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STRENGTHENING OF THE NATIONAL HYDROGRAPHIC OFFICE

A Project of Technical Co-operation between Sri Lanka and Germany

by M. GRUBER [1]

Abstract and Introduction

The project "Strengthening of the National Hydrographic Office (NHO) of the National Aquatic Resources Research and Development Agency of Sri Lanka", was initiated in the period 1984 - 1986 and commenced in 1988 as a project of Technical Co-operation between the Governments of the Democratic Socialist Republic of Sri Lanka and the Federal Republic of Germany (Bundesministerium für Wirtschaftliche Zusammenarbeit, Federal Ministry of Economic Co-operation, Bonn). Implementing Agencies are the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ - German Agency for Technical Co-operation) and the National Aquatic Resources Research and Development Agency of Sri Lanka (NARA).

The objective of the project is to enable the NHO to provide better and more comprehensive hydrographic information to users of these data in Sri Lanka, thus contributing to the overall goal for a better and improved management of aquatic resources of the country's exclusive economic zone.

HPC Hamburg Port Consulting GmbH is operating this project by sub-contract for the German implementing partner, the GTZ. Since 1988, experts of HPC, with the support of the Fachhochschule Hamburg (Hamburg Polytechnic, Section Hydrography) and the support of the BSH Bundesamt für Seeschiffahrt und Hydrographie (Federal Agency for Maritime affairs and Hydrography, Hamburg) were - and still are - engaged in Sri Lanka, together with their respective Sri Lankan partners and counterparts to set up and to strengthen the capability of Sri Lanka's Hydrographic Office.

[1] HPC Hamburg Port Consulting GmbH, Container Terminal Burchardkai, D 21129 Hamburg, Germany.

The project originally was planned for three phases, with two years duration each. As the project progressed, it was re-designed and finally modified into three phases of different duration, phase I from 1988-1990 (2 years), phase II from1990-1993 (three years), and the final phase III, from October 1993 to September 1996 (3 years).

The National Hydrographic Office of Sri Lanka presently forms an integrated section of the National Aquatic Resources Research and Development Agency (NARA) although one of the targets of the project was to establish the NHO as an independent body for Hydrography. However, it was not possible to establish the NHO as an independent body during the period of operation of this joint project. Reasons for this are complex and are not discussed here.

Consequently the NHO continues to function as a section of NARA which constitutes a Research Institute for Fisheries and Aquatic Resources Development under the Ministry of Fisheries and Aquatic Resources Development with limited competence only in the field of Maritime Affairs, Shipping and Hydrography, subjects which are within the competence of the Ministries of Ports and Shipping and Defence (Sri Lanka Navy).

At present, phase III of the project is in progress which ends this year (1996).

THE BILATERAL AGREEMENTS

The operation of each project phase was based on a Bilateral Agreement between the two countries. These Bilateral Agreements contain arrangements and commitments regarding the contribution of the partners concerned. They are generally drawn up after the relevant planning procedure for the project in order to obtain necessary information for the draft/approval/exchange of notes between the two Governments (which finally constitute the Bilateral Agreement). Generally all three agreements contained basically paragraphs of a similar structure:

- the title of the project,
- the period of operation,
- the involvement of the two Governments,
- the definitions of the German contribution,
- the definitions of the Sri Lankan contribution and
- information on the implementing Agencies.

The Bilateral Agreements (Exchange of notes) are then (after the approval of the Ministries) signed by the Embassy of the Federal Republic of Germany and the Ministry of Finance / Sri Lanka via its Department of External Resources.

The German contribution generally comprised expertise and equipment, while the Sri Lankan contribution was to make available suitable staff, office space, and the enforcement of certain regulations set up by the General Agreement

between the two countries on Technical Co-operation, such as customs regulations, duties, payments of taxes, etc.

It was originally planned, and agreed upon during phase 2 of the project, that the Sri Lankan contribution e.g. during phase III shall be to set up the Hydrographic Office as an independent organization. However, this was modified after the political situation in Sri Lanka changed in 1994.

THE PROJECT'S DESIGN AND ACHIEVEMENTS

The project originally was designed into three phases.

Phase I : Initial phase
Phase II : Implementing phase
Phase III: Consolidation phase

Implementing procedures were delayed due to various reasons, mainly caused by the non-availability of staff and political turbulences during phase I and II. Therefore even in phase III, now in progress, implementing procedures are still carried out. A consolidation would be welcome, but unfortunately the phase III in this regard cannot really be regarded as *consolidation phase*, due to above reasons.

The achievements of the three phases of the project are as follows:

Strengthening of the National Hydrographic Office	
Phase I	1988 - 1990, Achievements
	• Manpower development plan prepared • Procurement of basic equipment for hydrography • Training of hydrographic surveyors • Procurement of equipment for electronics laboratory • Installation and operation of hydrographic equipment • Installation and operation of EDP equipment • Procurement of project vehicles • Setting up of Job descriptions / Schemes of recruitments • Organization chart

HPC Hamburg Port Consulting reported on this phase and the projects targets in general in International Hydrographic Review , July 1991.

Strengthening of the National Hydrographic Office	
Phase II	1990 - 1993, Achievements
	• Manpower development plan (update) • EDP equipment (supplement installed) • Surveying boat ('Tharanga') in operation • Additional surveying equipment operational • Procurement of work boat, trailer, vehicle • Setting up of a mechanical workshop • Renovation and installation of new Electronics Lab. • Training courses • Refurbishing of office rooms

During the 2nd phase of the project, activities were focused around the introduction and the process of familiarization of equipment, mainly the SURVEYING BOAT and the Positioning Systems (See Figs. 1, 2 and 3), (a) the DEL NORTE TRISPONDER (Microwave) SYSTEM and (b) Positioning based on the use of Differential GPS. The DGPS hardware was designed by Prof. P.G.R. ANDREE (Hamburg Polytechnics, Sect. Hydrography), and analyzed by one of his students, R. SIEMER in his *Thesis on the use of Differential GPS in Sri Lanka*, (Referent Prof. ANDREE, Diplomarbeit Siemer, unpublished).

