

Call for the development and transfer of marine science and technology

Policy Memorandum to: The International Seabed Authority

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Executive Summary: The international seabed, also known as the Area, consists of the seabed, ocean floor, and subsoil thereof beyond the limits of any national jurisdiction, and is governed by the International Seabed Authority. Under the United Nations Convention on the Law of the Sea, the Authority has a prescribed function to acquire scientific knowledge and monitor the development of marine technology. However, a recent review report prepared by the Seascope Consultants on the organization's operation indicated that "the previous lack of engagement by the Authority in managing and encouraging the sharing of environmental data ... [was] a missed opportunity, which has led to much greater efforts being required to fill gaps in knowledge."¹ The review report also pointed out that the Authority had not carried out any significant work to monitor the development and transfer of marine technology relevant to activities in the Area. Drawing on analysis of the current legal framework and its implementation, this memo outlines challenges in the development and transfer of marine science and technology, and suggests that the Authority could develop a technology diffusion process that would include both patent licensing and research data sharing arrangements. It could cooperate with states and other organizations to implement the process, thereby achieving better governance of the Area and its resources.

¹ Seascope Consultants Limited, *Periodic Review of the International Seabed Authority pursuant to UNCLOS Article 154* (2016), 27.

I. Introduction

The 1982 United Nations Convention on the Law of the Sea (UNCLOS) and the 1994 Agreement relating to the Implementation of Part XI of the UNCLOS (1994 Agreement) established a legal regime for the international seabed, also known as the Area, which is beyond the limits of any national jurisdiction. Under the UNCLOS, the Area and its mineral resources are part of the common heritage of humanity.² The International Seabed Authority (ISA) is an autonomous organization to organize and control activities in the Area, particularly to administer the common heritage resources. The ISA contracts with entities that intend to extract the Area's mineral resources, and ensures that such contractors follow its regulations.³

The ISA is focused on developing detailed rules and regulations to fill gaps in the UNCLOS's framework. Drafters and signatories did not intend the UNCLOS to provide a comprehensive legal framework covering all aspects of the Area's regulation. They expected that the legal regime would be developed gradually as knowledge of the Area expanded. To date, the ISA has issued regulations on prospecting and exploration for nodules, sulphides and crusts of the Area.⁴ In 2014, the ISA moved from the regulation of prospecting and exploration to the regulation of exploitation of

the mineral resources.⁵ At this critical juncture, in 2015, the ISA appointed an independent consulting firm, the Seascope Consultants, to conduct a review with the aim of improving the ISA's operation. In May 2016, the consultants issued an interim report indicating that the ISA had not carried out any significant work to monitor the development and transfer of marine technology relevant to activities in the Area, and it is necessary to manage and encourage the sharing of environmental data to fill gaps in knowledge.⁶

This memo focuses on issues regarding the development and transfer of marine science and technology pertaining to the Area, and explores feasible mechanisms for facilitating technological innovation and ensuring that future seabed mining in an environmentally sustainable way.

II. Significance for the exploration and exploitation of resources in the Area

A variety of mineral resources and biological diversity lie in the Area, including polymetallic nodules on the abyssal plains, cobalt-rich ferromanganese crusts on and around the volcanic seamounts, polymetallic sulphides near the hydrothermal vents, and diverse species of flora and fauna in the ecosystem.⁷

Due to advances in marine technology and limited access to terrestrial resources, many states and private enterprises have made considerable investments in studying and exploring the Area.⁸ For

² In 1967, Ambassador Arvid Pardo, Ambassador of Malta to the United Nations, proposed the concept of the Area as a common heritage. Ambassador Pardo originally called the "common heritage of humanity" the "common heritage of mankind." This memo makes no distinction between two terms. Arvid Pardo, "Law of the Sea Conference – What Went Wrong," in *Managing Ocean Resources: A Primer*, ed., Robert L. Friedheim (Westview Press, 1979), 140.

