

formulation of a special task committee in February 1997 to resolve water problems. It consisted of 19 members with the Prime Minister as chairman. The special task centre is located in the Office of the Secretary to the Minister. The duty and responsibility of the committee was to propose policies, plans and measures concerning water problems to the Cabinet, including consideration and modification of any water plans and projects.

(f) **Songkhla Lake Development Committee** was set up by the Cabinet, chaired by the Permanent Secretary of MOSTE. The responsibilities of this committee are:

1. To establish and cooperate on the policy of natural resources and environment rehabilitation in the Songkhla Lake watershed;
2. To consider and recommend the Songkhla Lake watershed rehabilitation guidelines set by the Prince of Songkhla University (PSU);
3. To solve conflicts of natural resource and environment utilization.

(g) **Water Resources Management Subcommittee** set by NEB and chaired by the Secretary General of OEPP. The responsibilities of this subcommittee are as follows:

1. To make recommendations on natural resource management in the watershed area;
2. To coordinate and recommend on the management plan and its implementation in the local agencies.

(h) **The Pollution Control Department** was established on 4 June 1992 under the Royal Decree on the Organizational Division of Pollution Control Department, MOSTE B.E. 2535(1992), which resulted from the ECNEQ Act, B.E. 2535 (1992).

Under the new legislation, the Pollution Control Department has the following functions:

1. To implement the water quality provisions of the ECNEQ Act;
2. To develop regulations and standards for implementation of the Act, and assist in its enforcement;
3. To serve as the focal point of the Government for all matters concerned with water quality management.

6.1.3 Existing laws and regulations on water quality management

In Thailand laws concerning water pollution are fragmented. There are more than 20 addressing issues relating to the utilization, management and conservation of water, including the treatment of wastewater. However, only a few regard the prevention of pollution as their primary goal. These are as follows:

Enhancement and Conservation of National Environmental Quality Act B.E. 2535

This Act was amended in B.E. 2521 (1978) and led to the creation of the NEB and the ONEB. NEB develops environmental policy and coordinates issues relating to the environment and quality standards between government agencies. NEB issues Ministerial regulations, oversees what development projects must submit an EIA report prior to approval before operations commence and establishes committees to assess and recommend standards on air quality, water quality and toxic substances. Below are some sections under this Act that aim to provide a better measure to regulate water quality effectively and efficiently:

- (a) Section 55 authorizes the Minister of MOSTE with the advice of the PCD and with the approval of the NEB to publish in the Government Gazette emission or effluent standards to control the discharge or emission of wastewater, polluted air, waste and other pollutants from point sources to the environment in order to meet the environment quality standards as specified in the ECNEQ Act, B.E. 2535.
- (b) In cases of overlapping authority between relevant government bodies, the ECNEQ Act, B.E. 2535, section 56 provides that if emission or effluent standards set up under other laws are not less stringent than those set up by this Act, the former standards shall continue to apply. If less stringent, such standards shall be modified to meet those provided for in this Act. In cases where such modification is difficult, the NEB shall decide and such relevant government bodies shall comply therewith. In the absence of emission or effluent standards as required by other laws, the Minister of MOSTE with the advice of the PCC and with approval from the NEB shall have the power to publish in the Government Gazette such emission or effluent standards.
- (c) For water pollution control, Section 69 of the same Act authorizes the Minister of MOSTE with the advice of the PCC to publish in the Government Gazette the types of pollution sources that discharge wastewater or waste outside their location. Upon publication in the Government Gazette, the owner or possessor of pollution sources must install or arrange for wastewater treatment or waste disposal systems as specified by the pollution control official. The owner or possessor of pollution sources which had a treatment system prior to the publication shall notify the pollution control official for inspection. If the official considers that such a system could not treat wastewater or waste effectively, the owner or possessor shall modify the system as specified by the official under Section 70.
- (d) Where pollution sources are located in the Pollution Control Area or the locality where the central wastewater treatment system disposal facility is provided for by a government authority and the owner or possessors of such sources have not yet installed their own wastewater treatment system or waste disposal facility, or do not wish to do so, such owners or possessors shall undertake to have their wastewater or waste treated at the central wastewater treatment system or waste disposal facility for a service fee as specified under Section 71.
- (e) The owners or possessors of pollution sources other those than those under Section 72 shall also have the duty to have their wastewater and waste treated at the central wastewater treatment system or waste disposal facility for a service fee unless they already have their own wastewater treatment system or waste disposal facility in compliance with the specified standard. According to the ECNEQ Act, pollution control officials have the power to inspect and control wastewater treatment or waste disposal.

