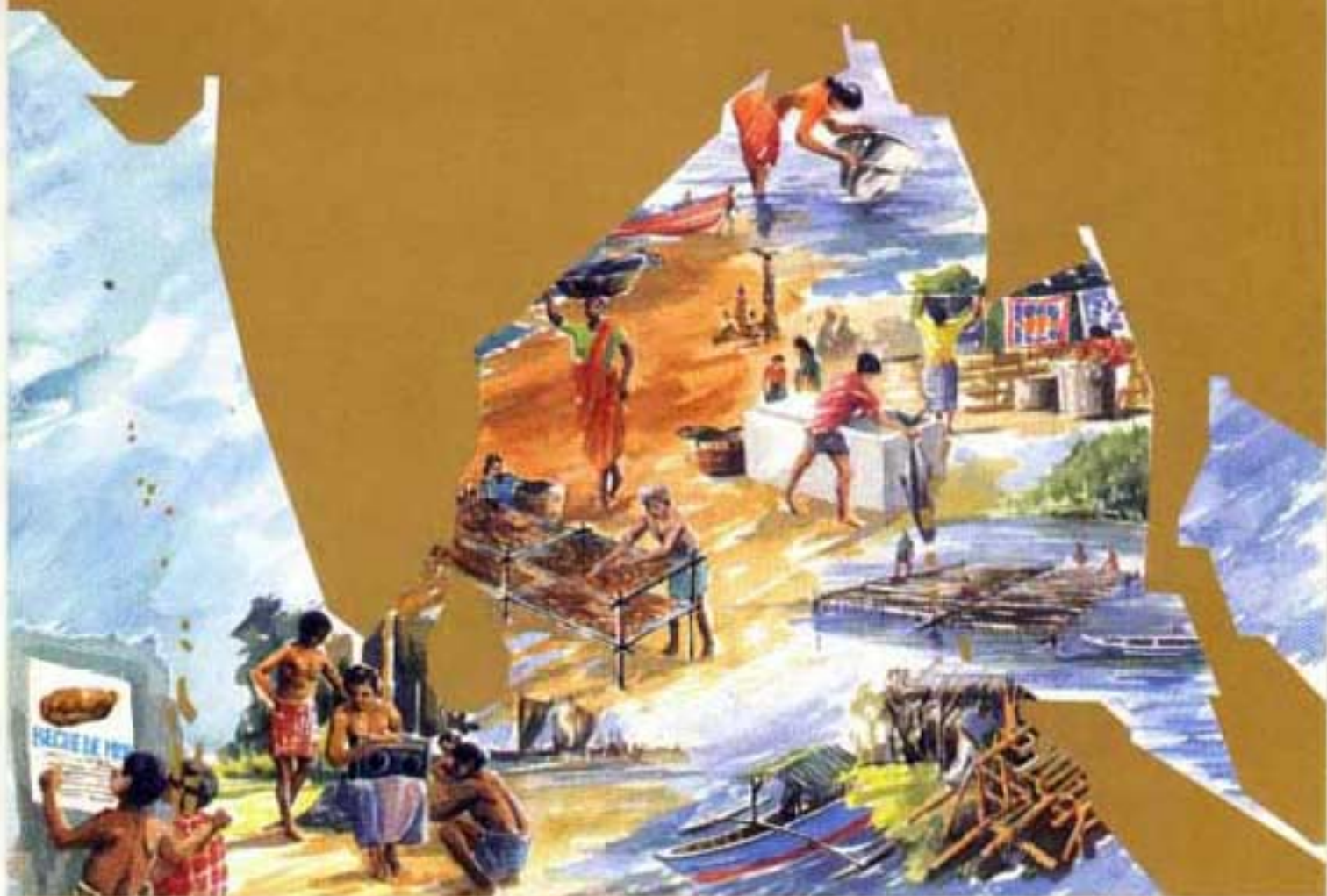


**BOBP/WP/93**



# **Dealing with fishery harbour pollution — the Phuket experience**



**BOBP**

For Fisheries Development

BAY OF BENGAL PROGRAMME  
Cleaner Fishery Harbours

BOBP/WP/93  
IMO

Dealing with Fishery Harbour Pollution - the Phuket experience

by

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**BAY OF BENGAL PROGRAMME**  
**Madras, India**  
**1994**

This working paper describes a pilot project to improve the fishery port environment at Phuket, Thailand. It was implemented by the Fish Market Organization (FMO), in cooperation with the Phuket Marine Biological Centre (PMBC) with assistance from the Bay of Bengal Programme (BOBP).

