registered pioneer investors’ 15-year exploration project plan in 1997;<sup>3</sup> 2) adoption in 2000 of the “Regulations on Prospection and Exploration for Polymetallic Nodules in the Area,” which had been seen as the most critical core issue of seabed organizations since 1997;<sup>4</sup> and, the, conclusion of an exploration contract, based on the Regulations, with seven registered pioneer investors in 2002;<sup>5</sup> 3) adoption of the “Regulations on Prospection and Exploration for Polymetallic Sulphides in the Area” in 2010;<sup>6</sup> and 4) completion of the enactment of the “Regulations on Deep Seabed Mineral Resources,” such as polymetallic nodules, polymetallic sulfides, and cobalt-rich crust, by adopting the final draft of the “Regulations on Prospection and Exploration for Cobalt-rich Crust in the Area” in the 18<sup>th</sup> Session in 2012.<sup>7</sup>

Additionally, a noteworthy event surrounding the development of deep seabed mineral resources occurred in 2011. The delegate from Fiji requested the enactment of the Regulations on the Commercial Development of Polymetallic Nodules at the 17<sup>th</sup> Session of the Authority.<sup>8</sup> The Authority decided to adopt the Regulations on the Commercial Development of Polymetallic Nodules as a formal agenda item at the 18<sup>th</sup> Session. This means that the Authority now will treat issues related to development as a priority.

The discussion about enactment of the Regulations on the Commercial Development of Polymetallic Nodules by the Authority seemed related to the seabed mining activities of various private enterprises. Specifically, companies such as Nautilus Minerals and Neptune Minerals, two of the private enterprises involved, are continuously investing in the Exclusive Economic Zone of the Pacific island nations for seabed mineral resources.

In particular, the activities of Nautilus Minerals are notable. Nautilus

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<sup>2</sup> Regarding the revisions to the Deep Seabed Regime in the Convention through the enactment of the Agreement on Implementation, see Lee Yong-Hee, “Study on the Enactment of Standards for the Management of Deep Seabed Activities and the Trend of International Seabed Authority,” *Journal of the Society of International Laws*, Vol. 5 No. 1, 2000, p. 144.

<sup>3</sup> See, ISBA/4/A/11.

<sup>4</sup> See, ISBA/6/A/18, ISBA/6/12.

<sup>5</sup> See, ISBA/8/A/5.

<sup>6</sup> See, ISBA/16/A/12 Rev.1.

<sup>7</sup> See, ISBA/18/A/11.

<sup>8</sup> See, ISBA/17/C/22.

Minerals<sup>9</sup> holds the rights for the exploration of an extensive area that covers approximately 600,000 km<sup>2</sup> in a region including Fiji, Tonga, Vanuatu, and the Solomon Islands. Moreover, Nautilus Minerals planned accelerating the commercial development activities in the Solwara 1 area of Papua New Guinea. Additionally, Neptune Minerals<sup>10</sup> holds the rights for the exploration of an area covering approximately 290,000 km<sup>2</sup> around New Zealand, the Republic of the Marshall Islands, and Papua New Guinea. Bluewater Metals<sup>11</sup> and Odyssey Marine Exploration<sup>12</sup> are also conducting exploratory activities for ocean floor mining, and a rush of seabed mining is anticipated if commercial developments by Nautilus, planned for 2013, turn out to be successful.<sup>13</sup>

Indeed, if the commercial development activities of Nautilus are successful, commercial development of other mineral resources, together with polymetallic sulfides, will be possible. For such commercial development, it will be necessary to enact separate regulations. Accordingly, after the review on the kinds of deep seabed minerals involved, as well as the issues related to the development of deep seabed resources in the Convention and the Agreement on Implementation, the core issues to be considered in the future development stages would be addressed in the next section.

## **II. Deep Seabed Mineral Resources**

### **1. Polymetallic Nodules**

Polymetallic nodules, potato-shaped metallic oxides with a 1 to 15-cm diameter, were created over the course of several million years via the precipitation of dissolved metallic components from seawater at a precipitation speed of a centimeter per several million years in rock

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<sup>9</sup> “Nautilus Minerals Inc.,” last modified June 20, 2012, <http://www.nautilusminerals.com>.

<sup>10</sup> “Neptune Minerals” last modified June 20, 2012, <http://www.neptuneminerals.com>.

<sup>11</sup> “Bloomberg Businessweek,” Company Overview of Bluewater Metals Pty Ltd. last modified December 20, 2012, <http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=81598262>.