³ To date, the ISA has reached 26 contracts for the exploration of mineral resources in the Area: 16 for polymetallic nodules in the Clarion-Clipperton Fracture Zone and the Central Indian Ocean Basin, 6 for polymetallic sulphides in the South West Indian Ridge, the Central Indian Ridge and the Mid-Atlantic Ridge, and 4 for cobalt-rich crusts in the Western Pacific Ocean. International Seabed Authority. "Deep Seabed Minerals Contractors." <https://www.isa.org.jm/deep-seabed-minerals-contractors> (accessed Jan. 24, 2017).

⁴ International Seabed Authority. "The Mining Code." <https://www.isa.org.jm/mining-code/Regulations>. (accessed Jan. 24, 2017).

⁵ International Seabed Authority. "Ongoing Development of Regulations on Exploitation of Mineral Resources in the Area." <https://www.isa.org.jm/legal-instruments/ongoing-development-regulations-exploitation-mineral-resources-area>. (accessed Jan. 24, 2017).

⁶ Seascope Consultants Limited, *Periodic Review*, 27-28.

⁷ Salvatore Arico & Charlotte Salpin, "Bioprospecting of Genetic Resources in the Deep Seabed: Scientific, Legal and Policy Aspects," *U.N. Univ.-Inst. of Advanced Studies* (2005): 9-15, <http://i.unu.edu/media/unu.edu/publication/28370/DeepSeabed1.pdf> (accessed Jan. 20, 2017).

⁸ The principal drivers of new interest in mineral resources of the Area include: "a dramatic increase in demand for metal; an equally dramatic rise in metal prices; the high profitability of mining sector companies; a decline in the tonnage and grade of land-based nickel, copper and cobalt sulphide deposits; and technological advances in deep seabed mining and processing."

example, the European Union has granted more than 9 million Euros in funding for the PharmaSea project, which brings together 24 partners from industry, academia, and non-profit organizations to search the deep sea trenches for bioactive compounds.⁹ Another example is a series of projects launched by the international European consortium, such as the Blue Mining project to accelerate innovations for sustainable deep sea mining¹⁰ and the Managing Impacts of Deep Sea Resource Exploitation (MIDAS) project to investigate the environmental impacts of the extractive activities.¹¹ These projects could vastly expand human knowledge and lead to the development of beneficial and patentable products and processes.

In fact, many patents have already been granted to technologies and methods for exploring and exploiting the Area, including ships, risers, dredge heads, subsea vehicles, submersibles, semisubmersibles, mechanical conveyors, hydraulic conveyors, subsea mining technologies and ancillary technologies.¹² Significant potential also exists for the discovery of new biodiversity in the Area and for

development of industrial and pharmaceutical uses of Area's resources. For instance, some companies have already marketed products derived from the deep sea biological resources both within and beyond their national boundaries. The first commercialized molecule from the Area is ziconotide, which is an ω -conotoxin identified in the venom of the cone snail *Conus magus*.¹³

Although there is no regulation on exploring or exploiting biological resources in the Area, the UNCLOS defines the functions of the ISA, including its responsibility to ensure effective protection of the marine environment from the harmful effects of mining. Therefore, since its inception, the ISA has adopted a number of rules, regulations and procedures, and convened a series of workshops on environmental protection of the Area.

III. Challenges in the development and transfer of marine science and technology

Disagreements among countries over a regime for governing the Area were a significant reason for the decade-long delay before the UNCLOS entered into force. Economists and policymakers from the United States and other industrialized countries generally oppose a regime built on the common heritage principle.¹⁴ They believe that it is the preferred vehicle by which developing countries delay the exploitation of common spaces on the logic that it is better for no state to harvest and appropriate common resources than for only

International Seabed Authority. "Towards the Development of a Regulatory Framework for Polymetallic Nodule Exploitation in the Area."

<http://www.isa.org.jm/files/documents/EN/Pubs/TStudy11.pdf> (accessed Jan. 9, 2017).

⁹ PharmaSea. "9 Million Euros EU-project on Deep-Sea Organisms Started." <http://www.pharma-sea.eu/news/pharmasea-project-started.html> (accessed Jan. 24, 2017).

