

AIAC.135/L3.

English.

(b) The report prepared by the Secretary-General according to General Assembly resolution 2172 (XXI) on Marine Science and Technology (Survey and Proposals) (E/4487);

(c) An information note prepared by the Secretariat on "the economic implications of the exploitation of mineral resources on and underlying the sea-bed and ocean floor and its subsoil with particular reference to world trade and prices" (A/AC.135/14);

(d) An information note prepared by the Secretariat on "the effect of exploitation of mineral resources on superjacent waters and on other uses of the marine environment" (A/AC.135/15);

(e) Other documents and available authoritative sources of information.

3. The Economic and Technical Working Group gave consideration to the following problems:

- Assessment of the extent of the mineral resources of the ocean floor and their geographical distribution.
- Present state and foreseeable development of technology in the field of the exploration, evaluation and exploitation of such resources.
- Possibility of exploiting such resources from the standpoint of technological progress and the profitability and soundness of investments.
- Possible consequences of the exploitation of such resources:
 - (i) Economic implications on the world market;
 - (ii) Possible repercussions on other uses of the sea;
 - (iii) Possibility of exploiting such resources for the benefit of mankind as a whole.
- Prospects for international co-operation in the development and exploitation of the resources of the ocean floor.

/...

Assessment of the extent of the mineral resources of the ocean floor and their geographic distribution

4. During its meetings on 18 and 19 June 1968, the Economic and Technical Working Group gave consideration to the question of "the assessment of the extent of the mineral resources of the ocean floor and their geographical distribution". The Working Group had before it the report of the Secretary-General on Mineral Resources of the Sea beyond the Continental Shelf (E/4449/Add.1) as a background for discussion. In its deliberations the Working Group also took into account other documents presented (E/4487) and available authoritative sources of information.

5. For the purpose of the exchange of views on the economic and technical aspects of the problem, the following working concepts were considered useful. They are related to the geological and topographic descriptions of the sea floor and in no way prejudice any legal connotation which some of them may have in other contexts:^{1/}

(a) Continental shelf: The area of the ocean floor between the mean low water line and that change in the inclination of the floor, from about one eighth of one degree to more than three degrees, that marks the beginning of the continental slope which occurs at various depths usually between 130 and 200 metres, but exceptionally as shallow as 50 metres or as deep as 500 metres. The width of the shelf ranges from less than one mile up to 800 miles. When the increase in slope is very gradual, the point of maximum rate of change of slope is considered to be the edge of the shelf.

^{1/} The delegation of Argentina had reservations with regard to the working principles set forth in point 5 on the grounds that they were not wholly compatible with the present state of oceanographic knowledge, bearing in mind, in particular, the fact that:

(1) The description of the working principles was technically incomplete and should be elaborated upon;

(2) The list did not cover all the geological and topographical factors. It should be supplemented by a description of other geomorphological irregularities on the sea-bed and ocean floor.

(b) Continental slope: Area of the ocean floor extending from the outer edge of the continental shelf to the abyssal ocean floor, usually from ten to twenty miles wide. The inclination of the slope varies widely from as little as three degrees to over forty-five degrees. Geologically it marks the rather abrupt transition from continental or sialic crust to oceanic or simatic crust.

(c) Continental terrace: Sometimes used to refer to the geological formation consisting of both the continental shelf and slope.

(d) Continental rise: Apron of clastic sediments, wherever deep sea trenches are absent, that slopes gently oceanward from the base of the continental slope, usually in 2,000 to 5,000 metres of water.^{2/}

(e) Continental margin: That region of the earth's crust where the continental sialic rocks are covered by the sea.

(f) Oceanic basin: That region of the earth's crust covered by water where the sialic rocks are thin or completely absent and underlain by simatic rocks.

(g) The abyss or deep-ocean floor: A rolling plain from 3,300 to 5,500 metres below the surface of the sea; it is scarred by deep gorges called trenches and studded with sea-mounts and guyots.

(h) Sea-mounts: Isolated elevations of the deep sea floor, varying from relatively small peaks to massive structures; sea-mounts deeper than 200 metres, the top of which is a comparatively small platform, are called guyots.

(i) Banks: Elevations of either the shelf or the deep sea floor to depths of less than 200 metres; conventionally banks taken as 11 metres or less at mean low water tides are called shoals. They are rather numerous and sometimes cover considerable surface.

^{2/} In the USSR the oceanographic term to which the description of paragraph 5 (d) corresponds is "abyssal slope".

(j) Mid-ocean ridges: Broad mountain chains, rising from the abyssal plains, and extending for many thousands of miles. The genesis of the mid-ocean ridges is still unclear.

(k) Abyssal or hadal depths: Flat area at the bottom of highly localized submarine gashes or rifts in the earth's crust - the Mariana and Tonga trenches are respectively the deepest in the Northern and Southern Hemispheres (circa 11,000 metres).

The Working Group noted that it is often difficult to distinguish the exact area covered by each concept. The importance was stressed of considering in a separate context the internal and/or marginal seas because of the marked oceanographic, geographic and geologic differences they present in comparison with the oceans in general.

6. Substantial mineral resources exist on and beyond the continental shelf. The general picture appears to be as follows:

(a) Known offshore placer deposits, among which might be mentioned gold, ilmenite, diamonds and other industrial minerals, are generally restricted to scattered areas along the coasts. Commercial concentrations are very localized, and are likely to be found only in the shallower parts of the continental shelf where submerged beaches and deltas occur, and may be expected to be scarce or absent on the deeper parts of the shelf, the slope, and abyssal depths.