Strengthening of the National Hydrographic Office	
Phase III	1993 - 1996, Objectives/Achievements
	• Improvement of planning procedures • Manpower development plan implemented • Equipment requirements are adequately met • Cartographic reproduction room set up and Cartographers trained in Nautical Charting • Financial capabilities are improved • Communication with users and other relevant parties is established (Public Relations programme) • Maintenance procedures implemented ***Procurement of Surveying Vessel*** (*)
(*)	will be delivered towards the end of the project only

During the 3rd phase of the project, activities were centered around the improvement of planning procedures, the general consolidation of work procedures and the specification and procurement of the surveying vessel, which will be delivered at the end of August 1996. A mechanical workshop was set up with the equipment delivered during phase II. Practical procedures regarding the familiarization and operation of the vessel, could neither be implemented nor trained due to the late procurement of the vessel (See Fig. 4).

PROJECT PLANNING AND MANAGEMENT

The background of the project, some of its implementation concepts, results, equipment and procedures regarding the first phase were introduced and highlighted in 1991[1].

Planning and management of Technical Co-operation Projects funded by the German Government are based on general principles of planning and implementation of **objectives oriented project planning**, ideally accomplished during Workshops held prior to each project phase. A summary of the main principles is given below, with brief descriptions and some project related examples.

PRINCIPLE	DESCRIPTION	EXAMPLES
Planning procedure	Planning procedure based on overall goal and targets	Overall Goal: Hydrography contributes to marine resources management Target (Project's target): Make Hydrographic Office functional to suit requirements according to needs.
User orientation	*Participation analysis* Who benefits from hydrographic activities? The beneficiaries should participate in planning procedures, articulate and formulate needs. Who are the adversaries? Who can be partners?	Coast Conservation Dept. needs 25 fairsheets. Navy needs 50 fairsheets and charts. NARA needs sub-bottom information on marine sanctuaries. Safety aspects / Shipping / Charting. Mapping aspects. Harbour Corporation needs surveyed approaches etc.

[1] U. BIELKE (Hamburg Port Consulting GmbH), IH Review, July 1991.

PRINCIPLE	DESCRIPTION	EXAMPLES
Problems orientation	*Problems analysis* Problem tree based on recognized short-comings to take necessary action.	- Financial constraints - Lack of equipment - Lack of proper management - Inadequate maintenance - Insufficient number and quality of staff etc.
Objectives orientation	*Objectives analysis* Conversion of problems into objectives (positive approach by re-formulating of problems).	- Financial management improved - Equipment procured and functional - Management improved - Maintenance facilities installed - Staff trained, manpower development organized.
Activities	*Definition of activities* to achieve objectives.	- Employ accountant - Set up budget plan - Procure equipment - Train staff - Purchase tools and install workshop - Set up manpower development plan etc. Obtain approvals for recruitments etc.
Indicators which are objectively verifiable	*Definition of indicators* (to control achievement and monitor activities)	25 staff members employed. Training certificates issued. Equipment inventorized. Letters, communication etc.
Assumptions	*Definition of important assumptions*	Support by Government. Sufficient budget provisions available etc.
Inputs Partners contribution	*Definition / Assessment of inputs* to achieve goals. What funds are required, which funds are available?	36 Man/Months Experts in Hydrography. 24 Man/Months Expert Electronics Workshop. 1 Mio DM for Equipment etc. Employment of staff. Renovation of Office.

PRINCIPLE	DESCRIPTION	EXAMPLES
Outputs / Results	Definition / Assessment of outputs. Quantity? Quality? Within which period?	5 surveyors successfully trained in Hydrography by 1993. 2 surveyors sent to post graduate course in 1995/96. 2 fairsheets surveyed and distributed by 1995 etc.
PPM	Project Planning Matrix	Matrix contains all necessary details indicated above and informing on project.
Plan of Operation	Relationship between activities, specified above, results, the time schedule, responsibilities, and indicators	Jan 95-Mar 95: Training programme prepared; responsible: Expert Hydrography (name); Result: Three Trainees on the job trained, certificate issued.
Monitoring and Evaluating (M&E)	a) Progress reports b) The annual progress report c) The project evaluation (normally at the end of the ongoing phase) d) Financial monitoring	Every 6 months Every 12 months Report on status, delays, modification of plan, adaptation of plan etc. Expenditures on staff equipment consumables etc. Local budget of the project General budget (Home Office) Equipment budget.

Please note, the examples given in the third column are not representative for the project's activities and are listed for the understanding of the table only. The number of activities in the actual plan of operation was e.g. detailed into more than 180 main- and sub-activities, which were updated annually - with permanent monitoring.

THE HPC - TEAM

The Project Team and the Home Office Support Team

Experts Designation	Function in the project (in brief) Qualification, Nationality, Duration of employment in the project, LT = Long Term, ST = Short Term	Her/His Counterpart(s) / Partner(s)
Team Leader	Co-ordination of activities, Management of project staff and funds, Implementation of Plan, General Expertise and specifications, Training, Documentation, Reporting, Planning and Monitoring. Master Mariner, Geodesist, (Germ.Univ. Surv. Master Sc. Diploma), German, 8 Years (LT).	Director NHO
Marine Engineer	Setting up of Mechanical and Electronics Workshop, Maintenance Procedures. Marine / Mech. Engineer & Expert in Electronics, German Diploma, 2 Years (LT), 5 times ST (2 - 7 months)	Electronics Engineer, Mechanical Eng.
Hydrographic Surveyor	Practical Advisor, Implementing of Hydrographic Surveying, Routine Work and Processing of Data. Hydrographic Surveyor (A) and Surveying Engineer (German Diploma), German, 6 times ST, 3 - 8 months (Fair weather season)	Hydrographic Trainees and Hydrographic Surveyors
Cartographer	Practical Advisor, Setting up and Implementing of Cartographic procedures, Specification of equipment. Cartographer with long term experience, Sri Lankan, 2 years LT	Chief Cartographer and Cartogr. Draughtspersons
Cartographer	Advisor and Instructor for Training course on Nautical Charting. German Cartographer (Diploma), Expert in Nautical Charting, 3 months, ST	Chief Cartographer
Financial Advisor	Advisor and Instructor for the Accounts procedures of the NHO, budgeting, accounting, training of accountant. Chartered Accountant, Sri Lankan, 1 Year (part time)	Accountant NHO
Geodesists and Hydrogr. Surveyors	Home office support, specification, procurement and logistics. Geodesists, Hydrographic Surveyors, EDP specialists and Professor Hamburg Polytechnics (Hydrogr.)	Project Team in site