If any particular project or activity is required to obtain permission from the government authorities prior to its construction or operation, the environmental impact assessment must be submitted both to the competent authorities under other laws and to the OEPP. Such other competent authorities are required to suspend their decisions until they are notified by the OEPP of its decision on such a report.

The OEPP only has the power of preliminary consideration of the report. The final decision is vested with the Board of Experts for each particular report. The Board is able to render a relatively neutral opinion since it comprises experts from various fields, not only those from the OEPP but also from the government authorities responsible for the issuance of permission as well as from the private sector. The Board of Experts or its designee also has the power to inspect the project or activities submitting the report in order to verify the report. This is a new concept adopted by the ECNEQ Act, B.E. 2535.

The Environmental Fund

The Environmental Fund is one of the new supportive resources which have been established by the new Environmental Act. Initially the funding came from the government budget and Fuel Fund. However, other sources such as grants and soft loans should be added. The policy of this fund emphasizes water pollution and solid waste management projects both for the private sector and local governments.

Conservation and Environmental Protected Areas

Conservation areas are designated by ministerial regulation as environmentally protected areas if they are characterized by unique natural ecosystems which are sensitive and vulnerable to human activities.

Pollution Control Areas

If any locality is affected by pollution and if such problems may aggravate public health hazards or adversely impact environmental quality, NEB will designate such areas as pollution control areas in order to control, reduce and eliminate pollution. After the notification is published in the Government Gazette, the local official in the designated pollution control area must prepare an action plan to reduce and improve environmental quality in that area. NEB notified the following coastal areas as pollution control areas: Pattaya (Chonburi province), 1992; Phuket and Phi Phi Island (Phuket and Krabi provinces), 1992; Had Yai and Songkhla (Songkhla province), 1992 and Samutprakarn province, 1993.

Environmental Impact Assessment

To promote and conserve environmental quality, the Minister has, with the approval of the National Environment Board, the power to specify, by notification published in the Government Gazette, the types and sizes of projects or activities of any government agency, state enterprise or private person which are likely to have environmental impacts and which consequently need to prepare reports on environmental assessment in accordance with Section III.C.2, III.C.3, and III.C.4 (Section 46). If any particular project or activity is required to obtain permission from the government authorities prior to its construction or operation, the environmental impact assessment must be submitted both to the competent authorities under other laws and to the OEPP. Such other competent authorities are required to suspend their decisions until they are notified by the OEPP of its decision on such a report.

Polluter Pays Principle

If leakage or contamination caused by or originating from any point source of pollution is the cause of death, bodily harm or health injury of any person or has caused damage in any manner to the property of any private person or of the State, the owner or possessor of such point source shall be liable to pay compensation or damages. This occurs regardless of whether such leakage or contamination is the result of a willful or negligent act of the owner or possessor. Exceptions are made when it can be proved that such pollution leakage or contamination is the result of *force majeure* or war, an act done in compliance with the order of the Government or State authorities, and an act or failure to act of the person who sustains injury or damage, or of any third party who is directly or indirectly responsible for the leakage or contamination. The compensation or damages to which the owner or possessor of the point source of pollution shall be liable includes all the expenses actually incurred by the government service for the clean-up of pollution arising from such leakage or contamination (Section 96).

Duty Reduction for Pollution Control Equipment

In 1983, the Finance Ministry announced a duty reduction on imported machinery, materials and equipment for the purposes of energy saving and environmental conservation.

The NEB has the power to formulate water quality standards in rivers, canals, swamps, lagoons, lakes, reservoirs and other public water sources on the basis of water use in each river basin (Section 32 (1)). Such standards are prescribed by ministerial regulations. At present, there are many ministerial regulations under the ECNEQ Act such as Notification of the National Environmental Board, No. 8, B.E. 2537 (Surface water), Notification of the MOSTE, No. 4, B.E. 2539 (Effluent), and Notification of NEB, No. 7, B.E. 2537 (Coastal water).

