RATIONALE FOR A MARINE ELECTRONIC HIGHWAY PROGRAM IN THE MEDITERRANEAN SEA

Concept Paper

Stephen B. MacPhee

2005-06-09

Table of Contents

ABBREVIATIONS AND ACRONYMS

AIS	Automatic Information Systems
ARPA	Automatic Radar Plotting Aid
DGPS	Differential Global Positioning System
ECDIS	Electronic Chart Display and Information Systems
ENC	Electronic Navigation Chart
GEF	Global Environmental Facility
GIS	Geographic Information System
IALA	International Association of marine Aids to Navigation and Lighthouse Authorities
IFI	International Financial Institution
GMDSS	Global Marine Distress and Safety System
IHO	International Hydrographic Organization
ISO	International Organization for Standardization
ISPS	International Ship and Port Facility Security (ISPS) Code
IMO	International Maritime Organization
LME	Large Marine Ecosystem
MEH	Marine Electronic Highway
MSI	Maritime Safety Information
MSP	Medium Scale Project
OGC	Open Geospatial Consortium
SOLAS	Safety of Life at Sea (Convention)
PSC	Port State Control
SVC	Strategic Ventures corporation
VTS	Vessel Traffic Services
UNCED	United Nations Conference on Environment and Development
UNDAF	UN Development Assistance Framework
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Program
VLCC	Very Large Crude Carrier

RATIONALE FOR A MARINE ELECTRONIC HIGHWAY PROGRAM IN THE MEDITERRANEAN

1.0 Background to Marine Electronic Highway Development

1.1 What is now referred to as the Marine Electronic Highway (MEH) had its beginning more than 25 years ago. Early efforts centered around the acquisition and management of hydrographic data in digital form together with more accurate vessel positioning with the advent of the Global Positioning System (GPS) and later Differential GPS (DGPS). As a result of the increasing acquisition of hydrographic data in digital form, at the 1982 Quinquenniel Conference of the International Hydrographic Organization (IHO), under Decision 31 of the conference, the necessity to exchange hydrographic data in digital form was acknowledged.[1]

1.2 In the early 1980s, discussions were held on Electronic Chart development with workshops at the University of New Brunswick, Canada, in 1982, and at the Maritime Institute of Technology and Graduate Studies, Baltimore, USA, in 1983. In 1984, at the International Hydrographic Technical Conference in Plymouth, England, there were a number of papers on Electronic Charts and Integrated Navigation Systems for Very Large Crude Carriers (VLCCs) and in 1985; there were two Electronic Chart workshops, one at Rockville, USA, and one at Dartmouth, Canada. Attendance at the 1982 and 1983 workshops was mainly by hydrographers and geospatial data experts from Canada and the United States. The third workshop had a larger attendance than the first two and there were more than 150 participants at the fourth workshop representing more than ten countries. By this time, there was plenty of international interest in the Electronic Chart concept and plenty of debate on its future use and legal status. In the 1980s and 90s, the value of the Electronic Chart was demonstrated in several test-bed trials conducted in North American and European waters. During this time, the system used for the video display of Electronic Chart information together with positional information from navigation sensors began to be referred to as the Electronic Chart Display and Information System (ECDIS). ECDIS therefore embraces the entire navigation system. This includes the hardware and software needed for operating the system together with up-to-date Electronic Navigational Charts (ENCs) and the required navigational inputs, e.g. positioning information and vessel course and speed.

1.3 Awareness of the value of Electronic Chart technology was accelerated following the grounding of the tanker, EXXON VALDEZ, in Prince William Sound, Alaska, in the spring of 1989. Hearings conducted by the US National Transportation Safety Board included the recommendation:

Increased federal support should be provided to reinforce industry efforts to develop test and install integrated bridge navigation systems on all tankers… One key element which can only be conducted and certified by the federal government is the digitization of

[1] Proceedings of the 1982 Conference of the International Hydrographic Organization, Monaco, April, 1982.

navigational charts. This effort must be undertaken in order to accommodate modern computer technology currently available to enhance vessel navigation.[2]

In October, 1990, the Canadian Public Review Panel on Tanker Safety and Marine Spills Response Capability, in its many recommendations, specifically recommended that the Canadian Hydrographic Service:
Expedite the development of electronic charting technology and the required infrastructure, and then introduce regulations requiring the use of electronic charts on all tankers in Canadian waters.[3]

1.4 A Canadian pilot project aimed at demonstrating ECDIS and DGPS technology was carried out in the period, 1992-04, and strongly supported by the shipping community. The pilot project demonstrated that in addition to increasing safety, the use of ECDIS reduced transportation costs by; decreasing the number of accidents, direct fuel reductions, less engine movements, lower insurance rates and by allowing vessel operators to continue working during more inclement weather conditions. This was an important step for the ECDIS program in Canada. Since 1995, ECDIS has been widely used in Canadian waters and in particular in the Great Lakes and St. Lawrence River.