Exceptions to this may be the large deltaic fans off some of the world's major rivers, where sediments have spread out and subsided under their own weight to depths of many hundreds or even a few thousand metres. Commercial concentrations of sand, gravel, oyster shell, and lime mud are generally restricted to shallow coastal regions.

(b) Those parts of the continental slope which contain thick sedimentary deposits may be regarded as potential reservoirs of hydrocarbons. Geophysical and geological observations suggest that the sediments of the continental rise are thick enough in places to contain accumulations of petroleum, and the same may be said about some of the small ocean basins, such as the Gulf of Mexico. Other evidence suggests that there is little chance that petroleum occurs over large areas of the abyssal plain, but some parts of the ocean floor may have an important potential.

(c) There are extensive deposits of manganese nodules on the deep ocean floor uneven in distribution and concentration, but richer in their content of other metals (cobalt, nickel, copper, etc.) than those in shallower water. The chemical composition of nodules varies considerably, with characteristic differences noted in Pacific, Atlantic and Indian Ocean occurrences.

(d) Phosphorite occurs on the sea floor in the form of blankets of nodules, flat slabs, pellets and rock-coatings, mostly on the outer continental shelf, upper continental slope and submarine banks. Of the known and potentially favourable areas - off southern California (United States of America), Baja California (Mexico), eastern United States of America, western South America, Australia, north-west Africa, Japan, etc. only the first three are being investigated in any systematic manner.

(e) Metalliferous muds, rich in copper, zinc and other metals, have been found recently in some of the deeps of the Red Sea, associated with hot brines, and possibly occur elsewhere as well. Deposits in solution as well as geothermal energy associated with these hot brines may also be resources for the future.

7. Present knowledge of the mineral resources of the ocean appears to be more or less satisfactory only for a small part of the continental shelf. Knowledge of potential marine mineral resources at this stage is scant and depends in a large part on extrapolation of knowledge and experience gained on land.

8. While present knowledge of marine mineral resources beyond the continental shelf is very incomplete, it was noted that potentially valuable resources exist, that some exploration is already taking place and that leases have already been issued for evaluation and exploitation of such resources. From the various sources of information, it appeared that the potentially valuable minerals likely to be exploited economically are essentially petroleum and gas, manganese deposits, submarine phosphate deposits and metalliferous muds.

9. In these circumstances, the Economic and Technical Working Group emphasized the importance of fostering research and exploration in order to improve our knowledge of the nature, occurrence and concentration of sea-bed minerals, and to encourage development of new devices and techniques for exploration and exploitation.

10. Summing up the debate, the Chairman made the following points:

(a) It appears certain that substantial resources exist beyond the continental shelf.

(b) Present knowledge of the extent of these resources and their distribution is still limited and incomplete.

(c) It appears most appropriate to foster research and exploration activities in order to fill the extensive gaps in present knowledge.

The present stage and foreseeable development of technology in the field of exploration, evaluation and exploitation of the mineral resources of the ocean floor

11. During its meeting on 21 June 1968, the Economic and Technical Working Group gave consideration to the question of "the present stage and foreseeable development of technology in the field of exploration, evaluation and exploitation of the mineral resources of the ocean floor". The Working Group had before it the report of the Secretary-General on Mineral Resources of the Sea beyond the Continental Shelf (E/4449/Add.1) as a background for discussion. In its deliberations the Working Group took also into account other authoritative sources of information.

12. The following working concepts, which refer to the stages of the economic process in the field of development of marine mineral resources, were considered useful for the purposes of the discussion of this item:

(a) Exploration: The broadly based survey using all available methods, generally of large areas in the first instance, leading by progressively narrowing the search to the location of mineral occurrences of possible economic importance.^{3/}

(b) Evaluation: The detailed investigation of mineral occurrences or deposits using all appropriate techniques in order to discover their nature and origin, establish the quantity and tenor of the contained economic minerals, determine how best they may be exploited and generally consider all other factors affecting their economic development.

^{3/} In other contexts than the economic one exploration has the meaning of search of geographical or scientific information.

(c) Exploitation: The practical and economic development of minerals based on the appropriate application of various techniques in order to obtain an economically valuable product.

13. The present status of technology with respect to mineral exploration and evaluation in the ocean environment appears as follows:

(a) As far as exploration of mineral fuels and soluble minerals is concerned, some of the techniques required can be used in water of any depth; the necessary combinations of capabilities required to discover specific deposits of hydrocarbons, however, are more limited. As at June 1968 the deepest water in which exploratory wells were being drilled was approximately 200 metres. New equipment was expected to advance this capability to 400 metres by the end of 1968 and to 500 metres in 1969. It should be noted that the technology necessary to complete and bring a well into production is more complex and not as far advanced as for exploratory drilling.

(b) With regard to surficial deposits, e.g., manganese and phosphorite nodules, preliminary evaluations to depths of about 1,000 metres have been carried out. More advanced submersibles which are being developed will within five to ten years permit similar limited evaluations to depths of 5,000 metres.

(c) Technology necessary to find and evaluate sub-surface deposits, such as coal, oil-shales, etc., in water depths of more than a few tens of metres is virtually non-existent at the present time.

14. In exploiting mineral resources of the deep sea, three main techniques are used in relation to the types of minerals mentioned in paragraph 13: drilling, dredging and mining.

(a) As far as the exploitation of minerals by drilling is concerned, production has now reached depths of about 110 metres and is expected to reach depths of 200 metres by the end of this year; depths of as much as 500 metres (in relatively protected water near the coast) in three to five years. Beyond this depth, exploitation from drill holes will require the development of new technical concepts.

