

**PROJECT INFORMATION DOCUMENT (PID)
APPRAISAL STAGE**

Report No.: AB1678

Project Name	4E-Marine Electronic Highway Demonstration Project
Region	EAST ASIA AND PACIFIC
Sector	Ports, waterways and shipping (80%);Central government administration (20%)
Project ID	P068133
GEF Focal Area	International waters
Borrower(s)	REPUBLIC OF INDONESIA AND INTERNATIONAL MARITIME ORGANIZATION (IMO)
Implementing Agency	
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Environment Category	<input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> FI <input type="checkbox"/> TBD (to be determined)
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Date of Appraisal Authorization	July 12, 2005
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1. Country and Sector Background

The Straits of Malacca and Singapore, situated between Sumatra and the Malay Peninsula, are approximately 1,000 kilometers long, 300 kilometers wide at their north-west entrance, and just 12 kilometers wide at their south-east entrance, between Singapore and Indonesia's Riau Archipelago. They are shallow, with narrow channels, irregular tides and shifting bottom topography, and hence are hazardous to navigation for large ships. They are also rich in natural resources on which many of the coastal inhabitants depend.

Despite their difficult navigational features, the Straits are the shortest and hence the preferred shipping route between the Indian Ocean and the South China Sea, and for oil tankers trading between the Persian Gulf and the fast-growing countries of East Asia. Over 200 very large crude

carriers and container ships pass through the Straits each day, and traffic is growing by 10 percent per year. There is also much cross-Straits traffic which cuts through the major shipping lanes.

Recent enhancements in maritime safety infrastructure and regulatory mechanisms have improved navigational safety and traffic flow. Singapore has an efficient radar-based ship position monitoring system covering the Singapore Strait. In 1998, the three littoral states of Republic of Indonesia, Malaysia, and Republic of Singapore jointly commissioned a mandatory ship reporting system (STRAITREP) for the most congested 300 kilometer section of the Straits from One Fathom Bank to the Singapore Strait, which combines radar and automatic ship identification and tracking.

These recent improvements to navigational aids and facilities have reduced the frequency of ship collisions, groundings and oil spills. However, several vessel collisions and groundings occurred in the past five years that caused significant oil spills, such as those involving the 'Natuna Sea' (October 2000) and the 'Singapura Timur' (May 2001). Total compensation claims for the 'Natuna Sea' accident were over US\$127 million. A recent economic valuation of the natural resources at risk in the Malacca Straits estimated them at US\$5 billion and identified more than 50 species of marine coral and fish on the endangered species list. So, despite the improved navigation system, the threat of collisions and groundings and of consequent environmental damage is still significant and, with rapid traffic growth, is increasing.

The three littoral states have oil spill response capabilities and oil spill contingency plans, including a cooperative response agreement. However, the several recent serious shipping accidents highlighted the need for an improved ship management system, for quicker and more accurate deployment of spill response equipment and manpower, and for more efficient institutional arrangements for dealing with oil spills. In addition to more rapid response, immediate access to information on spill location and track and the environmental resources at risk are also needed if the impact of any spill is to be minimized. Better communication is the key to more effective oil spill response, but a more effective ship monitoring and control system is required to prevent major incidents, as well as to serve as early warning of their potential environmental damage and where such damage will occur.

Recent advances in marine navigation, communications and environmental impact prediction technologies offer an opportunity to upgrade existing systems to further reduce the risk of ship accidents in the Straits and the environmental damage they cause. By providing mariners with very accurate, real-time navigational information (depth, tide, and location of sand bars) the new technologies could also reduce shipping costs by permitting safe navigation in poor weather and optimal loading and may even reduce marine insurance costs.

The best-proven of the new marine navigation technologies is the "Marine Electronic Highway" (MEH). First installed in Canada's St. Lawrence River in the early 1990s, a MEH combines an Electronic Chart Display and Information System (ECDIS), an Automated Identification System (AIS), shore-based marine information databases and advanced ship-to-shore communications. The ECDIS involves the use of Electronic Navigation Charts which replaces traditional paper charts as the ship operator's primary navigation tool. It shows the ship's exact location, plus real-time data on water depth, tidal flow and navigational risks. The AIS gives shore controllers

precise information on ship location, direction and speed, which help them avert collisions or groundings. The same data used to compile the electronic navigation charts can predict the direction and speed of any oil spill movements and help to identify and deter ships that illegally flush their bilges or dump other oily wastes. The foundation for this technology already exists in the Straits and the littoral states are committed to its installation, however the cost to them of developing and operating it, and the uncertainty of whether they can recover those costs, has deterred them from making the investment. An external catalyst is needed to bring about the new institutional arrangements between national governments, the International Maritime Organization and the ship operators that are needed to make the system work.