1.5 As time passed, it soon became evident that the geospatial data (data where position entries are referred to an earth reference) being collected for the production of navigational charts was also important in many other aspects of ocean and marine environmental science and management. In other words, the importance of acquiring, managing and archiving marine geospatial data in digital form is equally strong in all the science and technology disciplines not only for marine applications but for terrestrial applications as well. With an increasing requirement in recent year to portray both terrestrial and marine data on the same graphics and in the same databases, as well as the requirement to have seamless data interfaces between the land and sea, there has been a strong move to better utilize common horizontal and vertical geodetic datums, an important consideration when combining geospatial datasets. The 'obtain once' and 'use many times' concept is now becoming well established in the community. In addition to acquiring, managing and archiving data in digital form, it is now apparent that common formats and protocols are necessary for optimum data transfer and sharing. It was in the mid 1990s that the term 'Marine Electronic Highway' (MEH) was coined. This term was anticipated to embrace more comprehensive datasets to include a larger spectrum of marine data. The larger spectrum includes environmental and other scientific data in addition to the marine transportation data.

1.6 The hydrographers and the mariners led the way in accepting common standards for the acquisition of digital marine data. International Hydrographic Organization (IHO) Special Publication 57 (IHO S-57) is the Transfer Standard for digital hydrographic data. It is also the standard adopted for the distribution of hydrographic data to manufacturers,

[2] Proposed Findings of Fact, Conclusions and Recommendations Regarding Grounding of the Exxon Valdez, Exxon Shipping Company to the National Transportation Safety Board, July 17, 1989.
[3] Protecting our Waters, Public Review Panel on Tanker Safety and Marine Spills Response Capability, Final Report, September, 1990.

mariners and other users. IHO S-57 was adopted in 1992 and S-57, Edition 3.0/3.1 has been in use by all hydrographic offices for encoding Electronic Navigational Charts (ENCs) since 1996. In addition to its importance for exchanging digital data, this standard was used to accommodate the ENC data requirement called for in the ECDIS Performance standards adopted by the International Maritime Organization (IMO) in 1995.[4]

1.7 While S-57, Edition 3.0/3.1 served the hydrographic community well for the past ten years, it has recently been decided that it will be superseded by a new standard, S-57, Edition 4.0. The new standard to be introduced in 2006 will be even more flexible in accommodating matrix and raster data, 3-D and time varying data, and new applications going well beyond classical hydrography. It will also embrace high density bathymetry, seafloor classification, and marine Geographic Information Systems (GIS). Furthermore, it will conform to the International Organization for Standardization (ISO) Geospatial Standards and have registers for information such as ice and an Additional Military Layer. In addition to IHO S-57, a second document, IHO S-52 provides specifications for chart content and display aspects of ECDIS.[5]

1.8 In this section, I have attempted to cover the early background to the MEH. In the early years, the backbone of the MEH focused on marine transportation as the hydrographers and mariners were the early supporters. However, in the late 1990s, the situation began to change with many others in the scientific and technical communities becoming more interested in the sharing of data and common formats. As an example, in 1999, the Canadian Government approved funding of $Can 60M over a five year period to support a Canadian Geospatial Data Infrastructure (CGDI) initiative to:

- co-ordinate Canada's numerous databases of geographic information and to make them accessible through a common window on the internet; and
- enable partnerships between provincial and federal governments, the private sector and the academic community.