(b) Present exploitation through dredging is limited to the depths of 30 to 60 metres, according to the minerals mined. Hydraulic dredging will almost certainly prevail over other dredging methods in deep sea mineral recovery. Using this technique, preliminary designs have been made for recovery of sea floor nodules deposits at depths greater than 1,200 metres.

(c) If large and rich sub-surface deposits are found, the technology to mine them beneath shallow waters might be developed within a few years; technology for mining bedrock deposits in water deeper than 100 metres is at present not in sight.

15. Remarkable progress has already been made in developing the ability to explore the ocean floor and its mineral resources. Much further progress will be required, however, to permit evaluation and exploitation of mineral resources at depths greater than a few hundred metres. This is in part dependent on increased incentives to seek mineral resources in the ocean.

16. In the past, the rate of technological progress was as follows:

(a) Experimental penetration drilling for scientific purposes (and without re-entry capability) had reached 3,600 metres in 1961 and has now been carried out in water depths of 6,000 metres.

(b) Experimental drilling by commercial operators was possible down to 450 metres in the late 1950's and it is predicted that it will be possible before long down to 1,000 metres water depth with hole re-entry.

(c) Serious evaluation drilling (wildcatting) was possible in 30 metres in 1954 and is now being done in depths of approximately 200 metres water depth.

(d) Production drilling, including ancillary operations, has increased in depths from 21 metres in 1947 to about 120 metres water depths in 1968.

(e) Production dredging for certain minerals (tin, gold, etc.) has increased in depths from 10 metres in 1947 to 60 metres in 1967. These examples show that an average of nine to ten years has been necessary to develop techniques to double the depths at which they could be operated. Extrapolation of these figures would imply that another decade will be necessary to double again the depths reached at present, but it is no doubt hazardous to anticipate the rate of further progress of technology since major breakthroughs cannot be excluded particularly under the stimulus of the discovery of some very high-grade deposits or of minerals in short supply. New techniques might be developed which would considerably reduce this time lag. This would certainly necessitate massive financial investment and human ingenuity.

17. Summing up the debate, the Chairman made the following points:

(a) It is important for the Working Group to provide the Ad Hoc Committee with the most accurate and up-to-date information and projections available concerning the rate of technical progress in the development of marine mineral resources.

(b) In view of the above-mentioned forecasts, sufficient time would seem to be available for the study of all aspects involved in the development of marine resources. However, it would certainly be unwise to procrastinate their consideration.

(c) Breakthroughs in technology are possible and new experiments are already under way. Certainly, considerable financial and human resources will be required to this end. A balanced view suggests that a cautious optimism is appropriate as to the technical achievements that may be expected.

The possibility of exploiting the mineral resources from the standpoint of technological progress and the profitability and soundness of investments

18. During its meetings on 24 and 25 June 1968, the Economic and Technical Working Group gave consideration to the question of "the possibility of exploiting the mineral resources from the standpoint of technological progress and the profitability and soundness of investments". The Working Group had before it the report of the Secretary-General on mineral resources of the sea (E/4449/Add.1) as a background for discussion. It also took into account other authoritative sources of information.

19. In the process of mineral development, four stages can be distinguished:

(a) the acquisition of the basic knowledge through systematic area surveys and research in geology, geophysics and geochemistry, necessary to understand the character, distribution and variation of the mineral resources;

(b) the identification of target areas for exploration and location of specific mineral deposits;

(c) the technical evaluation of the extent and quality of the deposits and on methodology and cost of extraction from the natural environment;

(d) the economic decision based on capital investment, pay-out period, operating costs and cash flow, leading eventually to commercial exploitation. For the last two stages of activity, determining factors are, amongst others, consideration of the depth of the water column, depth of deposit beneath the ocean floor, distance from shore, size and quality of the deposits, and the environment of the specific area containing the deposits under examination.

20. Profitability and soundness of investments with respect to the development of the potentially valuable marine minerals previously identified (hydrocarbons, manganese, phosphate and other metals) appear to be as follows:

/...

(a) The recent discovery on all continents of phosphorite deposits has removed the urgency of exploitation of phosphorite deposits on the sea floor for some years, except near agricultural regions that are far removed from low-cost land resources.

(b) The potential value of manganese nodules is enhanced because they contain, in addition to manganese, appreciable amounts of nickel, copper and cobalt. Due to the costly beneficiation processes needed for up-grading marine manganese, these additional minerals would constitute the main incentive for the recovery of manganese nodules. However, new discoveries of nickel deposits have been made on land, lower-grade copper deposits can now be up-graded at reasonable cost, and land reserves of cobalt are large. Hence, the exploitation of widely distributed discrete nodules does not appear economically feasible for some time.

(c) Sulphur is exploited on the continental shelf. Its development beyond the continental shelf is in process of investigation.

(d) Metal-bearing muds (containing copper, zinc and other metals) of a type recently found in Red Sea deeps also pose as yet unsolved technical problems but may prove to be recoverable in the not too distant future.

(e) In the case of petroleum and gas, development in water depths greater than approximately 500 metres is likely to require a breakthrough in technology. Investments required for platforms and operating procedures at such depths will markedly increase.

21. It appears that many of the costs involved in marine mineral development are much higher than the cost of operations conducted on land. It was mentioned, for example, that even in the shallow water areas of the continental shelf, daily average operational costs of under water oil drilling are four times those of comparable land operations. And if oil is found, installation of production

facilities make a completed well two or three times more costly than a hole on land. It therefore appears that appropriate conditions must be established to make investments profitable and the necessary incentives must not be impaired by prohibitive licence fees.