Public Health Act B.E. 2535

Local authorities are permitted to issue by-laws that cover areas ranging from disposal of rubbish and dirt to the control of operations by a commercial entity that affects an individual's health. Violation of this Act can result in fines not exceeding 100 baht. This Act also provides for the control of pollution which is detrimental to health or causes a nuisance. In such cases, the public health officials or local authorities have the power to order offenders to stop or rectify the cause of pollution. Failure on their part will allow such officials or authorities to act on the offenders' behalf at their expense under Sections 26-29. Although this Act does not have a provision directly authorizing the officials or authorities to set up effluent standards, pollution control could be carried out through Section 31 which empowers the local authorities to specify certain types of business needing permission for their operation. This Act also provides power to order a polluter of water sources to restore such water sources. Failure to do so will allow the local authority to take action to mitigate any further adverse effects to such water sources at the expense of the polluter. This type of power can also be found in the ECNEQ Act, B.E. 2535 and the Factory Act B.E. 2535.

Cleanliness and Tidiness of the Country Act B.E. 2503 (1960)

Section 37 of this Act regulates and controls dangerous and unsightly offences to the environment. The Act specifically prohibits the dumping of waste and waste by-products into any body of water.

Factory Act B.E. 2535 (1992)

This Act empowers the Ministry of Industry to issue regulations imposing limits on the level of discharged effluents by a factory and restricting concentration levels of chemical and/or metal pollutants within defined parameters. However, government-owned factories and other facilities are exempt from the provisions of this Act. This Act empowers the Industry Minister to prescribe Ministerial Regulations according to Section 8(4), (5) setting up effluent standards for wastewater from factories of all sizes including those whose construction does not need permission to comply with such standards and which are subject to control and monitoring by officials.

The Navigation in Thai Waterways (Vol.14) Act B. E. 2535

This Act bans the throwing of any pollutants and/or harmful substances into any source of water. Permission to put anything, from stones to chemical products, into canals, rivers, lakes or ocean bodies must be obtained from the Harbour Department.

Announcement No. 286 of the Revolutionary Council B.E. 2515

This Announcement is for the purpose of controlling commercial housing developments. The Housing Development Committee can issue regulations regarding the sanitation of commercial housing developments. In essence it can mandate the construction of sewerage and sewage treatment plans. It also controls household discharge into public waterways without treatment while authorizing the Land Allocation Board to prescribe ordinances regarding water drainage and treatment of developed villages.

Ordinance of Land Allocation B.E.2535 Section 36

This prescribes that wastewater from each household in the developed area must be treated before being discharged and its quality must not be lower than the effluent standards set by the Office of the former NEB or other local applicable laws.

Building Control Act B.E.2522

Local authorities are permitted by Section 8 and 9 to establish rules and guidelines as to the number and type of toilets a building should have, as well as requesting infrastructure to provide for storm and wastewater drainage. This Act authorizes Ministerial Regulation No.33 to formulate methods of treatment for large buildings or buildings higher than 23 metres. Its Section 33 requires wastewater from such buildings to be treated before being discharged to the catcher and its quality must meet effluent standards set up by the NEB. It should be noted that the discharge of wastewater from small buildings is not subject to this Ministerial Regulation.

Poisonous Substance Act B.E. 2510 (Amended B.E. 2516)

Under this Act, the Ministry of Agriculture, the Ministry of Industry and the Ministry of Public Health are empowered to control the handling of poisonous substances.

The Minerals Act B.E. 2510

Section 67, 68 and 69 requires the concessionaire to treat the effluent so that it does not pose any environmental threat to the public waterways or the well-being of people and property.

The Fisheries Act B.E. 2490

Section 19 prohibits the use of toxic chemicals in catching fish.

Private Irrigation Act B.E. 2482 (Amended B.E. 2521)

Royal Irrigation Act B.E. 2485 (Amended B.E. 2518)

This Act stipulates that the dumping of solid waste or nightsoil into irrigation systems is prohibited.