2. Objectives

The program's objective is to reduce the user costs and environmental damage of marine navigation through the Straits of Malacca and Singapore (the Straits). These objectives will be achieved by developing a Marine Electronic Highway (MEH) for the entire Straits (approximately 1,000 kilometers) which will: (a) reduce the frequency of ship collisions in the Straits' busy and congested sea lanes and port arrival and departure areas; (b) make marine navigation in the Straits feasible more often in poor weather; (c) allow ships in transit to optimize their loads for passage through the Straits; (d) facilitate more effective monitoring of vessel operations, such as illegal bilge water releases, thus deterring such environmentally-damaging behavior; and (e) generate more resources and increase capacity for environmental protection of the Straits and its surrounding coasts.

The Project's development objective is to assist the Republic of Indonesia, Malaysia, the Republic of Singapore and representatives of some of the large commercial ship owners that use the Strait of Malacca and the Strait of Singapore, to collectively decide whether to establish a marine electronic highway for the entire length of the Straits of Malacca and Singapore. The indicator of the Project's success is that these key stakeholders reach a decision on this issue.

The Project's global environment objective is to improve maritime safety and reduce environmental damage to the globally-significant shared natural resources of the Straits of Malacca and Singapore. It will not be possible to determine with certainty if it has achieved this objective in its short life. An evaluation of the Marine Electronic Highway demonstration system's technical performance and the project stakeholders' decision whether to maintain and/or expand it will indicate if this objective is likely to be achieved in the longer term.

3. Rationale for Bank Involvement

The rationale for Bank involvement is that the Bank has a unique combination of convening power and technical skills that can help the littoral states overcome the barriers that have prevented implementation of the system until now. The Bank can facilitate collaboration between the International Maritime Organization, the international institution responsible for promoting environmentally-sound marine navigation, the International Hydrographic Organization, responsible for marine mapping, major international ship-owner representative organizations and the governments of the three littoral states. Financially, it can access the resources of GEF, which, in its International Waters Focal Area, can provide grant or

concessional funding to help countries address major environmental threats to shared water bodies, such as the Straits of Malacca and Singapore.

The Marine Electronic Highway Demonstration Project is consistent with one of the major objectives of the GEF's International Waters Operational Program 10, as it will overcome the barriers to the adoption of best-practice technology in marine navigation and pollution control in the Straits, and thereby reduce the risk of contamination of an international water body. As the project is a partnership between governments, the GEF and the private sector, it is also consistent with one of the GEF's key strategic objectives, to promote public-private partnerships that benefit the global environment.

GEF support for the Project is further justified because the Straits of Malacca and Singapore is a zone of high marine biological diversity, rich in the marine fauna and flora that are characteristic of tropical estuarine environments. The abundance of sea-grass beds, mangrove swamps, coral reefs, and wetlands, enriches the associated coastal marine environments, which are also stopovers for migratory birds on seasonal transition. Natural resource-related activities, such as fishing and coastal tourism, are key to the regional economy. By catalyzing the development of a Marine Electronic Highway that will protect these natural resources, the GEF can help achieve global and local environmental benefits and poverty reduction, which is also the Bank's core objective.

4. Description

1. Lending instrument

The World Bank mobilized co-financing for this project in the form of a GEF grant. This is the most appropriate co-financing instrument because (a) the feasibility of the Marine Electronic Highway system that the project will demonstrate and test is unproven, and (b) the MEH system promises to deliver significant global as well as local environmental benefits. The bulk of its non-Bank co-financing will be provided by the commercial shipping industry, which is appropriate because it stands to gain commercial benefit from a successful MEH system.

2. Program objective and phases

The program's objective is to reduce the user costs and environmental damage of marine navigation through the Straits of Malacca and Singapore (the Straits). These objectives will be achieved by developing a Marine Electronic Highway (MEH) for the entire Straits (approximately 1,000 kilometers) which will: (a) reduce the frequency of ship collisions in the Straits' busy and congested sea lanes and port arrival and departure areas; (b) make marine navigation in the Straits feasible more often in poor weather; (c) allow ships in transit to optimize their loads for passage through the Straits; (d) facilitate more effective monitoring of vessel operations, such as illegal bilge water releases, thus deterring such environmentally-damaging behavior; and (e) generate more resources and increase capacity for environmental protection of the Straits and its surrounding coasts.