This is the third project, in a series of attempts to make fishery harbours cleaner, supported by the International Maritime Organization (IMO) under its Global Programme for the Protection of the Marine Environment which concentrates on activities of a catalytic nature, designed to support national and regional action to enhance marine environment protection.

The Bay of Bengal Programme (BOBP) is a multiagency regional fisheries programme which covers seven countries around the Bay of Bengal – Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka and Thailand. The Programme plays a catalytic and consultative role: it develops, demonstrates and promotes new technologies, methodologies and ideas to help improve the conditions of small-scale fisherfolk communities in member countries. The BOBP is sponsored by the governments of Denmark, Sweden and the United Kingdom, and also by UNDP (United Nations Development Programme). The main executing agency is the FAO (Food and Agriculture Organization of the United Nations).

This document has not been cleared by the Government concerned or by the FAO.

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*Entrance to Phuket fishery harbour*



*Typical private pier – Phuket*

**(iv)**

## **1. BACKGROUND**

In early 1987, it was agreed by the International Maritime Organization (IMO) and the Food and Agriculture Organization (FAO) that cooperation with the Bay of Bengal Programme (BOBP) would be mutually beneficial, particularly in the Bay of Bengal region, for implementing IMO-supported regional projects to protect the marine environment. After an IMO appraisal mission to India, a pilot project to upgrade reception facilities for garbage and oily wastes was proposed for the Vishakhapatnam fishery harbour and later implemented by the Vishakhapatnam Port Trust in 1988-89 with assistance from BOBP.

The Vishakhapatnam pilot project confirmed two important facts

- A fishery harbour can be polluted from many sources.
- A polluted environment not only poses health risks but adversely affects fish quality.

These were viewed as serious concerns by the BOBP member countries and IMO's support was requested to collect baseline information on harbour pollution in selected fishery harbours in the region. A regional consultation discussed the findings in 1991.

The surveys revealed that while basic requirements for providing shelter and facilities for fish landing, marketing and vessel support had been met to a reasonable extent, pollution of harbour waters and the port environment was alarming, the main causes being

- Inadequate reception/disposal facilities for solid and liquid wastes, and
- Lack of awareness among harbour-users on the need to maintain a clean fishery harbour.

One of the recommendations of the consultation was that catalytic pilot projects – on the lines of the Vishakhapatnam project – were needed at selected centres to focus attention on the problem of fishery harbour pollution and to serve as models for similar harbours in the region. This document describes one such pilot project – in Phuket, Thailand.

## **2. BASELINE INFORMATION**

### **2.1 The port area**

The Andaman Sea coast of Thailand contributes nearly 250,000 t of marine fish landings, accounting for approximately 22 per cent of the country's total catch. Phuket is the largest fishery harbour on this coast and provides berthing and landing facilities for over 400 fishing vessels at government and private piers. Annual landings are of the order 70,000 t and nearly 10,000 people are directly or indirectly involved with harbour activities. The fishing port is located on both banks of the Tha Chin canal and the complex consists of the FMO port, two fishmeal factories and one fish-drying plant with their own jetties, a tourist boat jetty, two slipways and several ancillary industries to meet the needs of the fishing fleet.