The Public Irrigation Act, B.E. 2485

Industrial use of water is also subject to this Act if water is abstracted within the irrigation area. If water is used for mining, such use will be regulated by the Mining Act, B.E. 2510 which prohibits the use of water from public waterways and controls mining activities harmful to public roads or waterways. The Public Irrigation Act, B.E. 2485 also assigns the RID to construct dams and to maintain water levels for energy production and agricultural use.

Maintenance of Canal Act B.E. 2446

This Act prohibits the dumping of solid waste into canals or water-courses or trench flowing into canals.

The Penal Code B.E. 2499

The Penal Code prohibits the pollution of public water courses and the disposed of where such sites are specifically provided. (meaning??)

The Municipal Cleanliness and Orderliness Act B.E.2535

Coordination problems arise with the Act as different ministries are affected. As a result, joint resolutions for water pollution control are sometimes not implemented. A solution to this problem will focus on a single government body responsible for the control of water use and pollution. In the opinion of the present research team, a ministry of water resources should be established.

Mischief and Penalty in Accordance with the BMA Ordinance for Sanitation and Orderliness in the Bangkok Metropolis B.E. 2523

This ordinance prohibits the discarding of refuse on lawns and the discharge of human waste in the public drainage or public water systems.

The Provincial Authority Act, Municipal Government Act, Sanitary District Act, City of Pattaya Act and Bangkok Metropolitan Act

Under these Acts, local governments are assigned compulsory functions, such as providing public utilities.

Petroleum Act B.E. 2514

This defines legal standards on pollution prevention. Ministry Notification Number 5 (B.E. 2514), which was issued under this Act, states that to prevent damage to property or other people, the concessionaires must apply the necessary precautions to prevent any petroleum, saltwater, drilling mud or other waste to contaminate natural groundwater.

Industrial Estate Act B.E. 2522

The Civil and Commercial Code Section 355 allows industries to access the surface water which flows through their land as necessary.

Port Authority of Thailand Act B.E. 2494

This Act empowers owners of the harbours or jetties to dredge for channel maintenance in order to control harbour activities and navigation in the jurisdiction of the Port Authority of Thailand.

The Electricity Generating Authority of Thailand Act B.E. 2511

This Act allows the Electricity Generating Authority of Thailand to construct, operate and maintain dams within its jurisdiction and to cooperate with the RID in setting up rules for restoring or releasing water from such dams.

Water Hyacinth Eradication Act B.E. 2456

Canal Dredging Act B.E. 2505

Metropolitan Waterworks Act B.E. 2510

The Groundwater Act B.E. 2520

Regional Water Works Act B.E. 2522

Raw Water Supply Canal Act B.E. 2526

The National Water Resource Act (draft)

Since there has been a serious shortage of water resources in the last decade in many parts of Thailand, a water law to manage and control water resources in the country has become necessary. National and local organizations will plan and supervise the proper use of water. Fines and punishment for physical and chemical damage to water resources are also stated in the act.

The Water Resource Act focuses on water pollution in headwaters, empowering the Minister to pass Ministerial Regulations determining the headwater areas. These regulations may set up conditions for land use, transit and any activity including other protective measures. In addition, they may prohibit occupation of land and the deterioration of its soil and water quality. This proposed principle is reasonably sound but it is not necessary to introduce new provisions since the headwater areas could be protected through the proclamation of Protected Area under the ECNEQ Act, B.E.2535.

Moreover, the draft also authorizes the Minister to issue Ministerial Regulations to control the use of public water sources and other activities possibly causing damaging impacts. However, the State already has this power in the ECNEQ Act B.E.2535. In case of emergencies, this Act empowers the Prime Minister to render an order under Section 9.

The draft does not adopt severe penalties for deterrence. Besides, offences in the draft would also be used as a tool for effective water resources management, development and conservation. Therefore, anyone who violated the provisions of the draft would not be considered a criminal but rather another member of community who has to use and share water resources with the rest of the community. Thus, punishment would be a tool to make offenders recognize that they should also have a common duty to conserve and manage water resources.