22. Since costs for the development of marine mineral resources rise rapidly with progression into deeper water, economic reasons suggest that marginal resources on land under present circumstances may be given preference over marine mineral deposits. Moreover, in the opinion of some delegations, any entrepreneur must be assured that the area considered for development of marine mineral resources be larger than that normally necessary on land and that he must be assured of security of tenure over this area.

23. A stable regime providing for orderly progress and security of title in the exploration, evaluation and exploitation of marine mineral resources would favourably influence the decision to develop these resources.

24. Minerals mined on the ocean floor would also have to compete with minerals mined on land, where new discoveries are still being made and extraction technology is still advancing. Future land technology may be able to exploit resources which for present-day technology are not accessible or are too low-grade to be economical, due primarily to still lacking beneficiation processes. Finally, the position of the different minerals on the world market will also be influenced by progress in the development and use of substitutes.

25. Under particular circumstances, it may seem desirable to exploit deposits which are clearly unprofitable on a purely financial basis. The desire to be independent of foreign supplies, for example, is conducive to the exploitation of off-shore deposits which would

otherwise be deemed uneconomic. Among the motives for such a decision may be mentioned the balance-of-trade position, as well as the desire to ensure stability of production in times of crisis and to control the volume of production and prices. Another reason for exploitation of less economic marine deposits may be concern for conservation of resources for periods of down-turn in world trade, fluctuations of prices or more serious emergencies.

26. In spite of the factors that seem now to diminish prospects for early exploitation of ocean floor resources, the accelerating growth of technology and the widening interest of potential investors justify cautious optimism concerning their future development.

27. It should be noted that banks and shoals occur at moderate depths, from a few metres to 200 metres; it is already possible to exploit the natural wealth to be found there with existing means. This is also true for a few of the accessible summits of the great oceanic mountain ridges.

28. It was pointed out that potential future use of the tremendous resources hidden beneath the oceanic crust might also be considered. Indeed the potential harnessing of thermal energy and recovery of elements contained in the magma or molten rocks through drilling unto the Mohorovicic discontinuity could well add a new dimension to the exploitation presently discussed. In spite of the technical difficulties of drilling at depths of more than 6,000 metres in hadal zones, one cannot exclude that this potentiality may one day materialize.

29. Summing up the debate, the Chairman made the following points:

(a) The need for greater efforts in the fields of basic research, detailed exploration and the development of new techniques to carry out successfully these tasks deserves greater emphasis.

(b) It is important to distinguish between the technological capacity for the development of marine resources and the economic feasibility or the commercial viability of such operations. Before beginning to exploit mineral resources, all economic factors which have a bearing on the development of these resources should be taken realistically into account.

(c) One important factor is the ratio at which costs of exploration and exploitation increase as greater depths are reached.

(d) Another factor is the considerable reserves of certain minerals existing on land which might be exploited if need arises, in the first place before drawing on the mineral resources of the sea.

(e) Newly discovered land reserves will inevitably compete with marine operations for investment capital. The decision to exploit marine reserves will, however, also be affected by the desire to be independent of foreign supplies and to conserve deposits on land which might be exploited if circumstances so require.

(f) Considerable investments will be needed; therefore sufficient incentives must exist if States or their nationals are to be encouraged in this venture.

(g) Among favourable conditions required there will have to be suitable arrangements for assuring the appropriate returns of the investments and their security through adequate international arrangements.

Possible economic implications of the exploitation of marine mineral resources on world market and prices

30. At its meetings on 25 and 26 June 1968, the Economic and Technical Working Group gave consideration to the question of the "possible economic implications of the exploitation of marine mineral resources on world market and prices". The Working Group had before it, inter alia, a paper prepared by the Secretariat (A/AC.135/14).

31. Some experience is already available with reference to the effects of present off-shore production of petroleum, in both the world market

/...

at large and in some local markets. In the two decades since off-shore production began, it has come to make up about 16 per cent of total world production and 6 per cent of the world's natural gas production and this proportion is expected to increase significantly with time. The new off-shore reserves and production have helped maintain a ceiling on prices which so far have generally been relatively stable. There has been a slight but rather steady downward trend in prices over the years. Considerable excess production capacity has developed, but its possible disruptive effects have been mitigated, if not altogether prevented, by artificial controls and other measures. Production beyond the continental shelf is likely to take place within a decade but production beyond the 500-metre isobath may not take place for a considerable time. Because costs will increase with increasing depth, new production will be limited to that which can enter the market at existing prices. If the total off-shore sources prove large, however, they may help maintain a ceiling on prices of petroleum from other sources.

32. It seems unlikely that manganese nodules will be exploited for many years to come and when marine manganese production starts, it will probably enter the market gradually just as petroleum has done, for at first it will have to compete with existing land sources. Present indications are that the first use of the nodules may be as a source of copper, nickel, and possibly cobalt, and that the manganese will not necessarily be recovered. In the beginning, most production would probably serve to meet new demand, but when it becomes feasible to reduce production costs, deep sea producers might be able to lower prices and hence displace high-cost production from other sources. Because cobalt occurs in some nodule deposits in ratios to nickel and copper which are much higher than their ratios in the market, a high cobalt recovery as a part of the whole process might at some stage lead to surpluses that would substantially reduce the world price.

33. Likewise, marine phosphate production is not likely for the foreseeable future, for land resources are large, of a higher grade and cheaper to mine. If phosphate is produced it will probably have an impact only in local areas where low-cost sources are not available; inasmuch as world demand is increasing such production for local use probably will not displace production from existing sources.