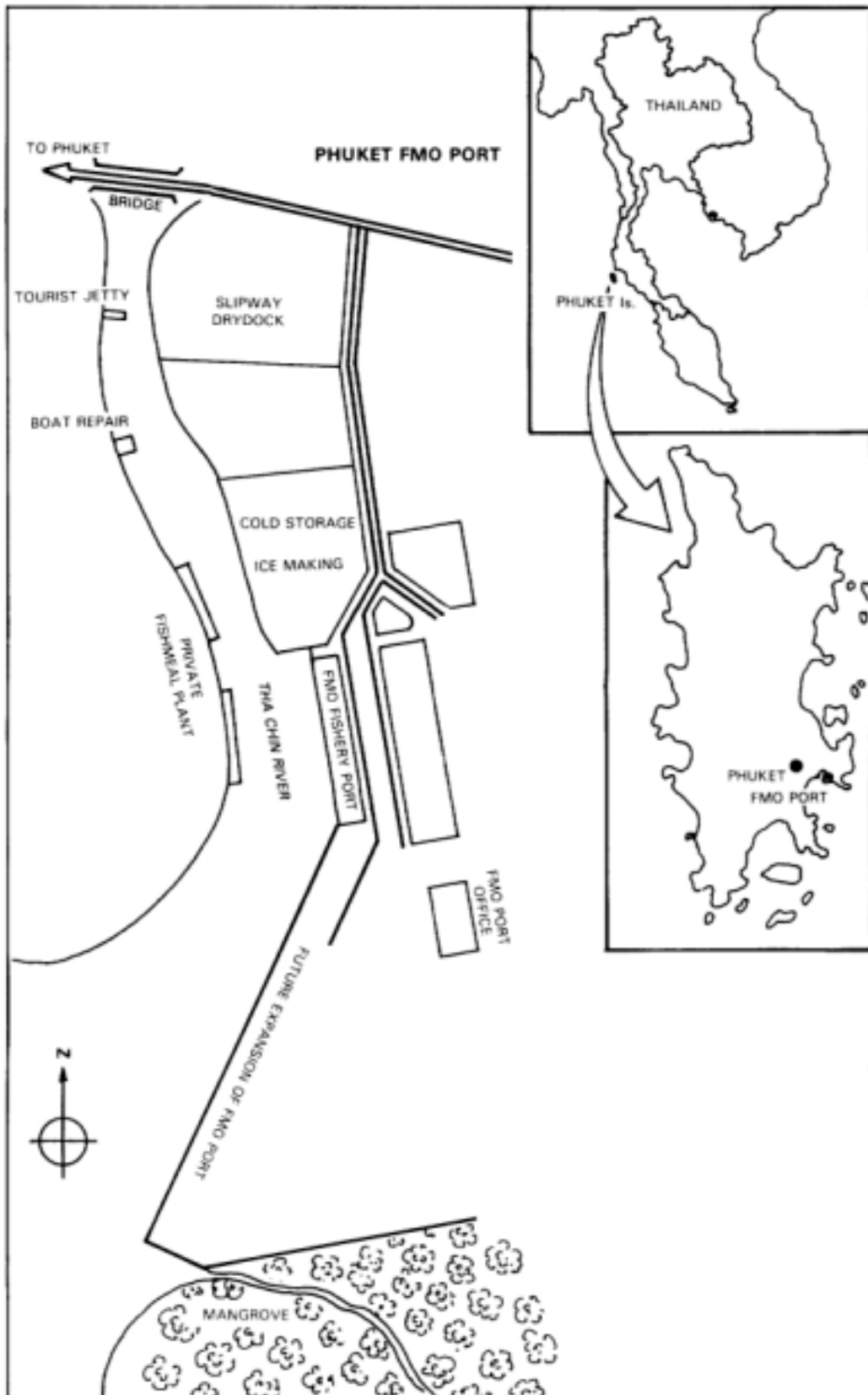
Fishing vessels that utilize Phuket fishery harbour are mostly trawlers and purse seiners 15-20 m in length. During the peak season, nearly 400 boats, including several foreign-owned vessels, operate out of Phuket. Sixty per cent of the total landings are food fish, including shrimp. These are iced and transported by refrigerated trucks after auction. The trash fish is landed directly at the fish meal factories.

The fishery harbour complex is beyond Phuket municipal limits and forms part of the Rasda subdistrict. The outer fringes of the harbour have dense mangrove vegetation.

The increasing demand for seafood, both for local consumption and export, has resulted in a rapid increase of the fishing fleet and this has, undoubtedly, strained the port facilities, particularly with reference to the reception and disposal of solid wastes.



Fig. 1. The Phuket fishery harbour, Thailand



The continuous dumping of garbage, fish waste, kitchen waste, used engine oil and the pumping of oily bilge water into harbour waters, in addition to untreated sewage from the village, has resulted in a polluted fishery port environment and poor water quality. The practice of washing fish and shrimp using harbour water is, without doubt, the reason for the poor quality of fish (see Appendix I) and poses a possible health hazard. Much of the floating garbage ends up in the mangrove swamps and this pollution can seriously affect an important feeding and breeding ground for marine life.