1.9 In February, 2005, an additional funding allocation of $Can 60M, over five years, was provided as a continuing commitment to further building the Canadian Geospatial Data Infrastructure and promoting its use, particularly in key priority areas such as health, the environment, sustainable development, public safety, cities and communities. Many countries are involved in putting their geospatial information archives in order and there is considerable international cooperation in the way of developing common specifications and standards. While the Canadian Geospatial Data Infrastructure (CGDI) exists in Canada covering both terrestrial and marine data; in United States a similar initiative is known as the National Spatial Data Infrastructure (NSDI), in Australia the Australian Spatial Data Infrastructure (ASDI), and in the UK the National Geospatial Data Framework (NGDF). There is considerable co-operation and sharing of information

[4] IMO, Performance Standards for Electronic Chart Display and Information Systems (ECDIS), IMO Resolution A19/Res. 817, 23 November, 1995.
[5] IHO S-52, Specifications for Chart content and display aspects of ECDIS, 5th edition, International Hydrographic Organization, December, 1996.

among the countries bilaterally and multilaterally and through international organizations such as the Open Geospatial Consortium (OGC) and ISO.

2.0 Defining the Marine Electronic Highway

2.1 There are many definitions of what constitutes a Marine Electronic Highway or MEH. As stated earlier, the nomenclature first appeared in the mid 1990s and in recent years, it has become quite commonly used. In a paper entitled *The Marine Electronic Highway of Malacca and Singapore – An Innovative Project for the management of Highly Congested and Confined Waters*[6], Messrs. Sekimizu, Sainlos and Paw state that, "The integration of the maritime safety component with the environmental protection and management component will be the foundation of the Marine Electronic Highway."

2.2 The definition is not static and tends to change with application depending upon whether the major emphasis is on the environment or marine transportation. Other names used include; Information Seaway, Marine Geospatial Data Infrastructure and Marine Information System, to name but a few. While the nomenclature and definitions continue to present a challenge, the purpose or task considered is similar. Increased maritime safety and security and marine environmental protection and management, and better commercial performance provide the reasoning for the development of the MEH and technology enhancements such as DGPS, ECDIS, AIS and VTS provide the technological underpinning. Scientific information on the ocean environment including information on the renewable and non-renewable resources and on the state of the ocean and seafloor provide the scientific underpinning. The MEH represents the assimilation of maritime safety and marine environmental protection in a geospatial framework. Stakeholders and beneficiaries include:

- Marine transportation managers and vessel owners
- Persons involved in marine habitat management
- Integrated coastal zone managers
- Researchers involved in renewable and non-renewable resources and biodiversity
- Personnel involved in disaster management/emergency response
- Personnel responsable for sovereignty and defence
- Ocean researchers
- Personnel with interests in recreation and tourism
- Technology providers
- The general public.

2.3 It is important to realize the importance of the general public as citizens more and more expect easy access to databases controlled by governments and by universities. An MEH for the Mediterranean is visualized as a marine geospatial infrastructure, built to internationally recognized standards and specifications, incorporating existing data and information systems. It needs to be a self-sustaining economic model with possibly private-public sector ownership.

[6] Sekimizu Koji, Jean-Claude Sainlos and James Paw, Tropical Coasts, July 2001, pp. 24-31.

3.0 Benefits of a Marine Electronic Highway (MEH)

3.1 Vessels have sailed the world's oceans and rivers since time immemorial. Early explorers, mariners and hydrographers gathered information on water depths, anchoring areas, tides and currents, as well as identifying conspicuous land features and other information to produce navigation charts, Sailing Directions, Manuals on Tide and Currents and information on routes to be taken to avoid danger. With the dawn of newer technologies, radars and gyro compasses became common on many vessels and land-based positioning systems were installed so that mariners and ocean scientists would not have to rely on the less accurate celestial observations. For the past fifteen years or more, the United States GPS has been in place, and the Russian System, GLONAS has been operational for the past ten years or more. These two satellite positioning systems with positioning accuracies of better than ten metres will be joined by the European Satellite Positioning System, Galileo, by 2008. While this series of changes in "positioning at sea' occurred over a long time interval, it was a step by step series of changes occurring when it was inevitable in terms of the technology available and in every instance, the mariners and the ocean scientists took advantage of the newer systems to their benefit in terms of safety and being able to acquire better information for decision making.

3.2 The advent of ECDIS was a similar step in progress. ECDIS was introduced when accurate positioning became available and when charts were available in electronic format. As mentioned earlier, more than ten years ago, when it became clear that there should and could be more sharing of marine environmental and transportation information, the MEH concept emerged. It came to fruition with common formats for different datasets and databases, common protocols, easier access to information, and increased interoperability.