34. Present knowledge is insufficient to assess with enough reliability the potential effects of marine mineral production on world market and prices. The various studies which have been made on this subject and the conclusion reached by their authors can only be considered as educated estimates.

35. There has been speculation about the possible loss of markets for developing countries that depend on mineral exports, particularly manganese, for much of their income. Indeed, some of the highly industrialized countries have to import most of their present consumption of manganese from certain developing countries. These produce manganese, phosphate and other minerals and export most, if not all, of their production.

36. There is, however, no reason to be unduly concerned at this stage about possible adverse or disruptive economic effects on world markets or world prices from the development of marine mineral resources:

(a) Until recovery processes are developed and production begins, such consequences are entirely speculative.

(b) By the time the relevant marine mineral resources are quantitatively important on the market, it may be hoped that the economies of the developing countries will be more diversified and consequently less dependent on raw materials exports.

(c) Moreover, world demand for these resources may be expected to grow with general industrial and economic development. None the less, the consequences of possible over-supply should be kept in mind.

/...

37. All projections as mentioned above are of a very speculative nature. The interest of the world community would, however, suggest the need for arrangements for the exploitation of mineral resources beyond the continental shelf that will avoid adverse consequences for the world market in general and the economy of developing countries in particular.

38. Summing up the debate, the Chairman made the following points:

(a) The economies of certain developing countries depend heavily on their exports of certain raw materials such as manganese or phosphates.

(b) There seems, however, to be no reason for undue concern about the adverse effects on the world market which might occur.

(c) Nevertheless, the possibility of prices being adversely affected and of the world market being disrupted by the exploitation of marine minerals cannot be excluded.

(d) Thus, future international arrangements concerning the production of marine mineral resources might prove very useful; it has been suggested that this could be dealt with by international agreements and co-operation.

Possible repercussions of the exploitation of marine mineral resources on other uses of the sea

39. During its meetings on 25, 26 and 27 June 1968, the Economic and Technical Working Group gave consideration to the question of the "possible repercussions of the exploitation of marine mineral resources on other uses of the sea". The Working Group had before it a note prepared by the Secretariat (A/AC.135/14) as well as a note prepared by IMCO (A/AC.135/23) and a document prepared by the IOC secretariat (A/AC.135/17).

40. Any exploration, evaluation and exploitation of marine mineral resources is likely to lead to some interference with the rights of enjoyment of the high seas, i.e. freedom of navigation, fishing and scientific research activities.

41. Generally, it has been possible to conciliate divergent interests of the various conventional uses of the sea. The task of reconciling marine mineral development with the existing rights of navigation, fishing research and others is already under study in the interested international organizations and must command increasing attention.

42. If the use of drilling rigs, production platforms and other devices for the development of marine mineral resources is not brought into harmony with existing regulatory régimes applied on the seas, they may constitute a hazard to navigation. In this context, the importance was also noted of ensuring the safe operation of craft used for marine mineral development and the safety of persons working on them.

43. Pollution caused by oil and chemical wastes represents a great hazard for the marine environment. The International Convention for the Prevention of Pollution of the Sea by Oil, formulated in 1954 and amended in 1962, is under constant review by IMCO, which has also extended its studies to other agents of pollution.

44. Radioactivity produced either by dumping wastes or by the use of nuclear devices in the recovery of marine minerals constitutes another pollution hazard. Studies to prevent these hazards have been undertaken by the International Atomic Energy Agency following the 1958 United Nations Conference on the Law of the Sea. It was emphasized that these efforts should result in the drafting and eventual adoption of internationally binding provisions.

45. The turbidity resulting from intense exploitation of marine sediments by the use of dredging techniques and by the employment of explosives and chemicals in the process of recovering and enriching minerals at sea might cause bottom-dwelling organisms to be buried and have harmful effects on the other living resources of the sea. Another danger to be feared is the escape of petroleum from the deposits which are being exploited.

46. Mineral exploitation operations in the ocean, dredging in particular, may also have hazardous effects on submarine cables if one does not know their location.

47. It will be necessary to take appropriate measures in order to prevent effectively any deleterious effects on the marine environment that may be caused by the extension of human activity in the ocean. These measures, however, should not tend to discourage advancement in this field.

48. Summing up, the Chairman made the following points:

(a) The interest witnessed in the possible exploitation of mineral resources of the sea should not make us lose sight of the importance of traditional marine activities such as navigation and fishing; exploitation must not result in unjustified interference with the conventional uses of the sea and the means of exploitation must themselves be safe.

(b) It is extremely important to develop present knowledge in order to be in a position to assess correctly possible effects of marine mineral development on other uses of the sea. In particular, effective means of preventing all forms of pollution should be assured.

(c) These considerations should not discourage the development of marine mineral resources, but rather bring about efforts to reconcile the conflicting interests in the regulatory framework to be set up for the purpose of mineral development.

/...

Possibility of exploiting marine mineral resources for the benefit of mankind as a whole

49. At its meetings on 27 and 28 June 1968, the Economic and Technical Working Group gave consideration to the question of "the possibility of exploiting marine mineral resources for the benefit of mankind as a whole". It had before it, among other documents, the report of the Secretary-General (E/4449/Add.1, chapter V).

50. The need for intensive and expanded international co-operation in the field of marine mineral development was unanimously expressed. As regards the ways of organizing such a co-operation, different views were taken. Some delegations insisted that this co-operation take place in the scientific and technical field. Some others saw this co-operation in the establishment of an international régime to exploit the mineral resources of the sea.

51. It was noted that the sea-bed and ocean floor beyond the limits of national jurisdiction are the legacy of all human beings.