## 2.2 *The FMO port*

The Fish Market Organization (FMO) is a state enterprise under the Thailand Ministry of Agriculture and Cooperatives. It was established by law in 1953, with its principal objectives being to

- Relieve the difficulties of fishermen with regard to facilities for berthing of boats and landing fish;
- Relieve the difficulties in marketing fish and to obtain a fair price for the catch;
- Enable prompt delivery of fresh fish to consumers;
- Promote fisheries and the welfare of the fishing community; and
- Support the activities of fisherfolk cooperatives.

The FMO port, a part of the Phuket fishery harbour (see map on facing page), was established in 1978 with a landing pier of 180 m length, an auction shed, administrative offices, a fisheries radio station, living quarters for staff, buildings for fish merchants, a cold storage, an ice plant, a boat repair yard and a fish processing plant. Expansion plans for the port have already been drawn up to increase pier space, cold storage and ice production.

Harbour management at the FMO port is limited to maintenance of structures and roads, and collection of port dues from vessels and from suppliers of ice, freshwater and refrigerated truck services. Typical charges are listed below

Berth charges for vessels <60 GT	100 Baht*/day
for vessels >60 GT	200 Baht/day
Commission on food fish	.04 Baht/kg
Commission on trash fish	.02 Baht/kg
Commission on fish caught in foreign waters	.10 Baht/kg
Vehicle entry charges	
Refrigeration truck	150 Baht/truck
Fuel truck	.05 Baht/litre
Fresh water truck	300 Baht/truck
Surcharge on ice	1 Baht/block
Building lease (boatyard, freezing plant)	200,000 Baht/year

The total income per year is of the order 4,000,000 Baht.

## 2.3 *Harbour pollution*

Pollution of harbour waters and the land area is due to solid/liquid wastes generated by the users. The typical sources of pollution can be categorized as

**Boat-generated** : Oily bilge discharge, dumping of used engine oil, deck and fish-hold washings, kitchen waste, toilet waste, torn nets, ropes, junk metal parts, used batteries, plastic containers, paint cans and fish fragments.

- US \$ 1 = 25 Baht (appx.)



Pierside : Fish from the boats are transferred in plastic barrels to the auction shed where they are washed and sorted. The barrels are lined with plastic bags. At the end of the day, the whole pier is hosed down and most of the solid waste, including plastic waste, is washed into the harbour waters.

**Other users** Within the harbour area, solid wastes from the boatyard, living quarters and canteen and administrative buildings pile up due to infrequent collection, Wind and rain carry loose waste into nearby canals which drain into the harbour. Toilet and other liquid wastes are drained into the harbour waters. Outside the FMO port area, municipal waste and garbage from the village find their way into the main canal through small drains.

**Flotsam** : Pieces of driftwood and floating garbage from shoreside residential areas wash in and out of the main canal.

The authorities have assumed that pollution due to liquid wastes drained into harbour waters is not yet serious because there is dilution and natural flushing achieved by currents and tidal action. Disposal of garbage has, however, been a problem, since the port area is beyond the Phuket municipal limits and the Rasda subdistrict hasn't the funds to handle the vast area. This situation, combined with the laid-back attitude of harbour administrators and users, has resulted in a badly polluted harbour environment.

A survey, with particular reference to pollution in the Phuket fishery harbour, was conducted by two specialists, one from the PMBC and the other from the Fishery Technology Development Division (Food Processing). It led to the following recommendations

- Facilities should be upgraded for reception of solid and liquid wastes.
- Public cooperation should be sought to mitigate pollution by creating an awareness of the situation.
- Harbour management personnel should be educated to change their perceptions and attitudes with regard to harbour pollution.

These recommendations formed the basis for the project to improve the fishery harbour environment in Phuket.

### **3. THE PROJECT**

The vast area of the Phuket fishery harbour complex, which comprises the FMO port, private jetties of fish meal plants, a tourist jetty, private slipway facilities and the fishing village, would warrant a large-scale project involving inputs from several civic bodies. This would be beyond the scope of the BOBP in terms of duration, financial implications and expertise. A 'catalyst' pilot project, with inputs restricted to the government-run FMO port, was, therefore, considered more suitable to demonstrate certain measures that would mitigate harbour pollution and serve as a guide for possible similar national efforts in Phuket and in fishery harbours elsewhere in the country.

