

HYDROGRAPHIC SURVEYS TO AID EXPLORATION AND EXPLOITATION IN THE EXCLUSIVE ECONOMIC ZONE

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BACKGROUND

In December 1970, during its 25th Session, the General Assembly of the United Nations adopted a Declaration of Principles relating to the sea-bed and ocean floor beyond the limits of national jurisdiction. In brief, this Declaration states that the sea-bed and ocean floor and the sub-soil thereof, beyond the limits of national jurisdiction, as well as the resources of this area, are the common heritage of mankind and shall not be subject to appropriation by states or persons and that no state shall claim or exercise sovereignty over any part of this area, the precise limits of which are yet to be determined. The Declaration further provides that all activities relating to the exploration of the resources of this area shall be governed by an international regime to be established by a treaty of a universal character.

The General Assembly also adopted a resolution to convene a Conference on the Law of the Sea which would establish an equitable regime and international machinery for the area and deal with a broad range of related issues including a precise definition of the area, the continental shelf, the territorial sea, fishing and conservation of living resources and the rights, jurisdiction and duties of coastal States.

In order to arrive at a precise definition of the area, it is first necessary to establish agreed limits of national jurisdiction. At the earlier stages of the Law of the Sea Conference a number of proposals were put forward relating to varying

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criteria and these included a straight distance criterion, a depth criterion, a combination of depth and distance, and geomorphological criteria for the continental margin alone or in combination with a distance criterion.

However, the two main aspects which have emerged, and with which we are concerned here, are the Exclusive Economic Zone and the continental shelf where the latter extends beyond a limit of 200 miles. These two issues, although dealt with separately within the Law of the Sea Conference, are nonetheless related in as far as the limits of areas of national jurisdiction are concerned.

VARIOUS LIMITS OF NATIONAL JURISDICTION

In general terms the informal negotiating text provides :

- a) *The Territorial Sea* : being an adjacent belt to the land territory and internal waters over which the coastal State exercises sovereignty. Every State has the right to establish the breadth of its territorial sea up to a limit not exceeding 12 nautical miles, measured from the appropriate baselines.
- b) *The Exclusive Economic Zone* : where the coastal State has sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the sea-bed and sub-soil and the superjacent waters.

The Exclusive Economic Zone shall not extend beyond 200 nautical miles from the appropriate baselines.

- c) *The Continental Shelf* : which comprises the sea-bed and sub-soil of the submarine areas that extend beyond a distance of 200 miles throughout the natural prolongation of the land territory to the outer edge of the continental margin.

In order to define the outer limits of the continental margin a number of formulae are given in the text and these include criteria based on thickness of sedimentary rocks in relation to the distance from the slope or lines delineated by reference to fixed points not more than 60 nautical miles from the foot of the slope. It is also specified that there will be definite cut-off points which shall not exceed 350 nautical miles from the baselines or alternatively 100 nautical miles from the 2 500 metre isobath.

In all cases involving limits of areas of national jurisdiction the negotiating text provides that these be shown on charts of a scale or scales adequate for determining them. Alternatively, lists of geographical co-ordinates may be substituted for the outer limits of lines of delimitation. Furthermore, the coastal State is required to give due publicity to such charts or lists of geographical coordinates.

A number of coastal States have already declared the breadth of their areas of national jurisdiction and from the information available with the United Nations at the end of 1978 there were 38 States that had declared a 200-mile economic zone.

THE ROLE OF HYDROGRAPHY

The Report of the United Nations Group of Experts defines Hydrography as the science of measuring and depicting those parameters necessary to describe the precise nature and configuration of the sea-bed, its geographical relationship to the landmass, and the characteristics and dynamics of the sea. The parameters encompass bathymetry, geology, geophysics, tides, currents, waves and certain physical properties of seawater. The primary use of the data collected is to compile graphic documents used by mariners and others concerned with the marine environment. These data are also essential for determining the extent and nature of the continental shelf, the 200 mile Exclusive Economic Zone and sea-bed topography. The same report states that "in the marine environment there can be no exploitation of resources without exploration and there can be no *exploration without hydrography*".