This first phase Project will facilitate the program's objective by: (a) developing and testing a demonstration MEH system for the most congested 300 kilometer section of the Straits; and (b) based on the results of these tests and on international marine navigation law, assessing the financial, economic, and legal feasibility and environmental benefits of developing a MEH system for the entire Straits. If, based on the results of this assessment, the three participating littoral states and representatives of the international shipping industry decide to develop such a system, the project will prepare the design of, and financing and institutional plan for, a MEH system covering the entire Straits.

The expected duration of the MEH Demonstration Project is four years and its total cost is about US\$17 million. The Project's implementation will be coordinated and technically supported by the International Maritime Organization, on behalf of the littoral states. The Governments of Indonesia, Malaysia and Singapore, primarily through their ministries responsible for marine navigation and the environment, will collaborate on and steer the project. The trigger for moving from phase one to phase two of the program to develop a Marine Electronic Highway for the entire Straits of Malacca and Singapore will be a decision by the concerned governments and representatives of the commercial shipping industry. The cost of such a system is not known at this time, but will be estimated by the Project. The process of designing the Full-Scale MEH system will take account of the rapid advances in marine navigation technology that are currently occurring.

3. Project development and global environment objectives and key indicators

The project's development objective is to help the littoral states (Indonesia, Malaysia and Singapore) and representatives of some of the large commercial ship owners that use the Straits to collectively decide whether or not to establish a Marine Electronic Highway for the entire Straits of Malacca and Singapore. The indicator of the project's success is that these key stakeholders reach a decision on this issue.

The project's global environment objective is to reduce environmental damage to the globally-significant shared natural resources of the Straits of Malacca and Singapore. It will not be possible to determine with certainty if MEH Demonstration Project will achieve this objective in its short life. An evaluation of the MEH demonstration system's technical performance and the project stakeholders' decision whether to maintain and/or expand it will indicate if this objective is likely to be achieved in the longer term.

4. Project components

The Project has five components. The total Project cost is US\$17 million. The International Maritime Organization (IMO) will manage all components of the project. The Republic of Indonesia will execute the Tide and Current Facilities of Component 2.

Component 1: MEH System Design, Coordination and Operation (US\$2.88 million)

This component will provide for project management by the IMO on behalf of the participating states, coordination of the design, development and operation of the MEH demonstration system

and also provide for key technical inputs to the project. The main functions will be performed by the staff of a Project Management Office (PMO), which will operate under the responsibility of the IMO. The PMO will be located on the island of Batam, Indonesia, almost directly across the Straits from Singapore. It will be co-located with Indonesian Government's marine management bureau that is responsible for the Indonesian waters of the MEH demonstration section and will be housed in facilities provided and serviced by the Government of Indonesia.

The major tasks to be undertaken within this component will be:

1. System Planning and International Maritime Organization Management
 - (a) Management of the operational aspects of the Project by the International Maritime Organization.
 - (b) Development of a system for the management and on-line access and storage of data and information, including links to the MEH Data Centers and financial and economic assessments.
 - (c) Development of criteria and measurable indicators for Project performance assessment, including the carrying out of a baseline survey to compile and analyze data and information covering a period of about thirty years up to the inception of the Project, as a basis for evaluation of the impact of the MEH system.

2. Project Management Office
 - (a) Strengthening the capacity of the staff of the Project Management Office, including relevant training.
 - (b) Establishment of MEH Data Centers in the Republic of Indonesia, Malaysia and the Republic of Singapore, including provision of relevant training to the staff of the MEH Data Centers in operation and management of the MEH system and in data handling and exchange.

3. Project Steering Committee Support. Carrying out of meetings of the Project Steering Committee (PSC), the Technical Committees (TCs) and the Working Groups (WGs), including travel and accommodations for participants.

Incremental Operating Costs are included in the above component and covers costs which would not have been incurred without the project and includes travel and per diem by staff of the PMO, PSC, WGs and TCs, communications, consumables, advertising of bidding, printing and publication of Project information, rental of meeting facilities, but excludes staff salaries.