52. In considering the development of marine mineral resources, the Economic and Technical Working Group kept in mind its paramount purpose, which has been set forth in General Assembly resolution 2340 (XXII), that "the exploration and use of the sea-bed and the ocean floor and the subsoil thereof should be conducted... for the benefit of all mankind"; it was pointed out that this concept should not be interpreted as referring only to the immediate profits made by leasing claims or granting licences. "Benefit of all mankind" should rather be understood in terms of the larger value of international output, in particular of the increase in value at stages subsequent to the primary production including the distribution and consumption phases.

/...

53. The great majority of countries are, for technical, financial and other reasons, not in a position to participate in the exploitation of these resources. The developing and the land-locked countries were specifically mentioned in this respect. In fact, only a few highly industrialized countries possess the technical know-how and the investment capital necessary to start any development of these resources. Many delegations stated that this would accentuate the economic imbalance existing between developed and developing countries, and that it would also be an incentive for the former to grab and hold the areas which are most promising.

54. Failure to reach agreement on some principles to govern exploration and exploitation of these resources might lead to new forms of colonial appropriations. Some delegations thought this aspect falls beyond the purview of the Economic and Technical Working Group because of its political connotations. Others felt compelled, nevertheless, to point out the importance of this aspect, emphasizing that a scramble would develop among the highly industrialized countries themselves, thus creating international tension and resulting in conflicts.

55. The need for some internationally agreed upon arrangements which would govern operations for exploring and exploiting ocean floor minerals has been generally recognized. So far, there has, however, been no sufficiently detailed study of the merits and demerits of differing forms of arrangements which might be possible. The Economic and Technical Working Group discussed the question and a large number of representatives indicated in this connexion that internationally agreed upon arrangements should satisfy certain requirements including the following:

(a) feasibility and acceptability to the international community of any such arrangements;

/...

(b) efficient and equitable means to ensure orderly exploration, evaluation, exploitation and conservation of the resources in accordance with the rules of international law of the sea and the protection of the rights of all States;

(c) means to prevent, or reduce to acceptable limits, damage to living resources and to the environment as a whole and interference with other legitimate activities;

(d) means to assure the practice of appropriate conservation and safety measures that will avoid resource waste and ensure safe working conditions;

(e) means to prevent or at least mitigate to acceptable limits economic and social dislocations that may arise from exploitation of sea-bed resources;

(f) provision of social overhead-type services such as aids to navigation, maps and charts, weather information, rescue capability and other services required to encourage and support exploration and development.

In this way, the Working Group wanted to indicate what characteristics any régime must have and provide guidelines which might be helpful in formulating and evaluating specific proposals.

56. Agreeing that an area of the ocean floor beyond the limits of present national jurisdiction does exist, the Economic and Technical Working Group stressed the need for an internationally agreed boundary between the area over which coastal States exercise jurisdiction and the one in which humanity as a whole has a stake. It suggested that further detailed examination of this matter should be undertaken.

57. Various possible régimes can be conceived to regulate the exploitation of mineral resources of the sea-bed and ocean floor beyond the limits of national jurisdiction. An international régime under the auspices of the United Nations was recommended by some delegations, but this represents only one among several possibilities. These delegations pointed out that by its very

nature the United Nations is the most comprehensive world-wide Organization and thus in the best position to fulfil the various requirements and meet the aspirations of humanity.

58. Some delegations referred to the possibility of creating a new agency within the system of the United Nations or in some relationship with it. Without entering into the details of the structure of such an agency they mentioned some existing bodies as examples of the type of administration which might be envisaged. Some delegations opposed the creation of any agency with administrative functions and pointed out the necessity at this stage to develop research and exploration of the mineral resources of the sea-bed and the ocean floor and the subsoil thereof on the basis of international co-operation through co-ordination by the Intergovernmental Oceanographic Commission (IOC).

59. In the context of the discussion of a possible international machinery to supervise and govern "exploitation for the benefit of mankind", attention was drawn to the possible disadvantages of large bureaucratic institutions. Such a machinery if allowed to cause lengthy delays at all stages of its activity would significantly slow down the return on capital invested and thus, in addition to inefficient spending on the administrative machinery itself, stifle progress. Furthermore, it was feared that the creation of such an international machinery would divert government funds at present earmarked for marine research. Some delegations pointed out that such machinery would hinder the development of co-operation among States in research and exploration of the mineral resources of the sea-bed and the ocean floor. This point of view was strongly controverted by many delegations.

60. However, the opinion prevailed that it was a timely endeavour to consider the possible establishment of a régime to ensure an exploitation for the benefit of all mankind.

/...

61. Summing up, the Chairman made the following points:

Generally accepted concepts

(a) With respect to the question of marine mineral development and related aspects, all delegations are in favour of international co-operation.

(b) There is also unanimous agreement that any international co-operation to be established for the exploration, evaluation and exploitation of the resources of the sea-bed and ocean floor and the subsoil thereof beyond the limits of national jurisdiction be for the benefit of mankind as a whole.

Various possible régimes of exploitation

(c) To regulate the exploitation of mineral resources of the sea-bed and ocean floor beyond the limits of national jurisdiction, various régimes can be conceived.

(d) It will be necessary to study carefully the economic merits and demerits of these systems. The requirements which must be met by any possible régime should be spelled out without delay.

Ensuring the benefit of mankind by means of an international régime

(e) Many delegations pointed out that the great majority of countries, in particular developing and land-locked countries, are, for technical, financial and other reasons, not in a position to participate actively in the exploitation of these resources.