<sup>12</sup> “Odyssey Marine Exploration, Inc.,” last modified June 20, 2012, <http://odysseyminerals.com>.

<sup>13</sup> On November 13, 2012, Nautilus Minerals Inc. announced it has decided to preserve its cash position by terminating the construction of the equipment for its Seafloor Production System. Nautilus announced that it was in dispute with the Independent State of Papua New Guinea on June 1, 2012. Terminating the equipment build for the Seafloor Production System includes discontinuing discussions regarding an alternative vessel and associated funding solution. This means there will be a considerable delay in any commencement of production operations and it may also result in an increase in the Project cost. [http://www.nautilusminerals.com/s/Media-NewsReleases.asp?ReportID=557207&\\_Type=News-Releases&\\_Title=Nautilus-Minerals-terminates-equipment-build-for-its-Solwara-1-Project](http://www.nautilusminerals.com/s/Media-NewsReleases.asp?ReportID=557207&_Type=News-Releases&_Title=Nautilus-Minerals-terminates-equipment-build-for-its-Solwara-1-Project) (accessed December 20, 2013).

concretions formed between 4,000 and 6,000 m below sea level on the seabed.<sup>14</sup> Polymetallic nodules contain large quantities of metallic minerals, such as manganese, copper, cobalt, and nickel, which are essential for industrial development.

Mineral deposits with great economic value were especially widespread in the Clarion–Clipperton Fracture Zone of the eastern Pacific Ocean. The nickel contained in the polymetallic nodules is an essential material for chemical plants and oil refineries. The cobalt in the polymetallic nodules is useful for aircraft engines and the medical device industry. The copper is essential for communications and the electric power industry, and the manganese is an essential material in the steel industry. Because polymetallic nodules are composed of approximately 40 different metallic components, including the metals mentioned above, they have been called “black gold.”<sup>15</sup> Compared with cobalt-rich crust or polymetallic sulfides, the biggest advantage of polymetallic nodules is the reserve amount. This is based on the distribution characteristics of polymetallic nodules, which are buried in vast areas of the seabed surface.

## 2. Cobalt-rich Crust

Cobalt-rich crust is mineral resource formed by the adsorption of metals contained in seawater on the rock bed of sea mount slopes and includes strategic minerals, such as cobalt, nickel, copper, platinum, and manganese.<sup>16</sup> Obviously, it is called “cobalt-rich crust” because of its high cobalt content. Compared with polymetallic nodules, development of cobalt-rich crust is competitive with other sources of seabed metals, but it has the advantage, especially pertinent to its development, that it is found at shallower depths than polymetallic nodules. Also, it is more economical to harvest. The economic feasibility of harvesting cobalt-rich crusts has attracted attention to some cobalt-rich crusts with higher levels of cobalt, approximately three times (0.8 wt%) the average content in polymetallic

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<sup>14</sup> “Polymetallic Nodules,” Technical Brochures pp. 1–2.

<http://www.isa.org.jm/en/documents/technical> or

<http://www.isa.org.jm/files/documents/EN/Brochures/ENG7.pdf> (accessed December 7, 2012).

<sup>15</sup> Fillmore C.F. Earney, “Marine Mineral Resources” p. 76. Ocean Management & Policy Series, Advances in Maritime Research (London and New York: Routledge, 1990), pp. xxiv and 387.

<sup>16</sup> James R. Hein, “Geologic characteristics and geographic distribution of potential cobalt-rich ferromanganese crusts deposits in the Area,” *Mining Cobalt-Rich Ferromanganese Crusts and Polymetallic Sulphides Deposits: Technological and economic considerations*. U.S. Geological Survey, Menlo Park (ISA Workshop, 31 July – 4 August 2006), p. 59.

nodules.<sup>17</sup>

### 3. Polymetallic Sulfides

Polymetallic sulfides are deposits formed by the rising and eruption of metallic elements in the crust. They are dissolved into the seawater infiltrating under the seabed and are turned into hydrothermal water in reaction to high temperatures and pressure by volcanic rocks under the plate rift and spreading center axis which gushing up to the seabed along the rift and spreading center axis. The main components of polymetallic sulfides are base metals, such as copper, lead, and zinc, but they also contain precious metals, such as gold and silver. Polymetallic sulfides have the following advantages for development;<sup>18</sup> they are of a high metal class and high reserve quantity per unit area; they exist at shallower depths than do polymetallic nodules; and, the costs of a refining system can be reduced markedly because the use of existing land-based sulfide refineries is possible.