3.3 While the MEH concept is still relatively new and is not in wide use, it is predictable that its application will expand to cover all major shipping routes and have a global influence on traffic safety and marine environmental protection. This will include all areas where it is beneficial to exchange and share the various marine information datasets. While some of the benefits in terms of marine transportation have been mentioned earlier, a more complete listing of benefits is as follows:

- enhanced ability to track and identify vessels and to detect illegal activities, e.g. the illegal discharge of bilge and ballast water;
- increased marine traffic safety and pollution prevention in congested sea lanes and port entrances;
- improved regional co-operation in data exchange on marine and environmental matters;
- higher efficiency and increased profits for the shipping industry;
- more effective route planning and decreased downtime due to weather restrictions;
- a technology that encourages realistic public-private sector partnerships;
- investments and opportunities for information technology and environmental industries in the bordering coastal states; and

- improved security against criminal or terrorist activities and faster response by coastal states to incidents of any threatening nature.

.

4.0 Marine Electronic Highway Projects Underway

4.1 While the marine infrastructure developments in Canada are rarely referred to as a Marine Electronic Highway program, the main waterways are covered by Electronic Nautical Charts and there are many projects embracing geospatial data integration including; projects in habitat and fisheries management, in oceanography, in the managing and storing of information on marine fish species, and in the management of marine transportation information. Automated Identification System (AIS) technology is not yet available in all marine traffic routes but the plan is in place to complete the AIS installation for all of Canada's waters by 2007. The reason for this strong backing for modern navigation systems is to increase safety, ensure that there is not a recurrence of incidents such as the EXXON VALDEZ grounding, and because of the demands of the shipping industry to increase efficiency. In the past few years, Open Geospatial Consortium (OGC) initiatives have been followed and all geospatial developments are OGC compliant providing enormous potential for interoperability. A newly developed GeoPortal system has been developed to allow government and private sector individuals to catalogue and publish geospatial data holdings for the general public, or in a more restrictive sense, when higher security is required.

4.2 By far, the largest MEH program underway is the Southeast Asia Marine Electronic Highway (SEAMEH) Program. With an oil flow of approximately 1.1 million bbl/day[7] and vessel traffic of approximately 150,000 transits in 2003 (up to 2000 on some days), there is no doubt that the Malacca-Singapore Strait is the busiest waterway for the transport of oil and natural gas as well as other commodities. The straits of Malacca and Singapore form the main seaway connecting the Indian Ocean with the South China Sea and Pacific Ocean and the requirement for Electronic Charts, ECDIS and for a Marine Electronic Highway for the Straits of Malacca and Singapore has been under discussion for more than ten years. The transit through the Straits of Malacca is 1,000 miles shorter than other possible routes and the three littoral states of Indonesia, Malaysia and Singapore have shown and continue to show a strong commitment to navigational safety and environmental management of the straits[8]. A brief review of progress on this MEH is as follows[9]:

- 1994-99 GEF/UNDP/IMO Regional Program for the Prevention and Management of Marine Pollution in the East Asian Seas and GEF Project on Building Partnerships for Environmental Protection and Management.

---

[7] Kreil, Erik, eia.doe.gov World Oil Transit ChokePoints dated April 2004, obtained from Internet on 26 May, 2005

[8] Maratos, Alexandros (Vice Admiral), President of Directing Committee of the IHO, Hydro International, Volume 8, Number 2, March, 2004, p.77.

[9] Information up until 1999 is summarized from the International Finance Corporation Feasibility Study – 1999, South East Asia Marine Electronic Highway, prepared by Strategic Ventures Corporation (SVC).

- 1997 Pre-feasibility Study by Strategic Ventures Corporation (SVC) funded by WB with focus on public sector.
- 1998 Feasibility analysis by SVC funded by IFC with emphasis on private sector stakeholder community.
- 1999 GEF/UNDP/IMO Regional Program for the Prevention and Management of Pollution in the East Asian Seas (MPP-EAS) prepared a Project Preparation and Development Facility (PDF) Block B Application that was submitted to GEF.
- 2000 WB approved in principle Block B Grant.
- 2001 Letter of agreement signed between WB and IMO making IMO the implementing agency for Block B Grant.
- 2004 Project Information Document (PID) issued by IMO approving $US 15M funding from a number of sources
- 2005 Final program approval expected later this year.