(f) These delegations believe that an international régime under the auspices of the United Nations or in relationship with it would ensure that the marine mineral resources would be exploited in the interest of humanity as a whole.

(g) They pointed out that without some international régime a new form of colonial competition would occur which would entail definite risks of oppositions and conflicts.

(h) Some delegations stressed that the questions raised in points (f) and (g) mainly fall under the purview of the Legal Working Group and of the Ad Hoc Committee.

(i) Some delegations emphasized the disadvantages which might result if a bureaucratic administration were to be set up considerably hampering the progress in the development of these resources.

(j) They further emphasized that the interests of all mankind lie in the larger benefit resulting from the broadest possible use of the minerals no matter where they come from rather than in the narrow goal of ensuring profits to the resource owners.

(k) From the examination of the economic and technical aspects of the problems of the sea-bed and ocean floor and the subsoil thereof beyond the limits of national jurisdiction, many delegations drew the conclusion that there was need for an internationally agreed boundary delineating the area which should be subject to a régime for the widest possible international co-operation and exploited for the benefit of all mankind. Other delegations felt that these considerations were of a legal nature and outside the competence of this Working Group.

(l) Finally, a number of delegations believe that the Secretary-General should be requested to undertake a detailed comparative study of mechanisms that could be established for this purpose. This would facilitate the discussion of this question. Some delegations considered that at this stage such a request should be made to Member States.

Prospects for international co-operation in the development and exploitation of the resources of the ocean floor

62. During its meetings of 19 and 20 August 1968, held in Rio de Janeiro, the Economic and Technical Working Group gave consideration to the item "Prospects for international co-operation in the development and exploitation of the resources of the ocean floor". The Working Group had before it the Report of the Secretary-General on Marine Science and Technology (E/4487) and other authoritative sources of information.
63. As previously mentioned in the report,^{4/} present knowledge of the extent, location and concentration of mineral resources of the sea-bed and the ocean floor and the sub-soil thereof is limited and incomplete. Therefore, the need was stressed to foster research and exploration activities in order to fill the extensive gaps in present knowledge. The best way to reach this objective would be international co-operation in the scientific field. This form of international endeavour is by the same token a prerequisite to increased exploitation on a global scale for the benefit of all mankind.
64. Concerted exploration in its broadest sense, including bathymetric and geologic mapping, sampling, geophysical surveys and other scientific studies, is called for in order to gain knowledge and an understanding of the properties of the ocean floor, of the nature of the marine mineral deposits, and of their distribution. An internationally co-ordinated programme to explore the economic aspects of a few specific areas may be expected to reveal potentially important deposits and stimulate their exploitation.
65. The Working Group noted with satisfaction the recommendations of the Secretary-General for an expanded programme of international

^{4/} See Chapter I, paragraphs 4-10.

co-operation to assist in a better understanding of the marine environment through science, as indicated in his Report on Marine Science and Technology.^{5/} This programme would provide, among other things, for the scientific foundation of the development and exploitation of mineral resources of the sea-bed and the ocean floor. Responsibility for formulating and co-ordinating this expanded programme is proposed to be entrusted to the IOC in co-operation with the other international organizations concerned. In this context, the necessity of stimulating the widest possible exchange and diffusion of scientific and related knowledge in this field was stressed.

66. Against the existing background of experience in scientific collaboration, the United States has proposed that the nations of the world join together in a concerted long-term co-operative programme of ocean exploration on a world-wide basis. As the initial focus for such an undertaking, a ten-year period of expanded collaborative efforts, designated as the international decade of ocean exploration would be launched. Although this concept is broader in scope than the task assigned by General Assembly resolution 2340 (XXII), sea-bed studies are an integral part of the proposal, and would offer great potential benefits for all countries.

67. The Economic and Technical Working Group noted that the Economic and Social Council:

"Invites the General Assembly to endorse the concept of a co-ordinated long-term programme of oceanographic research designed to increase, in the interests of world economic development, the resources available to all people of the world, taking also into account such initiatives as the proposal for an International Decade of Ocean Exploration and several international programmes already considered, approved and adopted by the Intergovernmental Oceanographic Commission for implementation, in certain cases, in co-operation with other specialized agencies."^{6/}

^{5/} See document E/4487, paragraphs 256, 260, 262, 264, 266 and 267.

^{6/} See ECOSOC resolution 1381 (XLV).

While some delegations raised some questions and asked for certain clarification, the Working Group expressed appreciation of the proposal for the decade and generally supported the idea of expanded international co-operation in the study of mineral resource of the sea-bed and the ocean floor and the subsoil thereof. It was also noted that the IOC considered the proposal for an IDOE as a useful initiative for broadening and accelerating such investigations and for strengthening international co-operation.

68. Some delegations, however, pointed out that both the proposed "expanded programme" and the "Decade of Ocean Exploration" are essentially scientific in character, and therefore held the view that both proposals should more appropriately be discussed in the Ad Hoc Committee. Other delegations, while welcoming the organization of the decade, expressed the view that the Ad Hoc Committee could only make suggestions or proposals within the framework of General Assembly resolution 2340 (XXII), that is, on the sea-bed and ocean floor and subsoil thereof beyond the limits of present national jurisdiction. Several delegations also stated that scientific research could not create rights of exploitation in the sea-bed and the ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction.

69. The Working Group recognized that the results of this research should be published and made available to all countries.

70. The Working Group felt that both the proposed "expanded programme" and the "Decade of Ocean Exploration" should include concrete plans aimed at strengthening the research capabilities of developing nations.

71. Some delegations felt that the function of the IOC should be restricted to its scientific organizational scope and not be broadened so as to cover international co-operation in the development and exploitation of mineral resources of the sea-bed and the ocean floor and the subsoil thereof.