**Table 1. Comparison of resources - polymetallic nodules, polymetallic sulfides, and cobalt-rich crusts.**

Category	Polymetallic Nodules	Polymetallic Sulfide Deposits	Cobalt-rich Crusts
Distribution Area	C-C area of Pacific Ocean, Indian Ocean, Atlantic Ocean	Fracture zones in Pacific Ocean, Atlantic Ocean, Indian Ocean	Sea mounts in Pacific Ocean, Indian Ocean, Atlantic Ocean

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<sup>17</sup> Ministry of Land, Transport, and Maritime Affairs, 2005 “Development of Mineral Resources in the South-Pacific Ocean (Polymetallic Sulphides·Cobalt-rich Crust),” II. System and Economy Aspects, 2006. 5, p. i, p. 3.

<sup>18</sup> *Ibid.*

Category	Polymetallic Nodules	Polymetallic Sulfide Deposits	Cobalt-rich Crusts
National Jurisdiction	Cook Islands, Kiribati, Tuvalu	Fiji, Tonga, Japan, Papua New Guinea, Solomon Islands, Guam, Samoa	Johnston Islands, Federated States of Micronesia, Marshall Islands, Kiribati, Tuvalu, Samoa
Depths of Reserves	4,900 m – 5,000 m	Approximately 3,700 m	Average 800 m – 2,500 m
Metallic Components	40 types, including manganese, nickel, cobalt, zinc, iron, copper, aluminum titanium, and barium	30 types, including gold, silver, zinc, and copper	30 types, including manganese, cobalt, nickel, platinum, aluminum, germanium, titanium, copper, and lead
Metallic Class	Nickel 1.2%, copper 1.1%, manganese 28%, cobalt 0.2%	Various kinds and classes, depending on environment (gold 30 ppm, silver 1,500 ppm, copper 10.9%, zinc 29.7%)	Cobalt 0.5% – 1.2%, nickel 0.2% – 0.9%, platinum 0ppm – 1 ppm, copper 0.1% – 0.4%, manganese 17% – 25%
Value (US\$/ton)	308–926 Average 544	489–1,360 Average 819	337–1,051 Average 404

Category	Polymetallic Nodules	Polymetallic Sulfide Deposits	Cobalt-rich Crusts
Usage	Materials for iron manufacturing, steel manufacturing (manganese), aerospace and electronics industry (nickel, cobalt), basic materials for electrical industry (copper)	Materials for industrial use such as electronics and jewelry (gold, silver, copper, zinc)	Materials for advanced industries such as aerospace and electronics (nickel, cobalt), materials for jewelry (platinum)
Characteristics	Growth centered around diversified forms of nuclei (zoneplate), oxides	Forms mineral deposits by ore solution erupting through seabed rocks, sulfides	Coated on seabed rocks in the form of crust, oxides
Research Country	U.S., Belgium, Italy, Japan, Canada, Germany, U.K., India, France, Russia, China, Poland, Bulgaria, Czech, Korea	Australia, Canada, France, Germany, Japan, U.K., U.S., Italy, Portugal, Korea	Germany, France, Russia, China, Japan, Korea

### III. Provisions for Deep Seabed Mining in the Convention and the Agreement on Implementation

#### 1. UNCLOS

UNCLOS (the Convention) consists of a preamble, a main body, 320 articles, nine annexes, and four resolutions. The Convention defines “Deep Seabed” as “the seabed, ocean floor and subsoil beyond the coverage of waters of national jurisdiction” and declares the deep seabed and mineral

resources in the deep seabed as the common heritage of humankind.<sup>19</sup> Part XI of the Convention sets the direction of its basic policy towards planning for the healthy development of the world economy and the balanced growth of international trade through the orderly development and exploitation of deep seabed mineral resources and the reasonable management thereof; the pursuit of the development of all countries concerned by expanding participation in deep seabed development and increasing the benefits therefrom, especially by promoting the development of developing countries through technology transfer and participation in deep seabed development; and, the consideration of the benefits to the developing countries that are engaged in existing land-based production through production-limit policies.<sup>20</sup>

Operating under the major assumption that deep seabed exploration and extraction activities develop benefits for the common heritage of humankind as a whole, the Convention includes production policies that condition access to markets for the import of minerals produced from the resources of the area and that stipulate that imports of commodities produced from such minerals shall not be more favorably treated than are the most favorably treated imports from other sources.<sup>21</sup> The criteria for commercial production in the Convention stipulate that the quantity for production authorization should be decided on the basis of a nickel ceiling,<sup>22</sup> while also allowing appropriate measures for the prevention of monopolistic activities in deep seabed mining.<sup>23</sup> Provisions related to the maximum production ceiling and minimum production limits for deep seabed minerals and the protection of land-based production as well as the standard production ceiling specified by Article 151 of the Convention are typical of the framework for the controlled economic system envisaged for deep seabed mining.