#### **3.1 Project objectives**

The overall development objective of the project was to demonstrate environmentally sustainable development of fishing ports which offer socioeconomic benefits to the community.

The primary immediate objective was to upgrade reception facilities for garbage and oily wastes in order to improve water quality and, thereby, achieve a cleaner environment at the FMO-managed wharf.

**The** secondary immediate objective was to create an awareness among users on the importance of a clean environment and the need for them to cooperate with the authorities in the upkeep of the harbour by proper use of the facilities provided them.

### 3.2 *Project organization*

For improvements to be sustained, project implementation and post-project inputs should come from national institutions. The Fish Market Organization (FMO), an autonomous body within the Ministry of Fisheries and Cooperatives, is responsible for managing the FMO port. The Phuket Marine Biological Centre (**PMBC**) is the fisheries institution involved with aspects of marine pollution, especially its effect on fisheries. As a research institution, it has worked closely with **BOBP** on several subprojects. These two institutions were assigned by the Ministry to implement the project.

PMBC was responsible for overseeing the project, disbursement of funds for material inputs and monitoring fish and water quality. In addition, its audiovisual unit, which is engaged in creating public awareness of the marine environment, was chosen for video recording the status of the Phuket fishery harbour and elements of the project's inputs and outputs.

FMO was responsible for deployment of all hardware inputs, interaction with the harbour users, liaison with private fish merchants and disposal of solid/liquid wastes from the harbour premises.

It was recognized at the outset that involvement of the private sector in the project was crucial. The Phuket Fishermen's Association, represented by two leading fishery entrepreneurs, were co-opted to the steering committee comprising **PMBC** and FMO staff. This steering committee reviewed the project from time to time and made appropriate course corrections while continuing to follow the objectives of achieving a cleaner port environment.

## 4. **PROJECT ACTIVITIES**

The main inputs that were required to achieve the project objectives were, according to the project document

- A study tour for harbour personnel to observe practices in Malaysian fishery harbours and the Port of Singapore with reference to control and mitigation of pollution.
- Upgrading/augmenting garbage reception facilities by deploying suitable garbage bins and providing a garbage collection truck.
- A mobile tanker with pump for oily waste reception and a quayside fixed tank for bulk storage.
- An awareness campaign using appropriate communication material.

### 4.1 *Study tour*

Arrangements were made with the Ministry of Fisheries in Malaysia and the Port of Singapore Authority for a one week study tour for

**Sanchai Tandavanitj**, Chief Administrative Officer, **PMBC**;  
**Prayoon Kumjornrit**, Manager, **FMO, Phuket**;  
Apichart Martrugsar, Asst. Manager, FMO, Phuket;  
Khanchit Tamphanuwat, leading fish merchant and Chairman of the  
Phuket Chamber of Commerce; and  
Sathian Ngernanek, fish merchant and boat-owner.

The team visited fishery harbours in Kuala Kedah in Kedah state, Batu Maung in Penang, Port Klang near Kuala Lumpur, the Port of Singapore and the fish landing centre at Jurong in Singapore.

The learnings from the study tour were, according to the team

- Garbage reception and disposal must be linked with municipal facilities and given top priority.
- Fish waste should be minimized by putting in a greater effort to improve quayside handling.
- Communication between harbour management and users must be improved to achieve compliance of simple harbour rules.

## 4.2 *Garbage reception and disposal*

The practice, until the project got underway, had been to dump garbage at a location within the harbour premises and burn it from time to time. Insufficient number of garbage bins also meant overflowing loose rubbish.

On returning from their study tour, the steering committee approached the Rasda subdistrict authorities (RSA) to alleviate this problem. It was agreed that the RSA would arrange for their garbage trucks to collect solid wastes from the harbour, provided the FMO deployed a sufficient number of bins at select locations. Garbage accumulated over the years at the dump site was cleared for a lump sum charge of 20,000 Baht. Monthly charges for garbage collection would be a nominal 2;000 Baht.

Considering the size of the FMO port and the various locations needing garbage reception facilities, it was decided to opt for the locally popular garbage bins made from used vehicle tyres\*. These bins have the advantages of being low cost, non-corrosive and easy to handle when full (30-40 kg) for tipping into the garbage truck. One hundred of these bins were purchased at 420 Baht each.