4.3 While the final program approval has not been obtained to start allocating the approved funding, over the past number of years, work has progressed unilaterally by littoral states and through bilateral and multilateral arrangements. It is felt that this program was slower than had been anticipated because it was really the first and while some of the littoral states embraced it initially, there may have been issues such as the effect on sovereignty through the sharing of information. There are a number of other projects that could be considered as MEH projects. One of these is a project in West Indian Ocean project entitled Western Indian Ocean Marine Electronic Highway and Coastal and Marine Contamination Prevention Project.[10] This project is ongoing. It will not be discussed as it is felt that the ones already discussed provide sufficient information on some of the steps necessary to ensure success.

5.0 Discussion of Proposed Marine Electronic Highway Project for Mediterranean

5.1 Before discussing the western Mediterranean and the area being considered for an MEH, it is important to address the entire inland sea. The Mediterranean is more than one million square kilometres in extent, but is significantly shallower than most oceanic regions, reducing its effective absorptive capacity for land and sea-based pollutants. The seafloor consists of a complex system of ridges, troughs and deep basins with narrow continental shelf areas incised by canyon systems. The Mediterranean Sea has more than 300 ports, significant oil and gas potential and there are a large number of fish species that are fished commercially. It is also a very important tourist region with many cruise ships and cruise visitors. As an almost totally landlocked basin, joined to the rest of the world ocean only by the Strait of Gibraltar on the western side, the pattern of circulation and the overall water budget are somewhat unique. The Mediterranean loses by evaporation almost three times as much as it receives through rainfall and runoff with the imbalance compensated by inflow from the Atlantic and to a lesser extent from the Black Sea. This makes it very susceptible to any harmful occurrences in the sea itself or in its supply and drainage waters.

[10] www.worldbank.org/website/externalprojects/procurement Project ID No. GE-PO78643

5.2 In the case of the Mediterranean, the requirement for environmental protection is considerably accented by the volume and type of ship traffic in conjunction with the unique nature of the sea as described above. Two-hundred thousand vessels of more than 100 GRT transit the Mediterranean each year, of which a significant proportion consists of oil tankers. Twenty-eight percent of the world's total oil and 30% of the world's maritime trade pass through the Mediterranean each year. Mediterranean shipping volumes are projected to increase by 74% over year 2000 volumes by 2010. The Mediterranean is also host to several key maritime "chokepoints" or narrow channels: the Suez Canal and the Sumed Pipeline connecting the Red Sea and Mediterranean Sea, and the Turkish Straits (Bosporus and Çanakkale) linking to the Black Sea to transport oil coming from the Caspian Sea region as well as other marine transportation commodities from Black Sea ports. These "chokepoints" are critically important to world oil trade because so much oil passes through them, yet due to their restrictive nature and high volumes, they are particularly at risk for shipping accidents. Furthermore, during the next few years, the Suez Canal will be widened, with a subsequent increase in shipping and an increased risk of marine pollution.

5.3 The narrow and constricted Straits of Sicily effectively divide the Mediterranean into two distinct basins. The Western Basin is dominated by abyssal plains with the Balearic and Tyrrhenian Basins as the two main deep depressions. The Tyrrhenian basin with a depth of almost 4000 metres is the deepest part of the western Mediterranean. It is most important that efforts to improve navigation and safety of shipping include the Straits of Sicily, probably the most hazardous passage area**.**

5.4 Safety and security of navigation and environmental protection in the Mediterranean and gaps in existing systems need to be reviewed by considering improvements that can be made by the application of modern technology. In addressing this issue, all options need to be considered, including radar installations Electronic Navigational Charts (ENCs) in conjunction with ECDIS, Automatic Identification Systems (AIS), Vessel Traffic Services (VTS) and Automatic Radar Plotting Aids (ARPA). After consultation and review of all options, the most appropriate ones will be recommended. Increased security can be provided optimally by adherence to the recently promulgated International Ship and Port Facility Security (ISPS) Code which came into effect on July 1, 2004 to establish an international framework of co-operation among governments, government agencies and the shipping and port industries in order to detect and take preventive measures against security incidents affecting ships or port facilities used in international trade. The Port State Control (PSC) Code is also important in terms of reducing pollution. The sharing of geospatial information has been greatly enhanced in the last fifteen years through the increased use of the internet, open systems architecture, interoperability and web based mapping development.

5.5 While traffic volumes in the Mediterranean are lower than in the Malacca Straits, security and navigational safety issues are similar. With the increase in traffic over the past few years and the anticipated increases within the next five years, the Mediterranean is a vital global transportation corridor. Furthermore because of the nature of the sea, it is

most at risk to long term effects from any marine disaster that would discharge deleterious substances into the marine environment.