The Authority grants priority approval to the following applicants: (a) those who give better assurances of performance, taking into account their financial and technical qualifications, and, their performance, if any, under previously approved work plans; (b) those who provide earlier prospective financial benefits to the Authority, taking into account when commercial production is scheduled to begin; and, (c) those who have already invested the most resources and the greatest effort in prospecting or exploration.<sup>24</sup>

With respect to technology transfer, the Convention stipulates that, when submitting a work plan, each applicant shall make available to the Authority a general description of the equipment and methods to be used in

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<sup>19</sup> See, UNCLOS Article 136.

<sup>20</sup> See, UNCLOS Article 150 (a) – (j).

<sup>21</sup> See, UNCLOS Article 150 (h)(i)(ii).

<sup>22</sup> See, UNCLOS Article 151, paras. 2 – 7.

<sup>23</sup> See, UNCLOS Annex III, Article 6, para. 3(c).

<sup>24</sup> See, UNCLOS Annex III, Article 7, para. 3.

carrying out the activities in the Area as well as other relevant non-proprietary information about the characteristics of such technology and information as to where such technology is available.<sup>25</sup> The Convention also stipulates that the contractor should make available to the Enterprise, on fair and reasonable commercial terms and conditions, whenever the Authority so requests, the technology that is being used in carrying out activities in the Area under the contract.<sup>26</sup> If the Enterprise is unable to obtain appropriate technology on fair and reasonable commercial terms and conditions sufficient to enable it to commence the recovery and processing of minerals from the Area in a timely manner, either the Council or the Assembly may convene a group of state parties composed of those who are engaged in activities in the Area, those that have sponsored entities engaged in activities in the area, and other state parties having access to such technology. This group shall consult together and take effective measures to ensure that such technology is made available to the Enterprise on fair and reasonable commercial terms and conditions. Each such state party shall take all feasible measures to this end within its own legal system.<sup>27</sup>

In terms of financial conditions, the Convention stipulates that the application fee for the approval of a project plan is US\$500,000<sup>28</sup> and imposes a fixed annual fee of US\$1,000,000 on all contractors.<sup>29</sup> However, in the event that the commencement of commercial production is delayed due to a delay in the approval of production, the annual fee is proportionately reduced for the period of delay. Contractors are required to pay whichever is higher, the production dues imposed from the commencement date of commercial production or the fixed annual fee. Contractors are also required to pay the Authority within one year from the commencement date of commercial production in the amount of the production dues alone or the production dues plus net profits, at the contractor's option.

## **2. Agreement on Implementation**

The Agreement on Implementation was formulated in the form of the Secretary General's informal Consultations on Outstanding Issues relating to the Deep Seabed Mining Provisions of the UN Convention on the Law of the Sea pursuant to the need to revise the deep seabed regime, which had been established in 1989 to solve problems with the deep seabed development system in the Convention. It established a development system that was controlled by an international organization instead of one

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<sup>25</sup> See, UNCLOS Annex III, Article 5, para. 1.

<sup>26</sup> See, UNCLOS Annex III, Article 5, para. 3(a).

<sup>27</sup> See, UNCLOS Annex III, Article 5, para. 5.

<sup>28</sup> See, UNCLOS Annex III, Article 13, para. 2.

<sup>29</sup> See, UNCLOS Annex III, Article 13, para. 3.

characterized by free competition. The need to revise the deep seabed regime gained further momentum with the demise of the East European bloc, and the prospect that the commencement of commercial production of deep seabed mining would be possible only 10 to 15 years hence. The session lead to nine core agenda items to secure universal approval of the Convention,<sup>30</sup> and a final draft for the Agreement on Implementation was created based on the agenda items.

