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Investigating challenges of a sustainable use of marine mineral resources

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Abstract

High-tech products as well as renewable energy systems require ever-increasing quantities and more different metals. The extraction of metals and industrial minerals for the production of consumer goods and machines take place almost exclusively on land now. However, the interest in marine mineral resources has been re-inflamed due to the problem of geopolitical availability, such as fragile or failed raw material states and oligopolistic structures among the producers. This article gives a brief outline of the political, social and economic context of this change in interest in marine mineral raw materials extraction.

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1. Introduction

Humanity has the ability to make development sustainable, to ensure that it “meets the needs of the present without compromising the ability of future generations to meet their own needs...” [1] Thus, the definition of sustainable development was introduced in the report of the 1987th Brundtland Commission. This was the first major milestone and a good starting point addressing sustainable issues. The definition of sustainable development can be traced further back, when in the 1972 Stockholm Conference on the Human Environment the conflicts between environment and development were first acknowledged. To promote sustainable development, the UN Conference

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on Environment and Development was set in Rio de Janeiro in 1992, which led to the Agenda 21, which essentially outlined the actions and international agreements on climate change and biodiversity. [2] In contrast to Agenda 21, the UN declared eight development targets to be achieved by 2015, with its Millennium Development Goals. A list of 21 targets in the fields of poverty, human rights, equality, democracy, environmental sustainability and peace was signed by the 189 member states in the year 2000. [3] Compared to former UN development policies, the objectives were developed in cooperation between governments, international organizations and companies. Moreover, the objectives were more comprehensive and concrete than previous attempts had been. On the basis of the results, as well as from national and international political efforts, further measures were adopted at an international level. For example, in September 2015, the UN General Assembly adopted a sustainable development agenda for the next 15 years. The agenda contains 17 key sustainable development objectives and 169 targets to be reached by 2030. The objectives represent a further development of the Millennium Development Goals from the year 2000. For the first time key objectives like Oceans, seas and marine resources (Goal 14), as well as Production and Global partnership (Goal 17) were explicitly addressed. [4]

Although 30 years after the achievement of sustainable was first defined, including supplements, which lead to further successful development, it still can be stated that there is an inherent ambiguity in the definition. It quickly becomes apparent that definitions can vary a great deal, depending upon perspective. For sustainable development, this means that the differences in the perspectives, with regard to non-renewable energies, can still be individually interpreted, in accordance with each stakeholder: e.g. industry, society and government. It may mean for the industry or business sustained profits. For the various sectors of society the definition is more complex. On the one hand, in the case of mining and other resource extraction, industries have the potential to cause negative effects on the environment, local human health and social well-being. On the other hand mining also generates income and vital raw materials for society. All the various interests of the stakeholder groups are further complicated because they are not independent, and commonly overlap. [5] Bearing this in mind, this paper deals with a new chapter in the commercial exploitation of marine resources, which will open in an area beyond national jurisdiction (ABNJ) – the deep sea. The excavation of massive sulfides and manganese nodules is expected to begin within the next few years. In addition to the two mentioned deposits, cobalt crusts are also of interest for marine mining. For high-tech products and new developments these three deposits, which contain different valuable metals are of great interest. Natural gas and oil have been extracted from the seas for decades, but the ores and mineral deposits on the sea floor in the ABNJ have attracted little interest so far. Main reasons for this behavior were the limited commercial interest on the side of investors because of stable economy reasons, in combination with the lack of new technologies capable of realizing such a difficult project. [6] Yet as resource prices rise and problems of political availability develop, such as fragile or failed raw material states and oligopolistic structures among the producers aggregate, the appeal of ocean mining and interest in mineral raw materials of the deep sea has been renewed.

The following chapters will give a brief introduction in the current situation of the distribution of the raw mineral resources. It describes the current state of art with regard to the regulations of the future planned mining of raw marine materials. After a description of the resources of interest from the ABNJ region, a comparison of the reserves on land and their use in high-tech products and technologies follows. The approach contains recommendations for action on the activities to achieve the objectives, with reference to the fields of technologies, environmental studies, ecological impacts and legal conventions.

2. Resources of interest for high-tech products and new technologies

2.1. Interest in resources of the deep sea

The current situation is that the International Seabed Authority (ISA) has approved a total of 28 contracts for exploration, which covers more than 1.3 million square kilometers of the seabed in the ABNJ. Explorative work is taking place simultaneously in the Pacific, Indian and Atlantic oceans. The map (Fig. 1) shows the Clarion - Clipperton Zone in the Central Pacific where 14 contractors are exploring for polymetallic nodules. [6]

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