Component 2: MEH System Development (US\$7.04 million)

This component will provide for production of the navigational information on which the MEH system will be based, and its incorporation into real-time Electronic Navigation Charts that ship operators will be able to use to navigate with precision through the MEH demonstration section of the Straits. These activities will be coordinated by the PMO, under the direction of the IMO, and comprise the following sub components:

1. Tide and Current Facilities. Tidal and current monitoring on the Republic of Indonesia's coast of the Strait of Malacca, including provision of relevant equipment.
2. Hydrographic Survey. (a) Carrying out of a hydrographic survey within the designated traffic separation scheme in the Strait of Malacca within the Project Area and (b) Provision of training to the hydrographic surveyors of the hydro-oceanographic services of the Republic of Indonesia, Malaysia and the Republic of Singapore.
3. Electronic Navigation Charts. Production of high resolution electronic navigation charts for the Project Area, including provision of relevant computer software licenses to the Republic of Indonesia and to Malaysia.
4. Information Exchange System. Establishment of a MEH information exchange system, including data servers, data exchange protocols and training of staff in data exchange.

Component 3: Ship-board Equipment and Communications (US\$6.00 million)

Carrying out of testing of the demonstration MEH system by about 160 ships fitted with type-approved electronic chart display and information systems, including internet connectivity. This component will be executed by the owners of at least 160 large oil tankers and container ships that regularly transit the Straits, and will be facilitated by two major ship owner representative organizations, the International Association of Independent Tanker Owners (INTERTANKO) and the International Chamber of Shipping (ICS). With the facilitation of INTERTANKO and ICS, the ship owners will arrange that, by the end of year three, at least 160 of their ships that regularly transit the Straits are fitted with internationally-approved Electronic Chart Display and Information System and Automatic Identification System and have internet connectivity—these elements comprise the suite of technical equipment required to use all the elements of the MEH demonstration system. In addition, the ship owners will ensure that, once the MEH demonstration system is operational, all of the 160 ships which are so equipped always use it when transiting the Straits and provide detailed and timely feed-back on its performance to the PMO and later to the independent experts tasked with evaluating the demonstration system and assessing the costs, benefits and legal/financial feasibility of expanding it to cover the entire Straits (see Component 5).

Component 4: Marine Environment Protection (US\$0.85 million)

This component will be executed jointly by the institutions in the littoral states that are responsible for marine navigation and environmental management and the International Maritime Organization and will consist of the following activities:

1. Oil Spill and Sand Wave Models. Carrying out of a modeling and analyses of: (i) the likely movement of oil spills originating in the Project Area, and (ii) the sand wave formation and movement in the Project Area.

2. Sensitive Area Mapping. Research and development of options for providing real-time geo-referenced environmental protection information to mariners navigating in the Straits of Malacca and Singapore and for conservation and coastal resources management and mapping of sensitive areas.
3. Emergency Response Systems. Carrying out of simulated oil and chemical spill emergency response exercises to determine the cost-effectiveness and efficiency of the MEH system in the event of chemical and oil spill incidents from ships.

Component 5: Information Dissemination, Evaluation and Scale-Up Plan (US\$0.23 m)

This component will be managed by the IMO through the PMO, and will produce the following outputs:

1. Website and Publicity. Production and dissemination of information through the Internet on the MEH system, including technical reports, progress reports and a newsletter, and carrying out of national and regional workshops and seminars to provide information and seek feedback on the benefits and applicability of the MEH system.
2. Evaluation. (a) Assessment of the cost and benefits of the establishment and use of the MEH system in terms of maritime safety and marine environment protection, including (i) the development of criteria and measurable indicators for the socio-economic assessment of the MEH system, and (ii) the carrying out of a socio-economic survey to evaluate the benefits of the MEH system; (b) (i) Carrying out of an assessment of the technical functionalities of the MEH system, including system performance, (ii) Carrying out of a continuous monitoring of new and potential technologies that could be linked to the MEH system or enhance its performance, including the carrying out of technical evaluations on the new technologies to determine their suitability, value added contribution, enhancing performance and cost effectiveness, (c) Carrying out of an assessment of the MEH system, including institutional and legal aspects, and (d) Consolidation of the technical, institutional, legal, financial and economic assessments of the MEH system, including the implementation of the Project, and development of a managing tool blueprint.
3. System Development. Carrying out of marketing strategies to package and market the MEH system and its marine information and other products, and the services it could provide.