The village leader and other influential residents of the fishing village requested that a few bins also be deployed at locations outside the FMO port. In addition, a suggestion was made to promote the idea of recycling some waste by separating the garbage into wet waste, glass items and plastic waste. Thirty sets, each of three large plastic barrels (used usually as fish containers), were made up and deployed at suitable locations in the FMO port and at the private facilities to receive the segregated waste.

To overcome the problem of floating garbage and flotsam, local islanders called 'sea-gypsies' were permitted to collect recyclable material on condition that they disposed of the rest in the garbage bins provided. Any additional costs would be met by the Phuket Fishermen's Association.



Oil and litter — tourist jetty, Phuket

\* Supplied by Rung Charoen Panich, 115 Srigunchorn Road, Phanasnikom, Chonburi.



*The stand of a local-type garbage bin made from truck tyres*



*The garbage bin*



*The garbage bin on its stand*



*The lid of the garbage bin*

*Garbage bins locally-made from tyres (left) and a set of large plastic fish barrels for segregating wet waste, plastic items and glasswaste*





Savings from not purchasing the garbage truck were partly used to pay for the central garbage points, cleaning up accumulated garbage and conducting a 'Clean Harbour Day'.

#### 4.3 *Oily waste reception and disposal*

Pollution of harbour waters by oily wastes, resulting from bilge discharge, dumping of used engine oil and leaks while bunkering, can best be minimized by enforcement of strict quayside regulations. The proposal to provide a mobile tanker with pump to collect bilge water from boats was not viewed as very practical by the FMO management and boat operators due to the vast expanse of the harbour, difficulties in manoeuvring the truck at the pier and the contention that boats did not pump out their bilges within the harbour. However, a 1000-litre tanker\* with pump and hoses costing US \$ 7500 was procured to meet emergency needs.



*Phuket harbour's oily waste reception truck. Note pump driven from 'power take-off unit'.*

Two old fuel tanks of 3 m<sup>3</sup> capacity were donated by a boat operator and these were repaired and modified to serve as a fixed reception facility for any oily wastes. The oil separated from water was to be sold for recycling.

In the absence of any quayside regulations, it was decided that the FMO would, through interpersonal communication and an awareness campaign, work towards voluntary compliance by the boat operators.

#### 4.4 *Awareness campaign*

It was recognized right at the outset that one of the key elements to achieve the objective of a cleaner fishery harbour was creation of awareness among the public that the environmental degradation of the fishery port should be viewed as a matter of grave concern and needed the cooperation and attention of many administrative bodies. The project was inaugurated by the Deputy Governor of Phuket Province and a one-day meeting was held to explain the objectives of the project and discuss the work plan. Participants included senior members from the Fisheries Department, commercial fishery enterprises, Public Health Department, the Phuket Municipality, Departments of Urban Planning and Industrial Development, the Port of Phuket, the University and leading citizens.

\* Supplied by Pibon Phetburi Ltd., 255 Phetkasaem Raisom Muang, Phetburi 76000, Thailand

The timing was appropriate, as the concern about environmental degradation was high on everyone's list, since the government had only recently promulgated an Environment Quality Act and Phuket was assigned the status of an Environmental Protection Area. The general view was that the project should be seen as a 'catalyst' which would help the overall improvement of the fishery port area.

The awareness campaign component of the project comprised of:

- Interpersonal communication.
- Use of video and slide shows.
- Deployment of posters, stickers and signboards.
- Organizing group activities.

**Interpersonal communication:** With the assistance of influential fishery businessmen and the village head, project objectives and the need to cooperate were explained to the various harbour users at every available opportunity. The outcome of such an approach was very positive, as it elicited several useful pointers to the perceptions of the various harbour-user groups. For instance, garbage reception and disposal was viewed as more important than oily waste reception and the FMO manager was encouraged to accord a higher priority to this problem.

Another suggestion was to use the public address system in the port to encourage use of the newly acquired reception facilities to minimize harbour pollution. Yet another suggestion was that the FMO organize social 'get-togethers' from time to time to generate voluntary group action aimed at cleaning the harbour premises and beautifying it with horticulture and other such activities.