THE VESSELS OF THE NHO AND THEIR EQUIPMENT

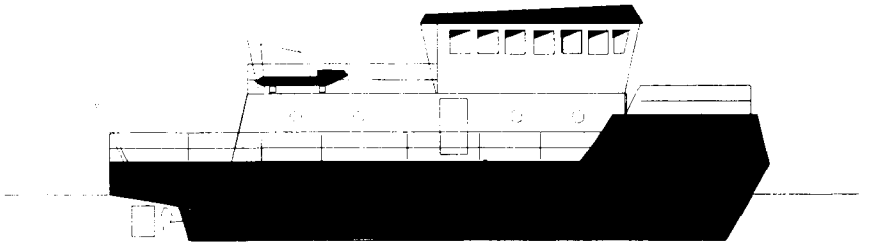

Figure 1

SURVEYING VESSEL

Presently under procurement (1995/96), Surveying Vessel, Length approx. 20m, Breadth 5 m, 2 Diesel Motors MAN, 500 HP, 20 kW Power Generator, 220V, 12V, 24V, Endurance: 700 Nautical Miles, Surveying Speed: 4.5 - 6 kts, Max. Speed 10 kts. Surveying vessel to survey the continental shelf of Sri Lanka. Crew and Surveying team: 6-8 persons, double cabins and bridge room, airconditioned, echosounder, Satellite navigator, data-acquisition systems HPC - SEADAT and NAVITRONIK - NAVISOFT. ELAC-NAUTIC-GmbH Echo sounder , DGPS positioning, Gyro compass, Radar, Dinghy. Ship builder: Visser Dockyard / The Netherlands.

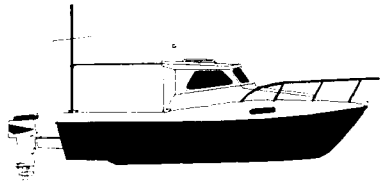

Figure 2

THARANGA, Surveying Boat

THARANGA, Sinhala: ***WAVE***
Length: 7.5 m, Breadth: 2.3 m, Engine: Diesel 27 HP, Generator: Marine Type, 4 kW, 220V, 12V, draught: 0.5 m, airconditioned, 2 berths, 2 seats, (2 spare seats on deck), 2 frequency echo sounder, three different positioning systems selectable, left/right indicator for accurate line control. In operation since 1992, hull: fibreglas, made in UK, equipped in Germany.

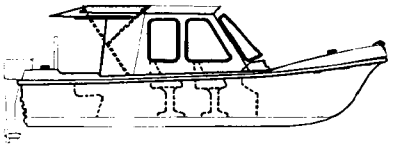

Figure 3

WORK BOAT

Workboat, Open cabin boat, Length: 6m, 15 HP OBM, Solar powered battery system, 90 Watt, Notebook PC as data acquisition computer, 1 frequency echo sounder and interface for positioning system. 4 seats, storage racks, 20 l tank for fresh water, signal horn, front seat steering control, Walkie Talkie, 3 m signal mast for reflector and/or antennas, canvas cover (canopy), hull: fibreglas, made in Sri Lanka. Purchased in 1993.

