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New scientific discoveries confirmed the widespread occurrence of the deep-sea polymetallic nodules. Encouraged by these findings, several groups of private, semi-private and public enterprises became active in the search for deposits of these minerals. This marked the transition from purely scientific research in these mineral occurrences to commercial interest in the metal bearing lumps. The initial groups of innovators, whose primary objective for undertaking the search for deep-sea bed polymetallic nodules mineral nodules was to determine their commercial viability, faced formidable obstacles.

Firstly, information about the minerals and their environment of deposition was inadequate. It still is. Secondly, technology for mining them was non-existent and thirdly very

Marine metal and non-metal, non-fuel mineral deposits were considered to be primarily derived

undertake assessments of the metal contents of the polymetallic nodules in the Area, based on the data and information available to it. In this regard, the Authority undertook a study to assess the metal resources of polymetallic nodule deposits that are found in the reserved areas of the Clarion-Clipperton Fracture Zone (CCZ) based on the data and information that had been received from the six pioneer investors who had prospected these sites. The study suggested that billions of tons of the copper, manganese, cobalt and nickel are to be found in these deposits. However, there is as yet no technology that has been proven for their commercial recovery. Additionally, the land-based mines that supply these metals appear to be more than adequate. So while polymetallic nodules sit at the bottom of the ocean *in situ*, as the common heritage of mankind, until they can be recovered at a profit, we are not in the position to benefit at all from them.

There are a number of factors that will contribute to the establishment of deep-sea polymetallic nodules as reserves of nickel, copper, cobalt and manganese. These are the legal framework, the economics that I have talked about and the existence of the technology. On our part, the Seabed Authority, work has been completed on the legal framework for exploration, which has been adopted and is being applied. There is no framework that has been devised for exploitation, the belief being that we are still quite a good distance in time away from exploitation and we do not want to make the same mistake that was made in the Convention of putting together regulations and rules regarding exploitation in the absence of proven technology.

Since our establishment, a number of other factors have come to light. As I have pointed out, even the occurrence of minerals in the Area, was a problem. The knowledge that we had 20 years ago was such that the only known deep-sea marine minerals were polymetallic nodules. What we have been trying to do at the Authority since its establishment is, for example, to take a look at all the possible mineral resources that are known to occur in the international area. We convened a workshop on marine mineral resources of the Area and were informed that in addition to polymetallic nodules, there were crusts that could be found in the area that were very rich in cobalt. In fact ferromanganese crusts as they are referred to, are literally a pure ore of manganese. They contain in many cases over 50% manganese. We have also been informed about other mineral resources referred to as polymetallic sulphides. Indeed along with these sulphide deposits that occur at the margins of diverging plate boundaries at the mid oceanic ridge that I earlier mentioned, we also found all these amazing life forms. These are life forms that subsist on hydrogen sulphide, without the benefit of oxygen and light. Finally we have also been informed that there are no marine mineral resource deposits that do not have some form of biodiversity associated with them.

Another thing we therefore did was to convene a meeting of experts, a workshop again to look at the biodiversity around a number of these mineral occurrences. In particular polymetallic nodule deposits and polymetallic sulphide deposits. Polymetallic sulphides deposits were considered in the meeting because there has been a request to the Authority to establish a legal framework for the exploration for deep-sea polymetallic sulphides deposits. We have also realized the need for standardization in the way that relevant data are gathered. For example, in the resource assessment study where seven Pioneer Investors used their own methods to try to establish what deposits they could find (sampling, data on nodule coverage etc) and the value of the deposits that they found, nothing was standardized. The way samples were picked up, the way samples were preserved, and the way samples we analyzed were all very different.