6.0 Status of Existing Infrastructure

6.1 Considerable infrastructure exists in the project area. From a navigation perspective, surveys have been carried out in most of the main navigation corridors but in many cases, these areas require resurveying with multibeam echosounder systems and more accurate positioning systems. Paper charts, either from International Chart producers or produced regionally, are available for most of the areas and raster derived navigational charts (RNCs) are available in most areas. Italy has relatively modern surveys, complete INT (small scale) chart coverage, complete RNC coverage and almost complete Electronic Navigational Chart (ENC) coverage. The status of hydrographic surveys and charting for Libyan waters will be obtained through consultation. Malta has chart coverage from United Kingdom charts but most of the areas require resurvey. Approximately 50% of Tunisian waters are covered by modern surveys through cooperative programs with Algeria and Italy and INT charting is approximately 50% complete. This information has been abstracted from S-55.[11] It will be verified through consultation in the named countries.

6.2 The status of Marine Safety Information (MSI) and the availability of the Global Marine Distress and Safety System (GMDSS) has been reviewed and felt to be mostly satisfactory but confirmation is required. In addition, Italy operates a virtual maritime information center for the Mediterranean and Black Sea. Italy and Tunisia are members of the International Association of Marine Aids to Navigation (IALA), Tunisia and Italy are IHO members and Malta is an Associate Member. Adherence to conventions and codes such as the International Ship and Port Facility Security (ISPS) code, the Port State Control (PSC) code, MARPOL and the Convention for the Control and Management of Ships' Ballast Water will be reviewed.

6.3 With respect to scientific information on living and non living marine resources, and on the state of the ocean areas under review, considerable information exists. This information exists in government research laboratories, in universities and in the private sector. Our understanding is that this information exists in many different formats and on many different databases. Marine Research Institutes in Italy include: The Marine Fisheries Research Institute, the Naval University Institute in Naples, Department of Oceanography and Environmental Geophysics, Space Applications Institute, Marine Environmental Unit, the University of Pavia, Interdisciplinary Center for Bioacoustics and Environmental Research and the University of Trieste, Department of Oceanology and Environmental Geophysics. There is also the Euro-Mediterranean Center on Insular Coastal Dynamics in Malta. In addition, marine fisheries and environmental information is available from research carried out by other EU countries.

[11] IHO (S-55), Status of Hydrographic Surveying and Nautical Charting Worldwide, 2004, 93p.

7.0 Reasons for Choosing Proposed Area

6.1 The pilot project needs to cover the waters of the Straits of Sicily (Sicilian and Malta Channels) and beyond to the west and to the east depending upon littoral state support and available funding. The final boundaries for the MEH program will be decided upon after consultations have been completed with representatives of the bordering states. The Straits of Sicily (Sicilian and Malta channels) have been chosen because these waters are considered to be the most difficult transportation area in the Mediterranean. The IMO has also highlighted concerns in terms of hydrographic surveys and charting for the S side of the Sicilian Channel.[12] The Medium Scale Project (MSP) document will be completed when these consultations are complete.

8.0 Project Linkage to National Priorities, Action Plan and Programs

8.1 The report will take into account other GEF activities in the Mediterranean. The nations bordering the western Mediterranean derive considerable wealth from marine transportation, from commercial fisheries and from marine recreation and every effort will be made to ensure that the final report will be consistent with the UN Development Assistance Framework (UNDAF) for the region. The project will be closely linked to the aims and objectives of the Regional Marine Pollution Emergency Response Centre for the Mediterranean (REMPEC), the Mediterranean Commission on Sustainable Development (MCSD), the Marine Action Plan for the Mediterranean (MAP), the International Convention for the Prevention of Pollution from Ships (MARPOL), the International Convention for the Control and Management of Ships' Ballast Water and Sediments and other codes and conventions concerning maritime safety and environmental protection and to planned navigation safety and environmental management programs of each participating country.

9.0 Rationale for GEF Involvement and Fit with GEF Operational Programs and Strategic Priorities

9.1 The littoral states in the region have over the years shown a considerable commitment to navigational safety and environmental management as evidenced by membership of many of the international organizations that can bring uniformity and credibility to ongoing national programs. Nevertheless, not all the countries are members of international organizations that would enhance their ability to better manage and protect the marine environment. Tunisia participated in the 1995 Barcelona Conference or Common strategy for the Mediterranean and in 2000, Libya acknowledged and signed up for the principles laid out in the Barcelona Process. However, there are national differences that need to be addressed during the course of the Project.