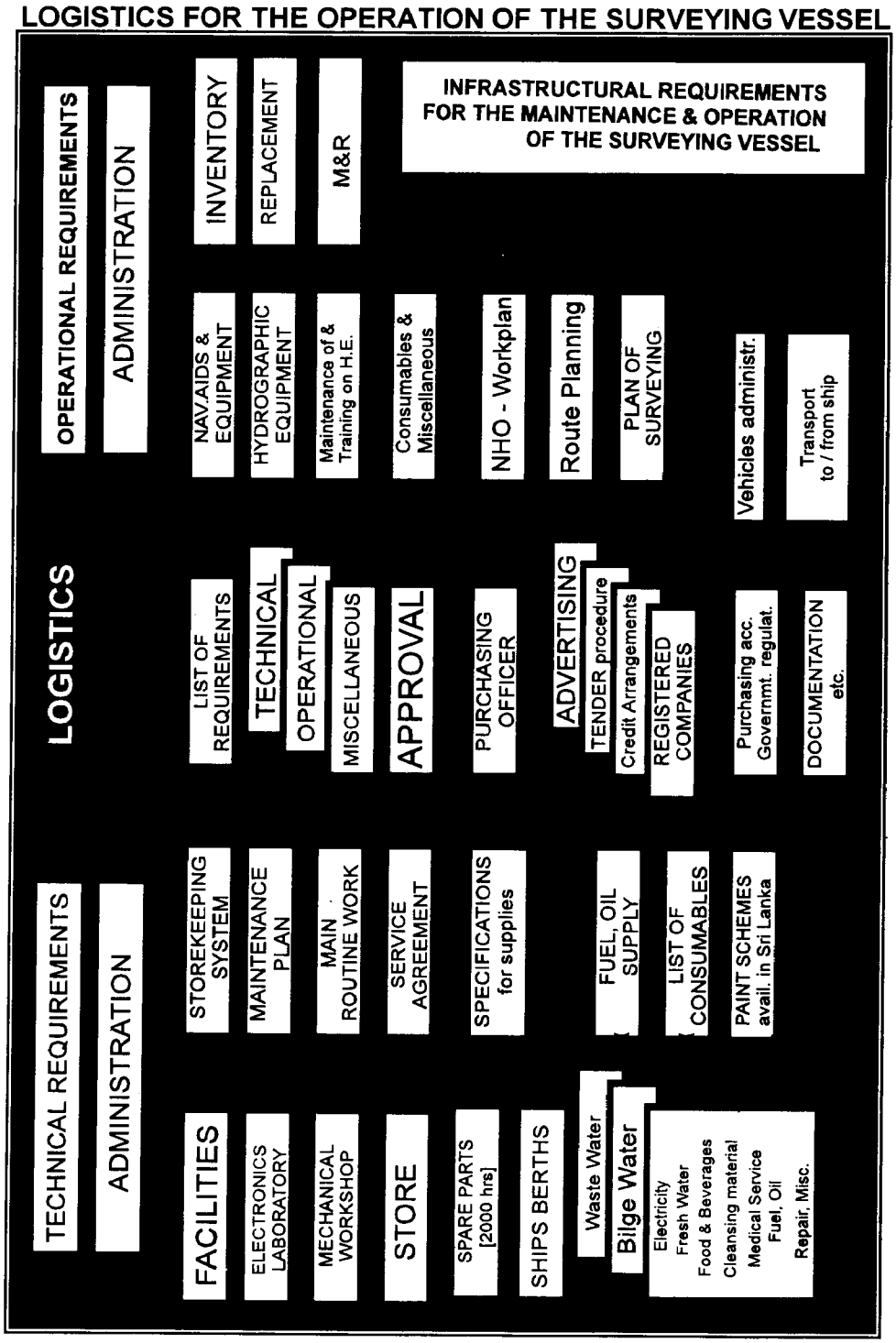

FIG. 4.- Logistics for the Operation of the Surveying Vessel /NHO Sri Lanka.

TRAINING AND STAFF DEVELOPMENT

DEVELOPMENT OF STAFF

From 1988 - 1995 the development of staff was considerable. In 1988, the total number of staff members was approx. 10, the total number of staff in 1995 was 46, and cadre approval was given for a total of 60. The project assisted with advice in the setting up of a scheme of recruitement, a set of job descriptions and the organization chart. The discrepancy between the number of employed staff and the cadre approval is mainly due to the fact, that the cadre approved for the surveying vessel and its necessary logistics, which is not yet procured, is still not employed.

TRAINING FACILITIES

A training room, including networked Personal computers and an attached SVGA - Overhead projector unit was installed and regularly used for instructions, lectures and workshops (See Fig. 5).

The training room further comprises a professional library on Hydrography and Marine Science, specified and procured by the project. A considerable number of books was also made available for this library by the International Hydrographic Society, IHS, by an independent activity carried out by one of the Hydrographic Surveyors. All the publications of this library, including any new in-house publications and brochures of the Hydrographic Office are permanently inventorized, the lists of the books are published for access by any interested person or organization. The planning procedures for hydrographic surveying and data processing is directly linked to an equivalent numbering system of training material which was created in both digital and analoguous documents (files) as overhead transparencies, printed output and hand-outs (photo copies) and stored in a computerized filing system for both updating purpose and direct use.

IN-HOUSE TRAINING

Training formed an integrated part of activities within the project. Training in standard computer software was conducted by NHO staff with the assistance of the HPC project team. A training programme was drawn up and implemented for Hydrographic Surveyors (Trainees) and Cartographers (Trainees). Five Cartographers participated in a 3 months Initial Training on Nautical Charting, conducted by a German Short Term Expert (from BSH Hamburg) with the assistance of the project in Colombo utilizing in-house facilities. The aim of the course was to make the cartographers acquainted with the theory and practise of all stages of chart production, starting from the compilation stage through the stages of design, construction upto reproduction techniques. The participants were familiarized with the conventional techniques and materials.

OVERSEAS TRAINING

Where necessary, a special training was organized for selected persons. Five staff members participated during phase I of the project in a special training for Hydrographic Surveyors conducted by Hamburg Port Consulting, the Hamburg Polytechnics and the BSH, in Hamburg, Germany.

One Trainee, who was sent to Italy for the Level B training course at the International Maritime Acadamy, Trieste, sponsored by the Italian Government, subsequently received some further assistance by the project.

One Hydrographic Surveyor was sent to the University of Plymouth for a Post Graduate Course on Hydrography (1995-1996, ongoing).

The Director of the NHO participated in a study tour to Germany (Hamburg, BSH and HPC).

ON-THE-JOB-TRAINING

With the growing number of equipment, on-the-job training in site became an important part of instructions necessary to fulfil both the NHO requirements towards standards of vocational training and output of day-to-day operations. With reference to training and with the experience of the project, one must admit, that it was not always feasible to integrate training aspects without disturbing the production process of data acquisition and processing of hydrographic data or the interruption of other necessary activities.

MODERN WORKING ENVIRONMENT AND FACILITIES

The building up of an institution with the technical and administrative capacity necessary for a modern hydrographic office required the setting up of a modern working environment including telecommunication facilities like telephone and fax. A telephone system and the use of computers for general office work contributed very much to the increase of efficiency and are prerequisite for further progress regarding the development of the NHO.

In the course of the joint operation of the project additional facilities were installed:

- Building of garages for the vehicles
- Building of store for general storekeeping
- Building of rest room for drivers
- Installation of air conditioning for 80% of the office rooms (and 100% of EDP/Cartography)
- Electrical wiring in 50% of the rooms and 100% in workshops.