5. Financing

The total Project cost is USD 17.0 million, which will be financed as follows:

Source:	(\$m.)
BORROWER/RECIPIENT	2.7
GLOBAL ENVIRONMENT FACILITY	8.3
FOREIGN PRIVATE COMMERCIAL SOURCES (UNIDENTIFIED)	6.0
Total	17.0

6. Implementation

The demonstration phase of the Project will be managed by the International Maritime Organization (IMO), a UN organization with a global mandate for navigation safety and marine environmental protection. The governments of Indonesia, Malaysia and Singapore have signed a Memorandum of Understanding that defines their relative responsibilities under the project. Other partners in the project, that have signed a Memorandum of Agreement (MoA) are INTERTANKO (representing the owners of tanker vessels using the Straits), the International Chamber of Shipping (ICS, representing the interests of owners of container vessels using the Straits), and the International Hydrographic Organization (IHO, the intergovernmental organization with responsibility for the quality of hydrographic information included in marine charts). Negotiations are under way with other national governments that have expressed an interest in participating in the project.

The Project Steering Committee (PSC) established during the project preparation will continue to act as the overall regional body to implement the demonstration stage of the MEH Project. The PSC will operate, administer and manage the MEH system under a cooperative agreement among all the stakeholders of the MEH.

Four Technical Committees and two Working Groups will be established under the guidance and direction of the PSC. They will evaluate various technical issues and outputs of the project for the purpose of adapting the structure of the Demonstration Project for the Full-scale Project. The PSC will participate in the annual GEF Project Implementation Review (PIR).

A Project Management Office (PMO) will be established at Batam, Indonesia (agreed to and partly funded by the government of Indonesia) to administer and manage the project. It will be staffed by a Project Manager, four technical experts, and administrative staff. The staff will work closely with the counterpart agencies, and staff of the national Data Centers. The staff of the PMO will also oversee/coordinate the work of the consultants as well as providing support to the PSC, the Technical Committees, and the Working Groups.

7. Sustainability

The project will be sustainable only if the three littoral states and the private operators of ships commit to the continuation of the project and its extension to the 1000 km straits of Singapore and Malacca (and potentially to the whole of the sea-lanes between the Suez Canal and the major ports of East Asia). This in turn will depend on the results of the feasibility study (component 5 of MEH Demonstration project) , including the design of a feasible operational and financing plan together with an institutional structure, for the scaled-up e St. Lawrence Seaway (where the concept of a Marine Electronic Highway was first applied).

8. Lessons Learned from Past Operations in the Country/Sector

The concept of a marine electronic highway (MEH) was initiated in Canada and deployed since 1995 in the Great Lakes and the St. Lawrence River corridor with considerable success, especially in assisting with navigating through treacherous waters even in heavy fog conditions. This led to the widespread adoption of electronic navigational charts and the Electronic Chart

Display and Information System (ECDIS), and the Automatic Identification System (AIS) with powerful shore-based databases to provide a basis for optimized shipping traffic management decisions.

IHO S-57 (electronic chart standard) together with commercial launching of the first type-approved EDCIS in 1999, are now well accepted in the maritime industry as a means to increase the safety of vessels and improve their commercial performance, particularly in areas with restricted under keel clearance and water depth. Placing these technologies in the framework of the MEH system will provide greater benefits not only for the shipping industry but also for the marine environment sector. From the marine environment protection standpoint, for instance, the reduction of vessel accidents and online availability of marine information could lead to improved monitoring and response to marine environmental incidents, lower response and clean-up costs and better quantification of damages as well as enhanced management of the coastal and marine resources in the Straits

9. Safeguard Policies (including public consultation)

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP/GP 4.01)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Natural Habitats (OP/BP 4.04)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pest Management (OP 4.09)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Cultural Property (OPN 11.03 , being revised as OP 4.11)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Involuntary Resettlement (OP/BP 4.12)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Indigenous Peoples (OD 4.20 , being revised as OP 4.10)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Forests (OP/BP 4.36)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Safety of Dams (OP/BP 4.37)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects in Disputed Areas (OP/BP/GP 7.60)*	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects on International Waterways (OP/BP/GP 7.50)	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Although the Project triggers [OP/BP/GP 7.50](#), Projects on International Waterways, the requirement of notification of other riparians does not arise. This is because the three littoral states of the Strait of Malacca, namely Republic of Indonesia, Malaysia and Republic of Singapore, are participating in the implementation of the Project, and are indeed the beneficiaries of the Project and have signed a *Memorandum of Understanding* regarding their participation.

10. List of Factual Technical Documents

Project Appraisal Document, May 2, 2006
 GEF Project Brief, June 2003
 Cost Benefit report, June 2004
 Financial management Assessment of IMO, August 2004
 Procurement Assessment for IMO, August 2004
 Procurement Assessment of Ministry of Environment, Indonesia, August 2004

11. Contact point

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