Penalties in the draft are not as severe as those in the ECNEQ Act B.E.2535 and the Factory Act B.E.2535 except for the offence of unauthorized use of water from a prohibited area which imposes six years' imprisonment and 600,000 baht or both upon an offender. Since the minimum rate of penalty for this offence is not proposed, the court could adjust the penalty to suit the offender's action. This judicial adjustment is relatively limited in the draft which adopts maximum imprisonment of fifteen years and a minimum penalty (Section 78).

The draft Administrative Fines has been proposed as a State mechanism to control water users which by-pass the court. The draft empowers the administrative official to fix the fine for offenders, not to exceed a maximum rate in each offence, by taking into consideration the type and severity of action. If the official gives an order to fine and the offenders do not pay within the specified period of time, they would be required to pay 20 per cent interest. To execute a fine, the official could sue an offender in the civil court with a summary trial. If offenders does not accept the administrative official decision, they could file a motion against the official to the court within 30 days.

The reason for the adoption of administrative fines is that the offence in the draft is not a crime per se but rather an administrative offence. Thus, the aim of the draft may not be achieved if the police use administrative fines because the police might not be aware of administrative necessity or concern. In addition, it would waste of time and money if such a case were to go through the formal justice system. Moreover, it would make the court overcrowded with unnecessary cases. The process of checks and balances of the official decision would be done by the court.

The draft also empowers river basin commissions to issue, for example, a licence to an applicant for water uses (Section 62(2)), a licence to construct reservoirs (Section 42) or a licence for interbasin diversion (Section 43). Suspension of such a licence may occur in cases of violation of rules or conditions for the issuance of the licence (Section 26). When a licensee no longer qualifies as a licensee, causes pollution, nuisance or harm to the public or changes the type of water use or intentionally violates any regulation, rule, announcement, ministerial regulation or official order, his or her licence may be revoked. Revocation could be made only after the hearing of testimony (Section 27).

At the present (January 1998), the draft is waiting for Cabinet approval.

6.1.4 Activities undertaken by the Government

Some activities by the Government regarding aquatic environmental quality in Thailand are described below.

RIVERWATCH

For the environmental monitoring and management of freshwater resources in Thailand, the Oceanographic Company of Norway (OCEANOR) and the Pollution Control Department (PCD) proposed the implementation of certain applications of RIVERWATCH. It is an environmental

monitoring, forecasting and information system for inland waters with several applications. This could be the availability of water, conflicting interests in the multipurpose use of inland waters, pollution control, the intelligent and sustainable exploitation of living and non-living resources, the monitoring of agricultural runoff and other pollution levels, forecasting and warning of floods and other disasters. The present project will focus on pollution control and the forecast of algal blooms.

The long-term objective is to improve the social and economic welfare of the country through the provision of processed and analysed water quality data for use by decision makers in the development and management of national water resources. In general, all those living and working in the area and who use the river for water supply, irrigation, hydropower production, aquaculture, fishing or as a recipient will benefit from the proposed project. A special concern is given to the shrimp and bivalve industry depending on the water quality in the Gulf of Thailand.

SEAWATCH

SEAWATCH, THAILAND is a complete marine environmental monitoring and forecasting system which integrates data collection, data analysis, environmental modelling and forecasting with an advanced computerized system for the distribution of marine information and forecasts to interested operators and/or authorities. This project is being implemented under close cooperation with the National Research Council of Thailand (NRCT), OCEANOR, the oceanographic company of Norway, and other involved parties, including the Harbour Department, the Meteorological Department, Port Authority of Thailand, Naval Hydrographic Department, Department of Fisheries, the Petroleum Authority of Thailand, Marine Police Division, Chulalongkorn University, Prince of Songkla University, and Burapha University.

This programme is being established through the networking of data collection buoys. The observed data can be integrated with data from other sources or used as input to various numerical models. Results from the models can be further combined with marine environmental data and forecasts in a PC based system that would allow users to log on and retrieve the information directly.