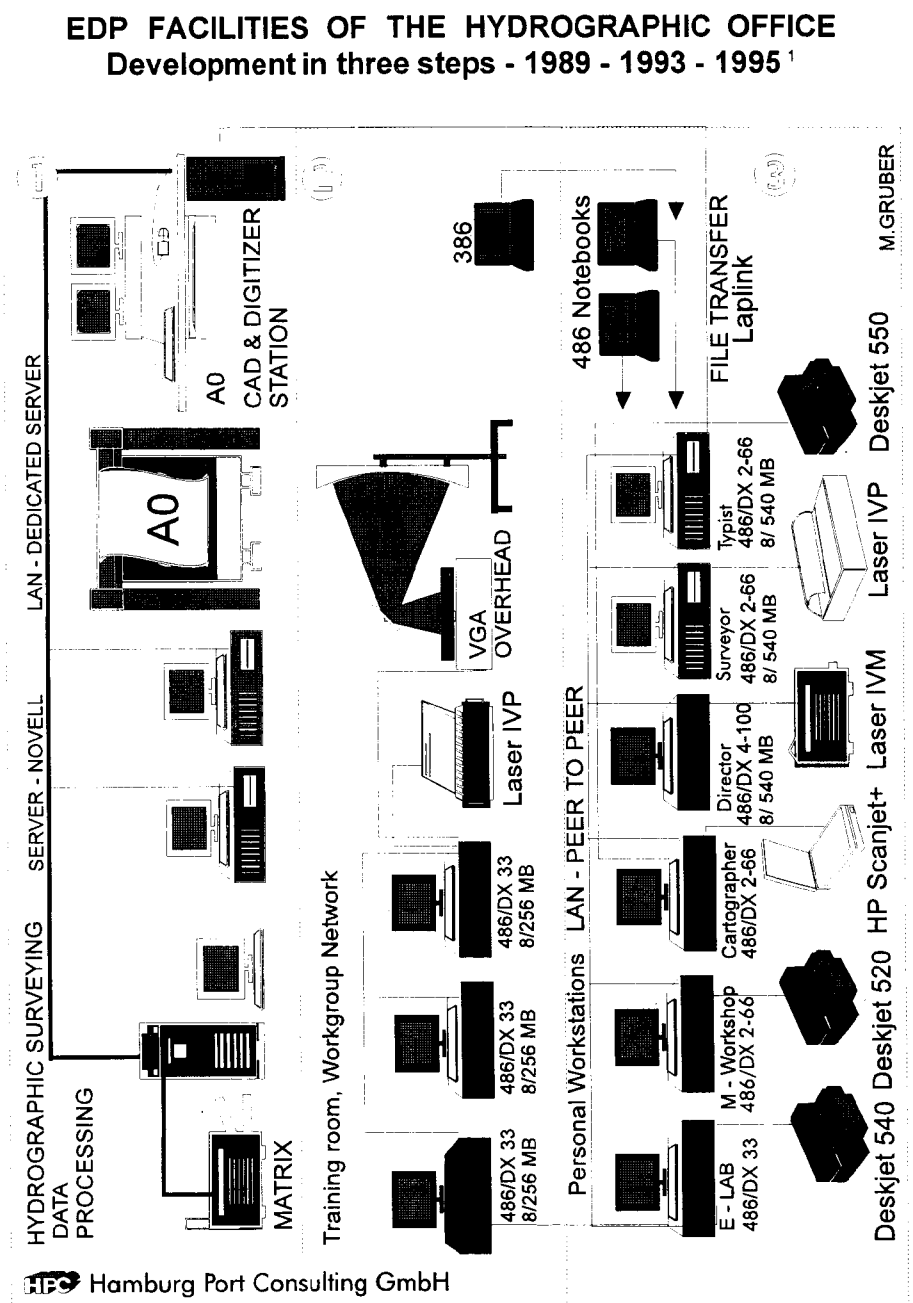

FIG. 5.- EDP equipment Hydrographic Office.

[1] HP Scanjet Plus: Procured in 1989, Laserjet II (1989) upgraded to LJ 4 M/6.

A significant amount of information regarding different areas of maritime activities was used in the preparation of this study. This comprehensive documentation has been summarized to include the most relevant aspects of this information which have a direct impact on the formulation of a national maritime policy. A wide range of literature was consulted, and the knowledgeable views and experience of naval officers, academicians, businessmen, legal experts, administration representatives and other persons with interests in maritime affairs were taken into consideration.

The marine environment has been always vital in human evolution, not only as an important source of food, but also as the most expeditious transportation route between coastal States. The economical advantages of transporting large volumes of commodities by sea over great distances are undeniable when compared to other means of transportation. Maritime transportation has, in fact, made the oceans a uniting factor rather than a barrier between nations separated by oceans and seas. Fishing as an economical activity, offshore petroleum resources and the potential of mineral deposits on the ocean floors are other important contributors to the uses of the sea.

While all nations have the same juridical right to use the oceans, International Maritime Law offers basis in which their interests in exploiting the oceans for economical purposes may peacefully compete. Fundamental principles are established to prevent conflicts or acts of war that may obstruct maritime trade or severely damage the oceans for future use.

II. NATIONAL MARITIME OBJECTIVES

The geographic conditions of maritime nations determine their future development. No efforts should be spared to help nations to realize the important role of the ocean in their future development, and therefore, the need to establish a National Maritime Policy.

This objective could be stated as follows:

"To make efficient use of the waters under the national jurisdictional interest and welfare of the nation, within the frame of International Maritime Law and preserving the marine environment and the stability of its ecosystems."

This national objective involves a number of subjects which cannot be considered as separate items. They are valid and fully effective only as a direct result of their harmonious integration.

1. Create a national maritime consciousness to drive the national objective.

2. Optimize the use of the seas as maritime transportation routes and for recreational purposes.

3. Ensure the effective use of the maritime resources within the area of national jurisdiction.

4. Promote science and technology in order to support the correct use, exploitation and administration of the national maritime resources.

5. Revise and improve the legal framework, and assist the national administration in matters related to national and international maritime law.

6. Preserve and enhance the marine environment within and adjacent to those areas under national jurisdiction and protect it against any possible detriment caused by foreign maritime activities that may affect the national interests and the welfare of the population.

7. Secure the waters under national jurisdiction, its interests and transportation routes from any threat or illegal action that may contravene the national rights and jurisdiction.

III. NATIONAL AND SECTORIAL MARITIME POLICIES

The following seven topics may be useful as a basis for carrying out an analysis of the geographic characteristics of a nation and to identify and develop its maritime interests. They are individual sectorial policies, but should be combined to create a single National Maritime Policy.

- Occupancy and development of the coastal region and all waters under natural jurisdiction.
- Promotion of a maritime consciousness and education in maritime affairs.
- Use of the seas as maritime transportation routes.
- Development of the maritime industry.
- Encouragement and enhancement of marine scientific research.
- Protection and preservation of the economic zone and all waters governed by national jurisdiction.

This classification, improved with detailed study, academic deliberation, and public and private debate may provide national institutions with some guidelines for the establishment of a National Maritime Policy to conduct future development. The brief description that follows, demonstrates that Hydrography and Oceanography are subjects strongly connected to the above sectorial policies.

1 - Policy for the Occupancy and Development of the Jurisdictional Waters and Coastal Zone

The rights of countries utilizing the ocean are governed by international customary and conventional law. Without the existence of geographical features

used as reference, maritime delimitation cannot be clearly indicated. Natural phenomena and human activity often have effects which may affect national laws. In this respect, the rights of coastal States decrease with distance, from the coastline, where absolute jurisdiction is recognized, to the high sea, which is recognized as the "Common heritage of all mankind" and, consequently, in which there are equal rights for every nation. Therefore, the establishment of a "Policy for the Occupancy and Development of the Jurisdictional Waters and Coastal Zone" is very important to ensure a harmonious relation between shore and maritime activities and between the maritime interests of neighbouring States.