Therefore, returning to the EEZ and the Continental Shelf – vast areas of the seas over which the coastal State will have rights of exploitation of resources – it seems logical that the first step should be the preparation of charts at adequate scales, compiled from modern survey data. These charts will not only constitute the first step in the exploration process but will be essential for delimitation of zones of national jurisdiction with adjacent and opposite States, on the one hand, and the International Sea-Bed Authority on the other.

The study made by the United Nations Group of Experts shows that for countries who do not have a national capability in hydrographic surveying the coastal areas of at least 60 %-70 % are covered by surveys carried out more than a century ago by methods that are completely outdated and totally inadequate to meet modern needs. There is perhaps also some lack of appreciation of the limitation in reliability and usefulness of the existing charts; and just because certain charts are available it is assumed that these reflect up-to-date knowledge. This state of affairs is not confined only to the developing countries, but even the big charting nations find that the available survey data in their waters are mostly inadequate to meet the modern needs of shipping and resource exploitation. In the United Kingdom, for instance, there has been a growing realization of the need to have detailed surveys made covering the shelf. From recent reports in the press I understand that a decision has been made to augment the existing surveying fleet by more hydrographic vessels.

Japan and Canada are engaged in carrying out systematic multiparameter surveys of their continental margins and adjacent waters within the limits of the 200-mile Economic Zone in order to provide a comprehensive description of the offshore zones necessary for the establishment of jurisdictional rights and effective management of resources. I believe that Canada estimates that, with the present rate of progress, it would take approximately 10 to 15 years to describe the continental margins.

In order to assess the magnitude of the task involved in carrying out

detailed surveys, let me give a few examples of the areas of the sea that would come within the 200-mile Exclusive Economic Zones :

Country	Total land area km ²	EEZ km ²	% of area increase
Bangladesh	144,000	76,800	53
Barbados	400	167,300	38,825
Cyprus	9,300	99,400	1,075
Fiji	18,300	1,134,700	6,210
Ghana	238,500	218,100	91
India	3,280,500	2,014,900	61
Jamaica	11,000	297,600	2,715
Malaysia	329,700	475,600	144
Malta	300	66,200	20,943
Mauritius	1,900	1,183,000	63,432
Sri Lanka	65,600	517,400	789
Trinidad & Tobago	5,100	76,800	1,498

The figures quoted above are approximate and should be considered as order of magnitude values only.

In systematic surveys the coastal zone as well as the continental margins need to be described, and nautical charts as well as basic resource maps compiled from the data collected. Suitable vessels equipped with the necessary instrumentation collect the data by traversing the entire area by a series of regular profiles. A profile of the sea bottom is obtained by measuring the time it takes for sound waves emitted from a survey vessel to return as echoes from the seafloor, and relating this time lag to the corresponding depth. By steady accumulation of such data the topography and nature of the sea bottom can be built up. Depth measurement would, of course, be of little value if each sounding could not be accurately located relative to the coast. By means of various radio positioning systems it is now possible accurately to locate the survey vessel at great distances from the shore during all phases of operations.

The ocean floor can, in very general terms, be divided into three main physiological regions : the continental margin, the deep ocean floor and the mid-ocean ridges. The continental margin is the zone, generally consisting of the shelf, slope and rise, which separates the continent from the abyssal plain or deep sea bottom. The shelf, which is relatively flat, extends from the low water line to a depth at which there is usually a marked increase of slope towards oceanic depths; the continental slope normally goes down steeply from the edge of the shelf to the beginning of a continental rise.

These are very general definitions and, contrary to popular belief, the topography of the margins is highly complex in most areas, being marked by the presence of terraces, canyons, trenches and ridges.