9.2 The GEF has played a critical role in the development of the Southeast Asia Marine Electronic Highway (SEAMEH) and has been active in other areas of the world's

[12] International Hydrographic Organization (S-55), Status of Hydrographic Surveying and Nautical Charting Worldwide, 2004, Executive Summary.

oceans. The GEF global mandate fits well with the requirements for environmental safety, prevention of pollution and better management of marine resources in the area. The project falls under GEF Operational Programme 10, Contaminants-based, Ship-Related Contaminants Component, and supports Strategic Priority 3, Innovative Demonstrations for Reducing Contaminants.

10.0 Expected Goals, Objectives and Outcomes of Final Project

10.1 The ultimate goal of the program is the establishment and utilization of innovative maritime safety and environmental management information to create, network and maintain a geospatial marine infrastructure for enhanced maritime services, higher navigational standards, integrated marine environmental protection and sustainable development of coastal and marine resources. This will result in:

- A decrease in the number of human injuries and causalities and the amount of environmental damage caused by shipping incidents;
- uniform rules for marine transportation in the area and adherence to international regulations and standards;
- sustainable financing;
- Linkages to other major GEF initiatives such as a potential Large Marine Ecosystem (LME) project.
- a strengthening of regional marine management and environmental infrastructures; and
- data sharing through the use of common formats, open systems architecture and interoperability.

11.0 Expected Outcomes and Completion Date of PDF A Project

11.1 There are a number of potential outcomes that need to be addressed as part of the PDF A project. These outcomes to be addressed through in-country consultation include:

- Establishing the political willingness of countries to cooperate in the project. Because of the nature of the task of improving navigation safety, this political willingness should be addressed in several ministries and in each instance will need some definition. While not all the bordering nations will be visited, the programs of all bordering nations will be considered.
- Assessing assurance of country stakeholder participation. Issues include the inventory of potential stakeholders and investigation of their interest in participation. In most instances, a discussion on the advantages of participation will be necessary as well as the political considerations.
- Identifying in-country technical capacity needs. The capacity needs within the countries may be somewhat variable. Nevertheless, on a global basis, this inland sea is considered to have less need in terms of capacity building than many other marine areas.

- Preparation of Concept Paper. This concept paper will be presented at the 'First International Conference on the Promotion of Ocean Security, The Tripoli Conference, scheduled for July 23-25, 2005.
- Preparation of MSP proposal with proposed financing, institutional arrangements, incremental cost analysis and other factors.

The completion date for the PDF-A is Sept 30, 2005.

12.0 Towards a Successful End Product

12.1 It is important to realize that the MEH is a natural historical inevitability in understanding and using marine information more effectively. It can be compared to the advent of the telephone where a considerable investment in infrastructure was required for the public good but with the opportunity to cover the initial cost and to maintain the system by charging users; or the advent of global positioning, where there was a considerable initial investment but now it significantly benefits many sectors of the economy. It may also be compared to the advent of civil aviation where there were sceptics, but the early adopters persisted, the infrastructure was put in place, and all users benefit from this self supporting development.

12.2 Some of the necessary steps to ensure success in this project include:

- **Understanding the objectives** In this instance, the prime objective is to put in place a pilot project that will expand over time to include the entire Mediterranean.
- **Involving public, private sector and academic stakeholders** In order to specify a program that will benefit the largest number of potential stakeholders, it will be necessary to ensure that the requirements of all three sectors are considered
- **Engaging in capacity building and regional knowledge transfer** During the discussion phase, every effort will be made to explain the process and the benefits. Seminars and workshops will be specified on issues such as sensitivity mapping, marine protected areas, oil spill contingency planning and the implementation of international conventions.
- **Ensuring financial sustainability** Financial sustainability will only be achieved through an overall commitment of the governments of the respected countries and the oil, fishing and shipping interests.

12.3 In brief, the main elements of an MEH are concerned with marine safety and security, environmental and living resource management and financial sustainability. The latter element needs to be investigated very early because the proposed financial sharing and the economic benefits of the technology suite offered to the various marine interests including ship owners and operators, the fishing industry, and the marine recreational community should be documented. This latter initiative is an integral part of effective ocean governance.