A full understanding of the characteristics of maritime activities, as well as a revision of the legal framework and administrative regulations that rule these activities are required to develop a policy on national jurisdictional waters as part of a programme of development.

The Law of the Sea provides an essential reference to facilitate maritime development and its implementation by the United Nations is a clear expression of the will to achieve it. Nevertheless, it is unsufficient without the existence of a national legal framework and regulations.

In accordance with a desire to make life at sea and with the sea possible, it is necessary to develop the necessary facilities to enable easy access to the coastal zone. A ground transportation network is needed to connect the main production centres with maritime terminals and ports of loading, where the commercial exchange actually takes place. Coastal roads are also necessary to permit tourism and recreational activities, domestic fishing, aquaculture and other activities, allowing people the beneficial effects of a direct connection with the sea. The level of welfare and prosperity of small coastal settlements is determined in many ways by this road connection, by providing residents with an access to basic services such as health, education, supply, trade activities and logistic support for their production systems. Access to the ocean is complemented with the capacity of the marine industry to design, construct and provide all sorts of coastal engineering works, marine devices, and other equipment to increase the safety and efficiency of maritime activities.

The areas of interest of a "Policy for the Occupancy and Development of the Jurisdictional Waters" must include the internal waters, the territorial sea and contiguous zone, the economic exclusive zone (EEZ), the continental shelf and the international zone. Its objectives may be stated as follows:

- To optimize the use of continental or inland waters as communication and transportation routes and to exploit touristic resources of economical significance.

- To establish harmonious relations with neighbouring States for better use of international waterways and lakes.

- To seek an efficient use of the coastal zone, considering its fragile and vulnerable characteristics, ensuring that no activity against the national interest is carried out therein.

- To encourage the growth of coastal settlements and the establishment of new communities to ensure an optimum distribution of the population.

- To identify and protect areas of special scientific, ecological or anthropological interest in the coastal area.

- To encourage and intensify touristic activities in inland and coastal waters suitable for these purposes, by integrating them with the economical exploitation of natural resources in the same areas.

- To reach an optimal and rational use of the coastal zone, developing a communication infrastructure to enable easy interaction between shore based and maritime activities.

- To keep an efficient control over maritime traffic and other activities carried out in the Territorial Sea and the Contiguous Zone, in order to ensure its efficient and safe progress and to prevent illegal acts that may contravene the national jurisdiction.

- To review and improve legal and administrative regulations in order to confirm and strengthen the national jurisdiction of the Economic Zone, fostering national activities related to the use and exploitation of the resources in this area.

- To contribute to the development of the national sense of ownership for maritime areas, explaining the importance of these maritime areas for the progress of economical activities and general welfare of the nation.

- To increase technological knowledge, development and professional training to support and guarantee economic activities carried out in the Economic Zone and neighbouring seas, in order to increase safety and to reduce the risks of working in the marine environment.

- To foster the development of international regulations which define the economic rights of institutions which fund and carry out marine research and exploration programmes.

- To develop and maintain a record of the available resources and characteristics of the area, in order to perform a reasonable and profitable exploitation of the zone.

- To encourage the creation of a coastal patrol system, in order to prevent foreign maritime activities which could damage the marine environment.

- To fulfil the agreements with the international community regarding safety of human life at sea and the health of the oceans.

- To acquire a sound knowledge of the sea bed and to upgrade technological development and professional training so that they may provide a basis for reaching international agreements regarding

maritime research and exploration and exploitation programmes in the national territory.

2 - Policy for the Promotion of a Maritime Consciousness and Education

"Maritime consciousness" may be defined as the exact and reflective knowledge of the marine environment. It is essential for a successful achievement of national maritime targets. It can be said that a country is maritime or ocean minded when most of its population is aware of the contribution of the oceans to its livelihood, safety, growth and prosperity. Some guidelines for the establishment of a Policy for the Promotion of a Maritime Consciousness are given below :

- To develop a collective will to strengthen the country as a maritime nation.

- To provide suitable information and training in order to optimize the use of the seas as maritime transportation routes, renewable and non renewable resource provision and recreational areas. This will ensure a good use of the natural marine resources and will develop activities to support their use and exploitation.

- To promote the protection and preservation of the national marine environment and to ensure that it will not be damaged by the activities carried out by neighbouring States.

- To provide the necessary training on the legal framework that governs maritime activities and to reinforce the legal aspects of the administration of the waters under national jurisdiction.

3 - Policy for the Use of the Seas as Maritime Transportation Routes

The "Policy for the Use of the Sea as Maritime Transportation Routes" contains the main guidelines for national administration and private sectors about matters of maritime and fluvial transport. Port Policies must share the same objectives regarding port affairs.

Transport is an instrument for the development of the national economy. Supply requirements, social life, agriculture, industrial and mining activities have an impact on the construction, extension, planning or termination of a transport system and its facilities. Similarly, the Transport Policy will be determined and conditioned by Social and Economy Policies.

The economic targets of a nation are often decided with a view to national development, through a sustained growth and diversification of foreign trade. The existence of efficient and economic transport services are vital for this purpose. A large percentage of foreign trade is performed through maritime transportation. The remaining 10% is shared by transportation by air and land. A network of roads, railways, sea and air ports is necessary to ensure reliable, efficient and economic

inland transportation of exports and imports, and also national and international vessels capable of meeting these requirements.

Some of the objectives of a "Policy for the Use of the Seas as Maritime Transportation Routes" could be:

- As a global objective: to observe the requirements of the national economy, providing adequate means to satisfy the needs of the population and achieving a satisfactory development of foreign trade. This policy should be aimed at providing such services at a minimal social cost.

- The defence of national territory, according to international law and its application, particularly in boundary zones and isolated territories.

- The growth of underdeveloped regions and the physical integration with neighboring countries accomplished due to port, inland and specially, maritime transport.