The Agreement on Implementation consists of a preamble, 10 articles, and annexes; the Agreement and Part XI of the Convention are to be interpreted and applied together as a single instrument. In the event of any inconsistency between the Agreement and Part XI of the Convention, the Agreement is to prevail.<sup>31</sup> Some major contents related to deep seabed mining in the Agreement on Implementation is reviewed as follows:

First, in relation to the production policy, the Agreement on Implementation deleted the production authorization system, which had been aimed at protecting the developing countries that were engaged in land-based production of the same minerals as those produced from the deep seabed.<sup>32</sup> This abandonment of the production authorization system, an output of the centrally controlled economic systems of the past, reflected accommodation of the opinions of advanced western countries that adhere to a free-market economic system.<sup>33</sup>

With regard to technology transfer, the Agreement on Implementation precluded the provision on compulsory technology transfer in Article 5 of Annex III of the Convention in relation to the protection of privately owned intellectual property rights.<sup>34</sup>

Regarding economic support, the Agreement on Implementation requested that the Authority establish an economic assistance fund from the portion of the funds of the Authority that exceeded the amount necessary for the administrative expenses related to assisting those developing countries that suffered serious adverse effects on their export earnings or economies resulting from a reduction in the price of an affected mineral or in the volume of exports of that mineral, to the extent that such reduction was caused by activities in the Area.<sup>35</sup> The amount set aside for this purpose was to be determined by the Council from time to time, upon the

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<sup>30</sup> Organization and Operation Plan for Deep Seabed Enterprises: technology transfer, financial burden for the countries concerned, production limit policy, compensation fund for developing countries that engaged in land-based production, decision-making procedure, environmental preservation, review session, financial obligation of deep seabed mining enterprises.

<sup>31</sup> See, the Agreement on Implementation Article 2, para. 1.

<sup>32</sup> See, the Agreement on Implementation Annex, Section 6, para. 7.

<sup>33</sup> L.D.M Nelson, "The New Deep Seabed Mining Regime," 10. *The International Journal of Marine and Coastal Law* (1995), p. 199.

<sup>34</sup> See, the Agreement on Implementation Annex, Section 5, para. 2.

<sup>35</sup> See, the Agreement on Implementation Annex, Section 7, para. 1.

recommendation of the Finance Committee. Only funds from payments received from contractors, including the Enterprise, and voluntary contributions were to be used for the establishment of the economic assistance fund.<sup>36</sup>

In relation to the financial conditions of contracts, the Agreement on Implementation deleted the provision of Article 13 of Annex III of the Convention regarding financial conditions, which was very complex and too detailed.<sup>37</sup> Given the decision that it was reasonable to stipulate detailed financial conditions at the commercial production stage, as in the case of technology transfer and production policy, the Agreement on Implementation stipulates only general principles, providing no differentiation between the contractor and the deep seabed Enterprise, establishing a simple payment system, and, setting payment rates under the payment system within those applicable to the same or similar minerals from land-based mining.

#### **IV. Key Issues for Deep Seabed Mining**

##### **1. Payment System**

In relation to the payment system, the Agreement on Implementation stipulates in Article 8-1 of the Annex that the system should be “fair to both the contractor and the Authority.”<sup>38</sup> What does “fair” mean? The Agreement on Implementation stipulates the rates of payments and the principles and detailed methods governing the payment system. First, the Agreement on Implementation stipulates that the rates of payments under the system shall be within the ranges of those prevailing with respect to land-based mining of the same or similar minerals to avoid giving deep seabed miners an artificial competitive advantage or imposing a competitive disadvantage on them.<sup>39</sup> This stipulation should lead to fair competition with no incentive for or restriction on the promotion of deep seabed mining or the protection of land-based mining as deep seabed mining is inevitably in competition with land-based mining. As the rates of payments are to be set within the ranges of the rates widely applicable to land-based mining, a study of those rates of payments for land-based mining would seem to be necessary. The rates of payments for land-based mining inevitably differ from one country and one mineral to another because the economic situations and overall social systems of each country differ. Thus, given the differences in the respective systems, it will not be easy to establish rates of

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<sup>36</sup> See, the Agreement on Implementation Annex, Section 7, para. 1(a).

<sup>37</sup> See, the Agreement on Implementation Annex, Section 8, para. 2.

<sup>38</sup> See, the Agreement on Implementation Annex, Section 8, para. 1(a).

<sup>39</sup> See, the Agreement on Implementation Annex, Section 8, para. 1(b).

payment that will be acknowledged by deep seabed Enterprises as fair and reasonable.

The Agreement on Implementation explains the criteria for the establishment of the payment system,<sup>40</sup> requiring first that the system not be complex. It seems that this requirement originated from an understanding that the Convention had established a very complicated payment system, rendering its operation difficult. The Agreement also stipulates that the payment system should adopt a royalty system<sup>41</sup> or a mixed system with royalties and a profit-sharing.<sup>42</sup> It further stipulates that the contractor should choose between these options, and that changes in the payment system could be made based on mutual agreement between the Authority and the contractor. Future discussions should address issues related to the use of royalty-based and profit-sharing systems in the commercial development of deep seabed mineral resources.