¹⁰ Blue Mining. "Blue Mining: Breakthrough Solutions for Sustainable Deep Sea Mining." <http://www.bluemining.eu> (accessed Jan. 24, 2017).

¹¹ MIDAS. "The MIDAS Consortium." <https://www.eu-midas.net/about> (accessed Jan. 24, 2017).

¹² US, Japan and Russia currently lead the world in the development of technology for deep sea exploration and mining. International Seabed Authority. "Patents Issued for Technologies for Deep Seabed Polymetallic Nodule Exploration and Mining." <http://www.isa.org.jm/files/documents/EN/Patents/CD1.pdf> (accessed Jan. 9, 2017). There is an increasing number of patent applications for relevant technology by industries, academic communicates, and professional research institutions. Korean Intellectual Property Office. "Significant Increase in Number of Patent Applications of Robotic Technology for Deep-sea Exploration and Resource Development." http://www.kipo.go.kr/kpo/user.tdf?a=user.english.board.BoardApp&c=1003&board_id=kiponews&catmenu=ek06_01_01&seq=1511 (accessed Jan. 9, 2017).

¹³ Arico and Salpin, "Bioprospecting," 20-21.

¹⁴ According to Ambassador Pardo's proposal, the common heritage principle has five basic components: "First, the common heritage of mankind could not be appropriated; it was open to use by the international community but was not owned by the international community. Second, it required a system of management in which all users have a right to share. Third, it implied an active sharing of benefits, not only financially but also benefits derived from shared management and transfer of technology, thus radically transforming the conventional relationships between states and traditional concepts of development aid. Fourth, the concept of common heritage implied reservation for peaceful purposes, insofar as politically achievable, and, fifth, it implied reservation for future generations, [creating] environmental implications." Pardo, "Law of the Sea Conference," 141.

industrialized countries to do so.¹⁵ Some commentators further contend that if firms are forced to transfer their own technology for deep seabed activities to developing countries, firms from developing countries will gain an undeserved competitive advantage, resulting in a free rider problem.¹⁶

The exploration or exploitation of resources in the Area requires an investment of money, time and technological development. Countries and firms will be unwilling to make such investments when free riders might deter them from recouping their investments or obtaining reasonable profit. In brief, free riders would undermine incentives for discoverers and developers to invest in exploring or exploitation the Area.

Obviously, economic and technical factors can lead to tensions between industrialized countries with the capacity to explore and exploit the Area's resources and developing countries which have few such capacities. To address conflicts regarding the seabed mining provisions contained in Part XI of the UNCLOS, the Secretary-General of the United Nations convened a series of informal consultations from 1990 to 1994.¹⁷ At these consultations, industrialized countries expressed two major concerns about technology transfer mandates: (1) principled opposition; and (2) practical difficulties for the commercial operators, particularly if they are not owners of the technology in question. After extensive discussions and negotiations, those consultations led to the adoption of the 1994 Agreement.¹⁸

Since the 1994 Agreement modified the original technology transfer provisions, the major implications are those general principles governing activities in the Area. For instance, the development of the Area's resources shall be based on sound commercial principles. The system of payments should be fair both to the contractors and to the ISA, and should have no preferential access to markets for the resources from the Area. Furthermore, Article 5 of Annex III to the UNCLOS, which dealt with the transfer of technology to the ISA and developing countries, no longer applies as a result of the 1994 Agreement.

Patents imply a restriction of third parties' rights to use and exploit resources, and therefore Area-related intellectual property rights are potentially in conflict with the common heritage principle. While the UNCLOS anticipates that users will privatize and commodify the Area's resources, it also attempts to honor the common heritage by stipulating that the resulting benefits are equitably shared. In other words, when the common heritage principle is operationalized, this conflict is rendered consistent if the benefits are equitably shared and the resources are sustainably used. There is a large body of literature focusing on the relation of intellectual property to the common heritage principle of the UNCLOS.