Survey and Database Preparation of Pollution Sources and Development of an Action Plan to Improve the Marine Water Quality in the Gulf of Thailand and the Andaman Sea

Owing to the rapid economic growth and population expansion in Thailand in the last few decades, the rivers, seas and coastlines and natural resources are under increasing risk of aquatic pollution from industrial, agricultural and domestic wastewater sources. In order to establish the extent of this threat, and to develop an integrated and comprehensive approach to water quality improvement, the Pollution Control Department have initiated various projects to investigate water quality problems and devise appropriate management solutions. Water quality management planning has been initiated in several inland rivers and catchments including those in the eastern, central and southern regions of Thailand and the Pollution Control Zones (PCZs) at Pattaya, Phuket, Phi Phi Island, Hat Yai/Songkhla and Samut Prakarn.

Nationwide Watershed Water Quality Management Plan

The Pollution Control Department has initiated a major, more organized water quality management project for the nation with the aid of state-of-the-art computer technology. The main objective of the project is to produce integrated master and action plans for the entire nation. Major rivers in the basins are modelled to simulate the current and future hydrodynamic and water quality conditions. All relevant pollution sources such as domestic, industrial, agricultural and non-point sources as well as all construction or development planned for those watersheds which could impact

water quality are taken into account. Short-term, intermediate term and long-term plans can be prioritized to meet the needs for areas predicted as most critical by the model. Pollution sources and watershed information are recorded on the geographic information system (GIS) database. These are the areas which are most critical to maintaining the nation's water quality.

The national watershed area is first divided into five regional river basins: central, eastern, north-eastern, southern and northern. In each regional river basin, there are several individual watersheds. Existing data concerning each watershed, such as water quality, hydrology, topography, meteorology, names, addresses and locations of all identifiable pollution sources, wastewater flow rates and characteristics from all identified pollution sources, population, land use, social and economic conditions, water use and wastewater treatment methods employed are gathered and compiled into a GIS database. Mathematical modelling is done for the major rivers in each regional river basin using the MIKE 11 model. Data contained in the GIS is used by MIKE 11 to make its water quality predictions in the study. Several future scenarios or alternatives for water quality rehabilitation projects can be tested by the models, namely, do nothing, short-term measures in 5 years, intermediate-term measures in 10 years, long-term measures in 20 years. The results of the predicted water quality can be compared with target water quality and cost/ benefit analysis carried out to find the most beneficial and economical solution to the water pollution problem in the watershed.

Finally, a master plan can be set up to achieve the target water quality objectives in the 20 year planning horizon. Action plans will provide details of the most suitable wastewater treatment scheme for municipalities/ sanitary districts within the river basin. Recommendations for the organization and legal framework to implement and monitor the selected water quality management plan are also proposed.

Water Quality Standard

In order to minimize the pollution loads in the waterways and the sea, the quantity of waste from pollution sources must be specified. The Pollution Control Department has already declared many standards for effluents and for the ambient environment. At the moment, the Pollution Control Department are preparing information for more effluent standards to control other potential pollution sources as follows:

(a) Draft on effluent standards for swine farming

Wastewater from swine farms is a main source of toxic substances, especially in the provinces of Nakhon Pathom, Ratchaburi and Chachoengsao where a large number of swine are raised. Because pig-farming is practised as an industry, the amount and intensity of pollution and environmental damage is greater. For these reasons, the Pollution Control Department has proposed water quality standards to control wastewater from swine farms.

(b) Draft on effluent standards for small ports (less than 500 tons gross) and fish piers

Wastewater discharged from fish markets and fishery ports is composed of high organic matter. This has caused deterioration in the receiving water. The Pollution Control Department monitored effluent water discharged from Bangkok, Samut Sakorn and Samut Prakan fish market and found that BOD, oil and grease and TKN were in the range of 5,710-6,280 mg/l, 110-750 mg/l and 46-145 mg/l respectively. Thongchai studied the wastewater management of the Bangkok fish market and founded that BOD loading from fish preparing and cleaning activities was 287.5 kg/day. At the moment, the Pollution Control Department has prepared information to formulate the effluent standards for the fish market/fishery port to solve these problems.