- Optimum use of the coastal zone, to be achieved by means of technical administration, which, within a legal framework, will permit priority access to the ocean for all maritime activities relevant to national development.

Experience on matters of development and port operations indicates that private operation has considerable advantages over the public operation of ports.The participation of private sectors in port operations introduces competition within and between ports that have areas of common influence, so that service tariffs are fixed according to a market economy. National and international shipping should also be privately managed and dependent upon the market economy.

4 - Policy for the Use of Natural Resources

The economic activities which optimize the use of the waters under national jurisdiction is a factor related to the establishment of this policy.

Note: Although there may be alternative ways of exploiting oceanic resources - such as obtaining energy from dynamic sea phenomena and, eventually, the extraction of minerals dissolved in sea waters - they are still in a rudimentary stage and have not yet been developed as profitable activities.

Some ideas for the planning of a "Policy for the Use of Natural Resources" are given below :

- To promote the development of coastal activities, aimed at gaining the maximum benefit possible, but preserving the natural marine environment.

- To make efficient and responsible use of hydro-biological resources in the coastal zone, bearing in mind the fragility of this environment and that fauna can be easily damaged.

- To encourage the development of national fishing as a small-scale industrial activity.

- To encourage a continuous growth of aquaculture, as a source of natural renewable resources. To encourage also the establishment of new production centres in coastal zones with low density of population.

- To minimize the negative impact of the foreign deep-sea fishing on the national fishing industry.

- To encourage the development of fishing at a State cost and risk.

- To comply with the obligations and responsibilities of a Flag State, with respect to national vessels operating in the deep sea, specially in areas under formal international agreements.

- To improve the prospects for commercial fishermen by providing them with opportunities for national and international post-graduate education and training.

- To harmonize the professional interests of mariners with the qualification required by national fishing industry in relation with production processes in use.

- To increase the professional level of fishing crews, in order that they may maximize the operation of their vessels and fishing equipment and be capable of introducing specialized technology to their work.

- To improve the efficiency of the exploitation of natural non-renewable resources in the economic zone but ensuring the quality of the environment.

- To reinforce the national ability to negotiate its independent or associated participation in oceanic mining activities.

5 - Policy for the Development of the Maritime Industry

The establishment of a maritime industry may produce considerable benefit to the economy of a coastal State. The industry requires the development of highly specialized personnel and consequently leads to a secondary industry of education and training. The availability of these well qualified people and the development of products within the country rather than importing them externally, has significant economic benefits.

The implementation of a policy which encourages the growth of a maritime industry can be seen to have major benefits. Organized well, it can lead to taking

advantage of strengths already existing in a country and reducing weaknesses that may exist due to an absence of key elements of the structure needed to maintain a strong economy.

The objectives of a "Policy for the Development of a Maritime Industry" are summarized as follows:

- To promote the development of the maritime industry in order to meet the national requirements.

- To seek to increase the National Gross Product (NGP) by exporting services and goods produced by the maritime industry.

- To facilitate a continuous growth of the supporting structure of national production in order to meet the market requirements.

6 - Policy for Marine Scientific Research

Maritime scientific research must often consider topics of a multi-disciplinary nature and the solution of problems often requires close cooperation between experts in different fields and with different experiences. Countries planning to establish a "Policy for Marine Scientific Research" in accordance with their particular circumstances should bear in mind some fundamental principles and considerations and, as a matter of priority, should clearly establish the following parameters:

- Description of their current situation regarding supporting structure and equipment, scientific vessels, qualification of their scientists, planning and research programmes and especially, the coordination mechanisms available.

- Future trends of the marine scientific research, as it is vital to establish a priority of the tasks involved in this field.

From these parameters, the different objectives sought by each country will be determined and, at the same time, these objectives will decide the specific policies needed for their achievement.

The impact of human activity in marine systems is diverse. A clear example of this is the modification of the number of marine species as a consequence of fishing activity, and the introduction of new species in the deep-sea flora and fauna, due to shipping activities. It is consequently necessary to have a better knowledge of the whole environment. On the other hand, the settlement of new population in coastal areas and their activitiy have evidently increased, resulting in the need for adequate administration which would control a continuous development and maintain the balance between this increase and the natural environment. In this respect, a more active participation and effort by the scientific community and institutions would be helpful and is needed to guarantee a sound knowledge of maritime affairs, in order to make good use of the coastal area and to protect the marine environment.

A list of some objectives to be considered in establishing a "Policy for Marine Scientific Research" is given below :

- To promote and strengthen national marine scientific research and to emphasize its importance for national development.

- To develop marine scientific research programmes in parallel with port and shipping activities and to protect the national marine environment from pollution.

- To develop marine scientific research programmes for the development and maintenance of touristic and recreational areas and activities in the coastal zone and waters under national jurisdiction.

- To exploit adequately the natural renewable and non renewable resources, thus contributing to the continuous development of the country, while preserving the natural environment and the equilibrium of its ecosystems.

- To define the typical environmental systems that can be found in territorial waters, in order to obtain a solid scientific knowledge of the seas, the coastal and open seafloor and their natural resources.

- To improve and maintain the national supporting structure for research, education and training in the marine sciences with a view to improving areas which at present are insufficiently developed.

- To strenghten the administrative structure in order to coordinate and carry out research activities.

- To develop educational strategies for the academic, technical and professional areas, in order to produce enough qualified scientists, experts and assistants to carry out marine research activities.

- To ensure the completion and continuity of the short, medium and long term research programmes carried out by national institutions.

- To develop and strengthen the scientific and technological capacity - in accordance with the objectives of the various national areas involved in marine sciences - in order to meet the national scientific and technological requirements and to contribute to the development of the economic and social programmes of the country.

- To carry out parallel and harmonious activities in the coastal zone, assuring the protection and preservation of the marine environment in the national development process.

- To acquire a solid knowledge of international law and its gradual development regarding marine sciences in order to assist the national participation in international courts.

- To establish national standards in order to standardize the calculation of pollution measurements in aquaculture activities.

- To emphasize the importance of the preservation of marine environment.

- To establish standards and regulations applicable to maritime and fluvial activities based on a scientific knowledge of their associated elements.

- To obtain a solid knowledge of the marine environment, in order to carry out its adequate exploitation for the benefit of maritime operations.