However, the upper layers of the margins are usually composed of sedimentary deposits which have accumulated over millions of years. Sedimentary areas have the potential for rich mineral deposits, particularly hydrocarbons, which need to be identified and located by means of systematic surveys. With the high cost of operating vessels it is more economical to obtain all the informa-

tion possible in a given survey. Whenever feasible, these data should include bathymetry, gravity field, magnetic field, as also reflection seismic profiling, core sampling and some biological data. These surveys will constitute the initial phases of resource development and the data acquired can be translated into basic resource maps. However, the bathymetric knowledge, combined where necessary with close examination of hazards to navigation, also provides the data essentially required for the compilation of nautical charts which, in turn, facilitate the safe movement of shipping and contribute towards economic growth in various other fields such as development of ports and harbours, fisheries management and sea-bed mining activity. In this context it is relevant to say that the hydrographer and the nautical chart both have a direct role in every phase of resources exploitation, for example :

- The precise location of identified areas of interest and the demarcation of mining concessions.
- The detailed survey of sea-bed configuration for placing exploitation platforms and their precise location on site.
- Detailed surveys for laying pipe-lines and cables.
- Precise location of well heads.

In fact, there is a hydrographic input of some type into all the different phases of exploration and exploitation.

In the broad concept of an extensive Exclusive Economic Zone, it will, no doubt, be appreciated that coastal State rights would have to be enforced, and this applies particularly in the exploitation of the living resources. Without appropriate charts and positioning systems it would be virtually impossible for the coastal State to ensure compliance with its laws and regulations governing exploitation, conservation and management of the living resources.

LIMITS AND DELIMITATION

To revert briefly to the question of delimitation, the first requirement is for the coastal State to identify its baselines, from which is measured the breadth of the territorial sea and other areas of national jurisdiction. The negotiating text provides that the normal baseline is the low-water line along the coast as marked on large-scale charts officially recognised by the coastal State.

The text also provides that under certain circumstances straight baselines may be drawn, and in this context low-tide elevations, off-lying rocks and other isolated features would require very careful charting, as they could have a significant effect on the seaward limits of such baselines, as well as in the delimitation of boundaries where they overlap with opposite or adjacent States.

The term "charts", used in the text, clearly implies nautical charts rather than special prepared maps. Nautical charts at large scales depict the low water line derived from sounding data which, in turn, is related to the vertical datum in use. The nautical chart also shows offshore banks, shoals and other low tide

elevations. In any event it has to be borne in mind that those most concerned with off-shore zones of jurisdiction are mariners and they rely on nautical charts for position determinations.

In terms of the revised text, the definition of the continental shelf is related to the foot of the slope and optionally to the thickness of sedimentary rock in relation to the shortest distance from the foot of the slope which is taken as the point of maximum change in gradient at its base. A third option relates to the use of the 2500 metre isobath from where the outer limits of the continental shelf may be drawn to a distance not exceeding 100 nautical miles.

In accordance with certain new provisions made in the negotiating text a commission is to be established on the limits of the continental shelf. This commission will consider data and other material submitted by coastal states in support of claims concerning the outer limits of the continental shelf in areas where these extend beyond 200 nautical miles. It is the responsibility of the coastal state to submit particulars of such a boundary to the commission along with supporting scientific and technical data.

In any event, all these proposals entail extensive bathymetric and geophysical profiling in order to lay down the detail on maps of adequate scale which would depict precisely the foot of the slope line as well as sediment thickness seaward of this limit. The preparation of such maps can best be achieved through close co-operation between hydrographers and geophysicists and geologists.

TRANSFER OF TECHNOLOGY

Although the negotiating text contains extensive provisions for the transfer of technology to developing nations, this process will inevitably take a considerable amount of time. However, the preparation of suitable charts, to facilitate the resolution of some of the questions that I have mentioned earlier, seems to me to be a task which deserves immediate attention. The U.N. Group of Experts has also emphasized in its report that inadequate hydrographic services can lead to costly delays in resource exploitation and restrict the growth of maritime trade. The Group has therefore recommended that national authorities seriously and immediately consider the benefits of establishing hydrographic services.

In concluding may I leave you with the thought that it is a matter of a relatively short time before the Exclusive Economic Zone becomes a reality. The charting of this extensive zone will call for greatly increased resources in ships, equipment and trained personnel if the surveys are to be completed and charts produced in a reasonable span of time. Individual hydrographic agencies would therefore have to take steps now in order to be prepared for this vast task that lies ahead.