(c) Effluent standards for oil cargo and gas stations

It was found that a large amount of oil had contaminated the waterways, partly because of the waste discharged from gas stations. Even though oil cargo had wastewater treatment, the waste still had high COD when compared with industrial effluent standards. Therefore, the Pollution Control Department is in the process of formulating effluent standards for oil cargo and gas stations in order to minimize the amount of petroleum contaminating the water and the sea.

Environmental Fund

The Environmental Fund was established under the Enhancement and Conservation of National Environmental Quality Act (1992). The policy of this fund emphasizes water pollution and solid waste management projects for both the private sector and local government. In 1992-1997, most of the Environmental Fund budget (5,030 baht) supported 12 projects of wastewater treatment plants. On the other hand, projects on environmental conservation and protection used only 3,370 million baht.

Clean technology

Technological innovation and diffusion will be critical determinants of the pace and character of future economic development and environmental management. Hence, governments have become concerned to identify policy options to promote cost-effective cleaner (pollution-preventing) technologies designed to conserve raw materials and energy, reduce wastes and emissions in industrial operations, and reduce hazards and waste in the use and disposal of products. Cleaner technologies are thus defined as production processes and products which minimize energy, resource consumption and hazards over the product life cycle. This life cycle includes the design, extraction, transport, processing, use and disposal of a product or material.

At present, there are several foreign assistance organizations giving support to pollution prevention and cleaner production, both in terms of funding and technicians, for example, assistance from the Japanese Government through JICA, assistance from the German Government through GTZ, assistance from the Danish Government through DANCED, assistance from the Asian Development Bank, and from UNEB. Some of these organizations have provided assistance to Thailand for many years.

Currently, many organizations are working on pollution prevention and cleaner production, be they the public sector, the private sector and non-governmental organizations. For instance, the Department of Industrial Works is organizing the Cleaner Technology Working Group to motivate and encourage the public sector and the private sector to adopt cleaner technology, Chiang Mai University is studying the reduction of pollution in small-scale metal plating factories within the northern region of Thailand, the Thailand Environment Institute and the Federation of Thai Industries are implementing the Promotion of Use of Clean Technology in Thai Industries Project. This monitors the operations of medium and small-scale industries in the collection of data and information for use as reference and for the creation of a clean technology information centre.

Projects focusing upon pollution prevention and cleaner production are as follows:

1.1 Department of Environmental Quality Promotion, MOSTE

- (a) Environmental auditing: in process
- (b) Creation of AEETC which will be a centre for the transfer of environmental technology: assisted by the European Union

- 1.2 Department of Vocational Education, Ministry of Education
 - (a) Inclusion of the subject A Development of Human Resources and Conservation of Natural Resources in all branches of the high vocational certificate curriculum to promote knowledge, understanding and awareness of students
 - (b) Collaboration with Mahidol University to increase the number of graduates with a Master of Environment degree
- 1.3 Department of Curriculum and Instruction Development, Ministry of Education
 - (a) Development of an environmental curriculum for primary and secondary education which encourages children to learn about ecology, which allows the system to exist naturally without introducing any foreign substances or synthetics, and which encourages learning about the outcome; a school in Nakhorn Sawan is the starting point
- 1.4 Agricultural Toxic Substances Division, Department of Agriculture
 - (a) Reduction in the use of pesticides in the agricultural sector
 - (b) Study in the production of chemical-free agricultural products
 - (c) The granting of certificates to certify non-toxic vegetables
 - (d) Pilot project on the development and transfer of chemical-free vegetables and fruit production technologies
 - (e) Research and development of pesticide substitutes projects
- 1.5 Waste Utilization Subdivision, Toxic Substance and Solid Waste Management Division, Pollution Control Department
 - (a) The recycling of community waste project
- 1.6 Office of Thai Industrial Standards Institute, Ministry of Industry
 - (a) Provision of the service to certify ISO 14000 standard; 19 applications are under consideration.
 - (b) Training in various industrial standards, especially ISO 14000
 - (c) Green label project implemented in collaboration with the Thailand Environmental Institute
 - (d) Pilot project on industrial environment management systems
- 1.7 Department of Health, Ministry of Public Health
 - (a) Training of entrepreneurs in industrial pollution prevention
 - (b) Studying the impacts on the health of industrial workers and people in the vicinity
- 1.8 Department of Chemical Engineering, Faculty of Engineering, Kasetsart University
 - (a) Curriculum improvement in the pollution prevention and control subject to change the original concept of the maximization of conversion of raw materials to production to the minimization of pollution from raw material conversion
 - (b) Collaboration with the New Hampshire University in training programmes for faculty members and students in clean technology
 - (c) Collaboration with the National Science and Technology Development Agency in promoting and publicizing the clean technology concept
 - (d) Collaboration with the Thailand Environment Institute and DANCED in projects concerning clean technology promotion
- 1.9 Kenan Institute Asia (question if Kenan is the right spelling)
 - (a) Support for training in sludge recycling
 - (b) Support for reprocessing oil residue from tankers at Map Ta Put
- 1.10 Thailand Institute of Scientific and Technological Research
 - (a) Thailand Programme on Cleaner Production in Pulp and Paper Mills.
 - (b) Training in cleaner production in paper and pulp factories, 19-21 March 1997