Pursuant to Paragraph 7(b) of Resolution II, a fixed fee of US\$1,000,000 was imposed on pioneer investors, and an annual fixed fee was payable from the date of commencement of commercial production. The amount of the fee was to be established by the Council.<sup>43</sup> Accordingly, the amount of any fixed fee and the royalty amount as a percentage of profits remain to be decided. The Agreement on Implementation adjusted the fee for the administrative costs of processing an application for approval of a project plan at the exploration or development stage from US\$500,000<sup>44</sup> to US\$250,000<sup>45</sup>. However, the application fee for a project plan can be adjusted with some flexibility in the context of the consumer price index as the Board of Directors is requested to review the level of the fee from time to time<sup>46</sup> to ensure coverage of the administrative costs incurred. In

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<sup>40</sup> See, the Agreement on Implementation Annex, Section 8, para. 1(c).

<sup>41</sup> A certain share allocated to the products by the original property holder of the mining right (nation, local government, government-owned corporation, land owner) through the rental of the mining rights and the conclusion of service contracts and lease contracts without the burden of the costs of exploration and production of underground resources. <http://www3.kemco.or.kr>. Refer to the Energy Terms dictionary of the Korea Energy Management Corp.

<sup>42</sup> A service contract is a method for deciding the collection of input funds and risk compensation and is divided into profit sharing and production distribution methods. In a profit-sharing system in oil development, a foreign oil company is engaged in the whole process, from exploration and development to the sales of crude oil, and it collects its investment from the sales proceeds. The profit after the collection of investment is subject to income tax, which is shared by the oil-producing country and the foreign oil company according to a certain ratio, but, in reality, crude oil disposition rights are acknowledged to belong to the oil company, and the sales profit of the crude oil produced is shared equally. A production-sharing method was developed in Indonesia in the late 1960s, and this method was adopted by other oil-producing countries subsequently.

<sup>43</sup> See, the Agreement on Implementation Section 8, para. 1(d).

<sup>44</sup> See, UNCLOS Annex III, Article 13, para. 2.

<sup>45</sup> See, the Agreement on Implementation Section 8, para. 3.

<sup>46</sup> See, UNCLOS Annex III, Article 13, para. 2.

particular, in the case of the application fee for the Regulations for the Exploration of Polymetallic Sulphides, adopted in 2010, the applicants were requested to choose a one-time fixed fee of US\$500,000 or a fixed fee of US\$50,000 plus installment payments of annual dues.<sup>47</sup>

### **3. Production Policy**

The production policy was a typical framework for a controlled economic policy and was one of the core reasons that advanced western countries were reluctant to join the Convention. To address this problem, the Agreement on Implementation abolished the production limit policy stipulated in the Convention and instead adopted sound commercial principles.<sup>48</sup> The following are examples of the application of such commercial principles:<sup>49</sup> 1) a prohibition on subsidy payments for deep seabed activities; 2) no differential treatment of minerals produced from the deep seabed versus those from land-based production; and 3) the application of GATT regulations and rules. The Agreement on Implementation defined a subsidy payment<sup>50</sup> as the factor that is most antithetical to sound commercial principles and, in circumstances where a determination is made that a State Party has engaged in subsidization, which is prohibited, or has caused adverse effects on the interests of another State Party and appropriate steps have not been taken by the relevant State Party or Parties, a State Party may request the Council to take appropriate measures.<sup>51</sup>

The plan of work for exploitation approved by the Authority with respect to each mining area shall indicate an anticipated production schedule that includes the maximum estimated amounts of minerals that would likely be produced per year under the plan.<sup>52</sup> Although the production limit policy was abolished pursuant to free-market economic principles, sharp declines in mineral prices may be anticipated due to excessive production if deep seabed mining operates at full scale. Because such a sharp decline in mineral prices would be a core factor in making commercial development impossible by destroying the profitability of deep seabed mining, the ways in which appropriate mineral prices for commercial production can be maintained is an important core issue.

### **3. Procedures Related to Applications and Approval of Development Plans**

One important aspect of the commercial development of the deep seabed

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<sup>47</sup> See, Regulations for Prospecting and Exploration of Polymetallic Sulphides, Regulation 21.

<sup>48</sup> See, the Agreement on Implementation Annex, Section 6, para. 1(a).

<sup>49</sup> See, the Agreement on Implementation Annex, Section 6, para. 1.

<sup>50</sup> See, the Agreement on Implementation Annex, Section 6, para. 3.

<sup>51</sup> See, the Agreement on Implementation Annex, Section 6, para. 1(g).