Acting as a focal point in the fields of marine scientific research and the transfer of marine technology, the Intergovernmental Oceanographic Commission (IOC) developed the Criteria and Guidelines on the Transfer of Marine Technology in 2005,¹⁹ and conducted a survey of states' practices with respect to the transfer of marine technology.²⁰ It found *inter alia* that resource

¹⁵ Bradley Larschan and Bonnie C. Brenna, "The Common Heritage of Mankind Principle in International Law," *Columbia Journal of Transnational Law* 21 (1983): 306-10.

¹⁶ Free Rider occurs "when one person seeks their self-interest at the expense of others by not contributing to a joint effort when the person will benefit from the contribution of others." Charlotte Hess and Elinor Ostrom, "A Framework for Analysing the Microbiological Commons," *International Social Science Journal* 58 (2006): 338.

¹⁷ U.N. Secretary-General, *Consultations of the Secretary-General on Outstanding Issues Relating to the Deep Seabed Mining Provisions of the United Nations Convention on the Law of the Sea*, U.N. Doc. A/48/950 (1994).

¹⁸ International Seabed Authority. "Secretary-General's Informal Consultations on Outstanding Issues Relating to

the Deep Seabed Mining Provisions of the United Nations Convention on the Law of the Sea: Collected Documents." <https://www.isa.org.jm/files/documents/EN/Pubs/SG- InformConsultations-ae.pdf> (accessed Jan. 24, 2017).

¹⁹ Intergovernmental Oceanographic Commission Advisory Body of Experts on the Law of the Sea, *IOC Criteria and Guidelines on the Transfer of Marine Technology* (2005).

²⁰ Elizabeth J. Tirpak, *Practices of States in the Fields of Marine Scientific Research and Transfer of Marine Technology: An Update of the 2005 Analysis of Member State Response to Questionnaire No. 3*, IOC/ABE-LOS VIII/8 (2008).

limitations were a leading deterrent to the transfer of marine technology for both the technology developer or supplier and the potential recipient. Other barriers included languages, customs limitations, and the lack of a focal point or organization for technology transfer. Over half the respondents reported difficulty in conducting technology transfer. At a meeting of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea, some states stressed that implementing the marine technology transfer provisions proved challenging because such technology was often subject to proprietary rights and suggested that cooperation schemes be developed to address these intellectual property issues.²¹

There is no legal instrument or governance mechanism that explicitly controls the distribution of benefits derived from the Area, and the degree to which the ISA can promote technology transfer, including licensing of intellectual property, is unclear. However, the UNCLOS still includes general provisions for technology transfer, which specify that if developing countries are unable to obtain deep seabed mining technology, the ISA may request that contractors and their sponsoring states cooperate in facilitating the acquisition of the technology in question. Furthermore, the ISA has a prescribed function to acquire scientific knowledge and monitor the development of marine technology. To date, the ISA has monitored technology development through the annual reports of contractors; however, there is no specific mechanism for the transfer of marine science and technology. The ISA could do more to incentivize the development and transfer of marine science and technology pertaining to the Area.

IV. Proposals for patent licensing and research data sharing

This memo proposes a technology diffusion process that would include both patent licensing and research data sharing arrangements, implemented

and overseen by the ISA for the development and transfer of marine science and technology relevant to activities in the Area.²² The process applies to Area-related technology, in particular technology regarding the protection and preservation of the marine environment.

The proposed patent licensing pertaining to the Area incorporates the Fair, Reasonable, and Non-Discriminatory licensing concept (FRAND).²³ This contemporary concept is developed in the context of patent pools and voluntary standard setting organizations (SSOs), and used primarily in the field of communications technology. To negotiate the tension between proprietary control of standard-related patents and the need for common access to the patented technologies, SSOs negotiate a “middle ground” requiring firms participating in standard-setting to license their patents on FRAND grounds. Without the FRAND commitment, patent holders can use the power that is inherent to impose unfair, unreasonable and discriminatory licensing terms, resulting in holdouts (patent holders who would charge licensing costs far above the ordinary market value for competitors to acquire the last patent necessary to complete the standard). This behavior would damage competition and inflate the patent holder’s own relative position. The FRAND commitment can provide suitable incentives for voluntary licensing and benefits to both the licensor and the licensee.