**Video and slide shows, posters, stickers:** The PMBC is the main fishery agency responsible for advising the Government on matters relating to marine pollution, conservation of coastal waters and dissemination of information to the general public. Its mandate includes the operation and maintenance of a marine aquarium, holding photo-exhibitions from time to time and awareness-building in schools on the importance and mysteries of the marine ecosystem. It was only natural to 'piggy-back' the project's awareness programme on the ongoing PMBC programme. A side show, including facets of harbour pollution, and a quiz were held at a school in the fishing village to encourage children's involvement in the 'clean-up' movement.



*A quiz contest on the marine environment at a local school in Phuket.*



Video recording the port environment, project inputs and users' views were done by the PMBC information unit. Posters, stickers and signboards were designed in-house, highlighting oil aiti garbage pollution and featuring appeals to reduce them. Two thousand sets of each were printed for display at the FMO port, private wharfs, the tourist wharf and other FMO ports in Thailand.

An exhibition was held at the aquarium to coincide with the visit of the Princess of Thailand, to display posters and photographs of the project activities.



*The 'Clean Harbour Day' procession led by from left to right front row; MChaiwoat Narekatpichai, President of the Phuket Fishermen's Association, Prayoon Kumjornrit, Manager of the Phuket Fishing Port, Panyarat Pathong, Phuket Vice Governor, and Khanchit Tamphanuwat, Chairman of the Phuket Chamber of Commerce.*

**Group activities:** Community support and participation, it was felt, was the key to ensure that hardware inputs were put to proper use and to sustain the upkeep of the harbour premises. Several group activities were planned, some for direct action and others to focus attention on the problem of harbour pollution and its mitigation.

While some of the activities have been postponed, due to seasonal rains, beyond the project's scheduled end, others, such as celebrating a 'Clean Harbour Day' by inviting the Deputy Governor of Phuket and getting the community to spruce up the premises and distribute information leaflets, were successful in drawing

public attention to the efforts. The FMO management, together with the Phuket Fishermen's Association, plans to continue with activities of this sort, as a regular feature of the Phuket fishery port.

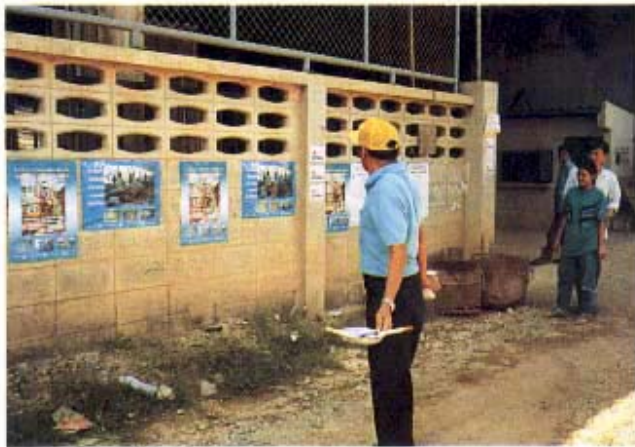


*Opening ceremony on the occasion of Clean Harbour Day Phuket fishing port.*





*The Princess of Thailand at an exhibition at the Phuket harbour aquarium. She saw displays of the project's activities.*



*The posters (below and on sides) on display at an FMO Port*



#### ***4.5 Guidelines for cleaner fishery harbours***

**A 16-page illustrated booklet (BOBP/MAG/17) has been published to highlight pollution aspects typical of fishery harbours and possible ways and means to deal with the various pollutants. The purpose of the booklet is to create an awareness not only among harbour-users but among harbour administrators and policy-makers as well. It is intended to provide harbour managers with the basic knowledge needed to initiate remedies through appropriate national agencies.**



#### ***4.6 Fish and water quality***

One of the serious effects of fishery harbour pollution is its effect on the quality of fish handled at the pier. The common practice of washing fish with polluted harbour water due to inadequate supply of clean fresh water results in bacterial contamination of the fish. Not only does this pose a health hazard, but it results in quicker spoilage and consequent economic losses. A monitoring programme to check bacterial contamination of fish prior to landing and after was initiated.

Results are given in Appendix I and show that harmful pathogens are detectable in most cases. The DOF plans to make arrangements, in due course, for the supply of disinfected cleaning water.



*Unloading fish at the Phuket fishery harbour*



*Fish handling at the FMO Port, Phuket*



*Drain for waste water from landing/cleaning pier at the FMO Port, Phuket*