<sup>52</sup> See, the Agreement on Implementation Annex, Section 6, para. 1(e).

involves the procedures related to applications and approval of development plans. In particular, it would seem necessary to have a stipulation about the abandonment and cancellation of development rights in relation to the period of development rights. Regarding the period of development rights, the Korean Deep Seabed Mining Act gives a basic period of 30 years, with the possibility of adding two five-year periods, for a total of 40 years.<sup>53</sup> Setting a development period may serve as an institutional contributor to the acceleration of commercial production by the developer. Accordingly, judgment is involved in the decision about whether to allow an unlimited period or an appropriately limited time period for development. The decision will likely vary depending on the mineral deposit, such as polymetallic nodules, polymetallic sulfides, and cobalt-rich crust. For example, in cases of polymetallic sulfides and cobalt-rich crust, all commercial developments may be completed in the allocated mining concession within 20–30 years because the quantities are relatively limited. By contrast, the quantities of polymetallic nodules are believed to be immense, and thus all development will not likely be completed in 20–30 years. Korea has reserve quantities that should allow development for more than 100 years at a rate of 3 million tons per year.

Situations may arise in which, after obtaining development rights, a developer has to give up the development during development activities for some reason. In such cases, post-control measures for the target area under development are necessary. For example, measures to remove equipment that was used in the development activities or actions to protect the marine environment may be necessary. Additionally, in cases where a developer violates any international obligation during development, appropriate provisions to enable the cancellation of development rights are required.

The Agreement on Implementation clarified the information required at the time of preparing the development project plan, specified provisions for financial and technical descriptions, mandated a written oath including the core factors mentioned above, and, required a production plan that includes estimated annual maximum production.<sup>54</sup>

#### **4. Protection of the Marine Environment**

One of the biggest issues related to any discussion of deep seabed mining is the protection of the marine environment. The Convention imposes general obligations<sup>55</sup> on contracting countries to protect and preserve the marine environment. As the Convention stipulates that each contracting country has to conduct activities under its control so as to not cause damage from

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<sup>53</sup> See, Submarine Mineral Resources Development Act (Act No. 10596, Apr. 14, 2011), Article. 10.

<sup>54</sup> See, the Agreement on Implementation Annex, Section 6, para. 1(e).

<sup>55</sup> See, UNCLOS Article 192.

pollution to other countries,<sup>56</sup> deep seabed mining Enterprises must take measures to protect the marine environment to ensure that any pollution due to mining activities does not cause damage to other countries. This provision seems to create a national obligation to prevent damage beyond national maritime boundaries.

The Convention requested the Authority to take appropriate measures to effectively protect the marine environment from harmful influences that may be caused by deep seabed activities. Thus, a question arises as to what protection and preservation measures are needed for the marine environment. It is expected that measures to protect the environment from damages related to the onboard processing of mined minerals will be needed in the development area. Section 4.3 of Article 1 of the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters of December 29, 1972 stipulates that “the disposition or storage of the wastes or other materials, which are directly generated from the exploration and development of seabed mineral resources and subsequent marine processing is not subject to the application of the provisions of this Protocol.” Thus, it seems that special measures regarding any environmental pollution incurred at the time of onboard processing should be included in the regulations for the development of deep seabed mining.

Based on scientific principles, issues that have to be dealt with at the time of mining at a deep seabed site include problems such as blocking floating materials, preventing damage to flora and fauna that inhabit the surrounding area, and preventing, mitigating, and controlling<sup>57</sup> influences on the ecological balance in the marine environment. These would all seem to be issues for discussion. Measures for the preservation of species are a general obligation that is also stipulated in the Convention on Biological Diversity (CBD). Measures for the protection of the environment include activities related to continuous environmental monitoring in the service of prevention<sup>58</sup> advanced environmental impact assessment<sup>59</sup> and development processes, as well as the general obligation to compensate for environmental damage and to restore damaged areas to their original state.

## **5. Technology Transfer**

In relation to technology transfer, the Agreement on Implementation stipulates that the Enterprise and developing States wishing to obtain deep

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<sup>56</sup> See, UNCLOS Article 194, para. 2.

<sup>57</sup> See, UNCLOS Article 145.

<sup>58</sup> Rio Declaration on Environment and Development, Principle 15; International Tribunal for the Law of the Sea, Responsibilities and Obligations of States sponsoring persons and entities with respect to activities in the Area (Request for Advisory Opinion submitted to the Seabed Disputes Chamber), Case No. 17.