7 - Policy for the Protection and Preservation of the Waters under National Jurisdiction.

Oceans are generally considered as an abundant source of food and recreational resources. They provide transport routes and act as a regulator and moderator of climate and as a result of all these, provide a function of extraordinary importance for the development and well being of the population.

It is necessary to know all the type and magnitude of all these, their variables, changes, seasons and periodic alterations in order to fully understand the diverse ecosystems that exist together in this environment.

If a country has not yet established a policy on nature reserves and the creation of marine sanctuaries, there is an urgent need to study the marine ecosystems as they represent a unique opportunity and are also important educational and touristic resources.

The State is responsible for the protection of the environment and from any danger that may alter its ecologic equilibrium and its value as a natural resource, especially from pollution, the consequence of which may be decisive for the survival of marine fauna and flora, harmful for human life and diminish its interest for recreational and tourism purposes.

The pollution of the maritime environment may originate from many elements but shore based sources of pollution are recognized as the most significant cause. A great part of the polluting elements that exist in the atmosphere are transported by precipitation directly into the seas, or indirectly by drainage from the shore. A portion of the industrial residues and polluting materials generated by cities and agricultural activities are also carried into the seas by fluvial processes.

The evaluation of the environmental impact is a basic reference and a very important element for decisions involving the establishment and operation of aquatic, marine and oceanic resources. All industrial installations, ports, maritime terminals, and all the activities carried out in the coastal zone, lakes, rivers or in jurisdictional waters, as well as undersea mining, cable laying, construction of bridges and other engineering works, are subject to a previous evaluation on the environmental impact before any decision is taken on this subject. The deposit of radioactive residues in

the oceanic sea bed and the dumping of toxic and harmful substances are also matters of grave concern that countries must investigate, monitor and control.

Ports and shipping terminals are important nodal points in transportation routes, but are also important polluting agents. Therefore, their design, installation and construction must be controlled, and great care must be taken to ensure that environmental criteria is applied to their construction along the coastline, and to the control of their activities and development.

The aim of a "Policy for the Protection and Preservation of the Waters under National Jurisdiction" is the protection and maintenance of the natural marine environment, improving the conditions for the existence of ecosystems, and establishing programmes to fight against harmful elements. The following items should therefore be taken into consideration:

- To prevent, reduce and control pollution, improving the environmental conditions in seas, ports, channels, rivers and lakes.

- To identify and evaluate the origin and effects of direct and indirect pollution of waters and their specific or dispersed action.

- To protect the marine environment from pollution caused by hydrocarbons, toxic and radioactive residues and other harmful substances, in order to maintain the equilibrium of the natural environment.

- To identify typical or nationally representative ecosystems along the coastline and to promote their preservation and development.

- To analyze the condition of the marine environment and to determine the existing and the potential pollution levels.

- To make efficient use of shore and oceanic resources by means of integrated programmes, establishing the framework for the exploitation of these resources. To develop monitoring and prevention programmes to control the pollution levels in waters under national jurisdiction.

- To draft guidelines and determine environmental impact parameters to carry out monitoring and supervisory programmes regarding the origin and consequence of marine pollution.

- To supervise, control and implement national jurisdiction regarding environmental protection of lakes, rivers and seas.

- To supervise, control and implement the international conventions ratified by national administration regarding the prevention, reduction and control of pollution in lakes, rivers and seas.

- To encourage participation in tourism and educational programmes by the private sector for the identification of ecosystems and the control of

contamination levels, procuring a highly qualified professional scientific participation and the best quality in the information provided.

- To emphasize the importance of preserving the marine environment by means of scientific programmes concerning the ecosystems in marine and inland waters, the species of economic and ecologic importance and those facing extinction.

IV. CONCLUSIONS

1. The potential of maritime nations is highly dependent on the ocean, where living resources and commercial possibilities must co-exist.

2. The seven policies suggested in this article intend to give nations a solid base for the establishment of a National Maritime Policy, strongly related to the hydrographic and oceanographic activities of their respective Hydrographic Services.

3. Hydrographic Services are commited to provide the necessary information and technical assistance to guarantee safe navigation and life at sea. At the same time, their specialized research, products and services provide important guidance for other maritime related activities relevant to the development of the country. The relation between Hydrographic Services and these policies has been outlined in the diagram annexed to this document.

4. Governments of maritime nations must always take the sea into account. When planning national policies, they must consider the ocean and its influence on the development and growth of their country, and in the achievement of the final objective of every nation : the welfare of its people.

5. Finally, it is necessary to note that a good knowledge of the sea and maritime resources is essential to make good use of them. In this respect, Hydrography and Oceonography include techniques, arts and sciences that can provide the sound and relevant knowledge required. Maritime nations should give them high priority in order to achieve the final objectives of their sectorial and National Maritime Policy.

Annex

Some Hydrographic Services and Products to Assist Maritime Policies

	Policy (1)	Policy (2)	Policy (3)	Policy (4)	Policy (5)	Policy (6)	Policy (7)
Nautical Charts	X		X			X	X
Thematical Charts	X	X		X			X
Atlas			X				X
Bathymetric Data Base	X		X	X		X	X
Oceanographic Data Base	X			X	X	X	X
Meteorological Data Base	X		X	X	X	X	X
Geographic/Nautical Information	X	X	X	X	X	X	X
Nautical Publications	X	X	X	X			
Forecasting	X		X	X	X	X	X
Cartographic Data Base	X		X	X		X	X
Parametric Monitoring	X			X	X	X	X
Maritime Concessions	X			X	X	X	X
Coastal Settlements	X				X	X	X
Tourism and Recreation	X	X	X	X	X	X	X
Environmental Impact Studies	X	X		X		X	X
Safety and Salvage at Sea	X		X			X	

(1) Policy for the Occupancy and Development of the Jurisdictional Waters and Coastline.
(2) Policy for the Promotion of a Maritime Consciousness and Education.
(3) Policy for the Use of the Seas as Maritime Transportation Routes.
(4) Policy for the Use of Natural Resources.
(5) Policy for the Development of Maritime Industry.
(6) Policy for Marine Scientific Research.
(7) Policy for the Protection and Preservation of the Jurisdictional Waters.