The general concept of a FRAND commitment is consistent with the common heritage principle and voluntary technology transfer in the context of the UNCLOS. As Peter-Tobias Stoll noted twenty years ago, key to the operation of technology diffusion through the ISA is the interpretation of the phrase “fair and reasonable commercial terms and conditions” in the UNCLOS and the 1994

²¹ U.N. General Assembly, *Report on the Work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at Its Eleventh Meeting*, U.N. Doc. A/RES/65/164 (2010), para. 58.

²² For the description of an empirical study on the processes, practices, and institutional infrastructure by which the ISA currently governs the Area, see Yao Zhou, “Governance in the International Seabed: Technology Diffusion and Its Implementation” (SJD diss., University of Wisconsin-Madison, 2016), 176-208.

²³ The Fair, Reasonable and Non-discriminatory (FRAND) term is used in Europe. The Reasonable and Non-discriminatory (RAND) term is known in the United States. Jorge L. Contreras, *Standards Development Patent Policy Manual* (American Bar Association, 2007), 22-23. This memo uses FRAND because that phrase more closely tracks the language and spirit of the UNCLOS.

Agreement.²⁴ Therefore, this memo proposes that those terms be given meaning in the licensing by drawing on recent national and international experience with the FRAND licensing of other types of technology.

Under this proposal, patent licensing would be voluntary. Licensing would occur among countries who hold essential patents for technologies used in the exploration, exploitation, and protection of the Area's resources, and technology users, particularly those from developing countries. This process would also provide for reasonable and tiered pricing and other terms of licensing to facilitate access for developing countries.

Regarding the implementation of this proposed process, in accordance with the UNCLOS, when developing countries cannot obtain Area-related technology on the open market, the ISA has the authority to convene a special group that "shall cooperate with [the Authority] in facilitating the acquisition of ... technology ..." ²⁵ The special group will be composed of contractors who have developed technologies, their sponsoring states, and other states parties. The patent licensing proposed here would expand on this notion of a special group, envisioning a standing or rotating group of states, contractors, NGOs, and other stakeholders that would collectively develop terms for licensing a pool of patents for Area-related technologies. This memo suggests that the ISA could provide an institutional framework for convening and operating the group, along with incentives for participation by patent holders. The group would determine what constitutes fair and reasonable licensing terms, which should include tiered pricing to promote access by developing countries. The group could also operate as a standard setting organization if standards became necessary for the development of an Area-related technology.

As research data sharing is a critical practice to establishing baselines for the Area's environmental

measurements, the ISA currently develops an integrated database to govern the activities of the Area.²⁶ This memo suggests that the ISA could adopt some approaches, such as better data management and data sharing mechanism, as a requirement before mining can begin. It could incorporate data sharing requirements, particularly for the sharing of environmental data, into the contracts for exploring and exploiting the Area's resources.

IV. Conclusion

For ensuring future seabed mining in an environmentally sustainable way, the ISA should develop specific mechanisms for the transfer of marine science and technology, especially for technology relating to the protection and preservation of the marine environment. It should cooperate with states and other organizations to implement such a mechanism. The technology diffusion process proposed here, including patent licensing and research data sharing arrangements, could help the ISA to effectively develop the exploitation regulations and move into another phase for better governance in the Area.

²⁴ Peter-Tobias Stoll, "The Entry into Force of the Convention on the Law of the Sea: A Redistribution of Competences in Relation to the Management of the International Commons? The Transfer of Technology under the Implementation Agreement," *ZaöRV* 55 (1995): 391.

²⁵ Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, July 28, 1994, S. Treaty Doc. No. 103-39, 1836 U.N.T.S. 3, sec. 5, para. 1.

²⁶ International Seabed Authority. "International Seabed Authority Ends Historic Session." <http://isa.org.jm/news/international-seabed-authority-ends-historic-session> (accessed Mar. 9, 2015).

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