<sup>59</sup> See, UNCLOS Article 206.

seabed mining technology shall seek to obtain such technology on fair and reasonable commercial terms and conditions in the open market or through joint-venture arrangements.<sup>60</sup> If the Enterprise or developing States are unable to obtain deep seabed mining technology, the Authority may request any or all of the contractors and their respective sponsoring State or States to cooperate in facilitating the acquisition of deep seabed mining technology by the Enterprise or its joint venture or by a developing State or States seeking to acquire such technology on fair and reasonable commercial terms, and, conditions that are consistent with the effective protection of intellectual property rights. State parties must cooperate fully and effectively with the Authority for this purpose and ensure that contractors sponsored by them also cooperate fully with the Authority.<sup>61</sup>

A core issue related to technology transfer is that technology transfer should occur on fair and reasonable commercial terms and conditions in the open market. This means that ultimately, general principles for the protection of intellectual property rights in deep seabed mining technology should be followed. Intellectual property rights are a value system governing the output of the mentally creative activities of humans and consist of copyright and industrial property rights (e.g., patent rights, utility model rights, design rights, trademark rights). The World Intellectual Property Organization (WIPO) was established to protect intellectual property rights, and the Industrial Property Protection Convention (the Paris Convention), the Patent Cooperation Treaty (PCT), and the Universal Copyright Convention (UCC) are international laws related to intellectual property rights.

## **6. Other Pertinent Regulations**

Another issue that should be included in the mining regulations for the commercial development of deep seabed resources concerns reporting obligations with respect to data acquisition and the status of mining activities. Enterprises will typically conduct initial deep seabed mining operations through joint ventures. Upon the approval of a plan of work for exploitation by an entity other than the Enterprise, the Council shall take up the issue of the functioning of the Enterprise independently of the Secretariat of the Authority. If joint-venture operations with the Enterprise employ sound commercial principles, the Council will issue a directive providing for such independent functioning.<sup>62</sup>

## **V. Conclusions**

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<sup>60</sup> See, the Agreement on Implementation Annex, Section 5, para. 1(a).

<sup>61</sup> See, the Agreement on Implementation Annex, Section 5, para. 1(b).

<sup>62</sup> See, the Agreement on Implementation Annex, Section 2, para.2.

It had been forecast that the commercial development of deep seabed polymetallic nodules would not be possible until 2033. However, the development of polymetallic sulfides by private enterprises, such as Nautilus Minerals and Neptune Minerals, off the islands in the Pacific Ocean has suggested that commercial production could be possible in 2013. It would seem that momentum in marine mining has progressed to the point at which these endeavors became an independent industry. In recognition of this change in status, Fiji requested the enactment of regulations on the commercial development of polymetallic nodules at the conference of the 17<sup>th</sup> session of the Authority, and it is anticipated that full-scale discussion of the commercial development of deep seabed mineral resources would occur in 2013.

In terms of the commercial development of deep seabed mineral resources, UNCLOS provided regulations on production limit policies, compulsory technology transfer, and financial conditions, but these regulations reflected controlled economic systems of the past, and the regulations could not secure universal approval because the advanced western countries that were actually implementing commercial development activities objected to those regulations. To solve these problems, the Agreement on Implementation, which reflected a free-market economic system, was adopted. The Agreement on Implementation precluded the prior production policy and technology transfer system, and dissipated the negative views of the advanced western countries about joining the Convention and lead to universal approval of the Convention.

The Agreement on Implementation defined only basic principles, stipulating that detailed regulations related to commercial production should be discussed separately when commercial development of the deep seabed became possible. If the private enterprises currently exploring deep seabed mining become successful, it is anticipated that true commercial development of the deep seabed area will begin. Accordingly, issues to be dealt with at the level of the Authority include regulations on the fees for development applications, royalty amounts, procedures related to applications and approval of project plans, measures for protection of the marine environment, technology transfer, data acquisition, and reporting obligations with regard to mining activities.

Urgent issues to consider in relation to the commercial development of the deep seabed include how to balance it (develop it competitively?) with land-based mining. Of course, the Agreement on Implementation requires enactment of various regulations on deep seabed mining in accordance with a “no differentiation” principle, and it is inevitable that land-based mining and deep seabed mining will be competitors. Accordingly, studies about various implementation issues related to environmental protection, together with a review of the profit-sharing systems used in land-based mining, would also seem to be necessary. However, we will have

to use our best efforts to avoid making errors that hinder economic development due to excessive controls in the service of environmental protection, so that deep seabed mining can be implemented for the common benefit of mankind. This is a fundamental idea behind the deep seabed regime, but it is relevant only if there *is* commercial development.