72. Some delegations noted that the exploitation of these resources would at any rate progress and would thus contribute substantially to the broadening of scientific knowledge. In its turn, the acquisition of additional knowledge through co-operative endeavours in the scientific field would undoubtedly increase the possibilities of exploiting the mineral resources of the sea-bed and the ocean floor and subsoil thereof beyond the limits of national jurisdiction.

73. The requirement for more information about the nature of the sea and the sea floor is universal, and therefore there is manifest need for greater co-operation in marine scientific exploration and research at a global level. At this stage, the scientific sphere appears to offer the broadest scope for co-operation on a global level. Although the resources of the sea-bed are scattered in limited areas of concentration, many delegations stressed that world-wide international co-operation should also be considered from now on in order to encourage the exploitation of these resources for the benefit of all mankind.

74. At a regional or local level, the possibilities of practical co-operation in economic and other matters seem especially promising. Groups of nations can join together to explore and develop the resources of a limited area of the world ocean. By sharing the burden of costs, planned cruises, sharing specialist expertise and data-processing equipment on shore, great economies can be achieved and faster rates of progress attained.

75. In particular, coastal States bordering on marginal and internal seas have many problems and objectives in common. Thus, it would be desirable to promote co-operation among these countries; this could be done by existing regional and international organizations and by any other means that might be considered feasible and applicable.

76. In connexion with this idea, the Committee of Co-ordination of Joint Prospecting for Mineral Resources in Asian Off-Shore Areas, which was set up under the sponsorship of ECAFE, was mentioned.

This Committee is undertaking various projects of interest to bordering States and has established a form of regional co-operation which might serve as an example for other regional seas and for co-operation on an ocean-wide scale. It was emphasized that the views of the countries directly concerned are of paramount importance for establishing successful and workable regional arrangements.

77. The view was expressed that a clear distinction should be maintained between international co-operation for a better understanding of marine environment through science and international co-operation in the development and exploitation of mineral resources of the sea-bed and the ocean floor and the subsoil thereof beyond the limits of national jurisdiction, each of which may be entrusted to different international bodies.

78. Many delegations felt that the United Nations should play an essential role in promoting and co-ordinating co-operation in development and exploitation of mineral resources of the sea-bed and the ocean floor and the subsoil thereof beyond the limits of national jurisdiction. In particular, they referred to the relevant proposal of the Secretary-General in his Report on Marine Science and Technology.^{7/} Many advocated that the United Nations be given adequate responsibility to increase its technical assistance to developing countries as far as the development of the resources of their continental shelf is concerned. They also stressed the responsibilities which should be assumed by the United Nations aimed towards development of marine mineral resources of the sea-bed and ocean floor beyond the limits of national jurisdiction.

79. Certain delegations mentioned the possibility of increasing international co-operation by considering the concept of international enterprises. Certain delegations also favoured international co-operation in the private sector.

80. Summing up, the Chairman made the following points:

(1) The importance of furthering international co-operation in scientific research by means of concerted efforts was strongly felt.

^{7/} See document E/4437, paragraph 277 (the text of this paragraph will be the subject of a corrigendum).

For this reason it was pointed out that the proposal presented by the Secretary-General concerning an expanded programme of international co-operation in the scientific field on a long-term scale,^{8/} and a proposal of the United States of America calling for an international decade of ocean exploration deserve support, in principle, and should be the object of careful consideration by the General Assembly at its next regular session.

(2) It was felt that, although these proposals deal basically with scientific programmes and therefore apertain to the purview of the Ad Hoc Committee itself, they nevertheless bear on aspects falling within the scope of the Working Group's terms of reference.

(3) With respect to co-ordination of a long-term co-operation programme in the field of scientific research and investigation of the marine environment, including the proposal of the Secretary-General of the United Nations on the expanded programme of research and the proposal of the United States on the international decade of ocean exploration (IDOE), the group held the view that this task could be entrusted to the IOC whose scope is essentially scientific in nature and which has already begun activity in this field. It was stressed that the IOC should avail itself of the co-operation of the other international organizations concerned.

(4) Several delegations emphasized the importance of regional endeavours and expressed the wish that activities such as those pursued by the Intergovernmental Committee operating within the ECAFE framework should be increased. It was stressed that the particular form of regional co-operation affecting coastal States on internal and marginal seas, apart from its intrinsic value, might also set an example for co-operation on an ocean-wide scale. The usefulness of further studying this aspect was widely felt.

^{8/} See document E/4487, paragraphs 252-267.

(5) Many delegations stressed the essential role to be assigned to the United Nations aiming towards international co-operation in the development and exploitation of marine mineral resources. In this context, they strongly supported the relevant proposal of the Secretary-General in his Report on Marine Science and Technology.^{9/}

81. At its meeting of 23 August 1968, the Economic and Technical Working Group adopted unanimously its report to the Ad Hoc Committee. In forwarding the present report to the Ad Hoc Committee, the following reservations were made by the representatives of Argentina, Brazil, Chile, Ecuador, El Salvador and Peru in the Economic and Technical Working Group: "In view of the extremely technical nature of the matters dealt with by the Economic and Technical Working Group, the delegations of Argentina, Brazil, Chile, Ecuador, El Salvador and Peru reserve their positions generally with respect to the report of the Working Group. It is their understanding, in particular, that the conclusions reached by the Working Group in no way constitute a prejudgement concerning the legal aspects of the question."

^{9/} See document E/4487, paragraph 277 (the text of this paragraph will be the subject of a corrigendum).