1.11 The Federation of Thai Industries

- (a) Industrial Environmental Management Programme (IEM): the main activity is the promotion of clean technology and effective environmental management in industries

1.12 The Industrial Estate Authority of Thailand

- (a) Establishment of the Environmental Enhancement Centre (EEC) as a centre for technology transfer and training in pollution prevention and cleaner production
- (b) Collaboration with the New Hampshire University and other organizations in the Road to Sustainable and Clean Growth in Thailand Project.

6.2 GROUNDWATER

The Department of Mineral Resources first proposed a law to control groundwater use in 1964, but the Groundwater Act B.E. 2520 eventually came into force in 1977. The Act was amended in 1992 (B.E. 2535). The major principles of this act are that:

- (a) An interdepartmental committee, called the Groundwater Committee, chaired by the Director General of the Department of Mineral Resources be set up;
- (b) Activities related to groundwater must obtain permission from the local groundwater officer in each groundwater zone. There are three kinds of permission: (1) to drill a well, (2) to pump the water, and (3) to dispose of any water into the well;
- (c) The responsibilities of those granted permission are defined;
- (d) The authorities of the enforcing officers are laid down;
- (e) Permission withdrawal criteria are defined;
- (f) The punishment of violators is prescribed.

As a consequence of this act, the Ministry of Industry issued several regulations and notifications, the major ones are:

Regulation Number 6 (B.E. 2537) sets a fee of 3.50 baht (US\$ 0.14) per cubic meter that the users must pay to the Department of Mineral Resources Notification Number 1 (B.E. 2521) on the Groundwater Zone in Bangkok and its vicinity with a definition of groundwater depth

Notification Number 2 (B.E. 2521) on Principles and Standards for Well Drilling and Termination controls the methods, location, drilling equipment, well size, soil and rock sampling, well depth, well lining, filters, gravel pack, well plug and seal, well development, pressure testing, water sampling, reporting and drilling termination

Notification Number 3 (B.E. 2521) on Principles and Standards for Conservative Groundwater Extraction defines the type and rate of pump, groundwater quantity and quality monitoring

Notification Number 4 (B.E. 2521) on Principles and Standards for Hygienic and Groundwater Pollution Protection includes the protection of wells from surface water contamination, groundwater quality standard (table 6.1), sterilization methods, hygienic standards, and well abandonment procedures

Notification Number 5 (B.E. 2521) on Principles and Standards for Water Disposal in Wells covers the quality of disposed water (table xx), geological structure of allowable wells, observation well, disposal rate, well modification and reporting

Notification Number 6 (B.E. 2528) on Principles and Standards for Well Drilling and Termination to amend Notification Number 2

Notification Number 7 (B.E. 2528) on Principles and Standards for Conservative Groundwater Extraction to amend Notification Number 4

Table 6.1 Standard for potable groundwater quality according to the Ministry of Industry Notification No. 4 (BE 2521)

Physical properties	Range	Acceptable level
Colour	5 (platinum cobalt unit)	50 (platinum cobalt unit)
Turbidity	5 (turbidity unit)	20 (turbidity unit)
PH	7.0 - 8.5	6.5 - 9.2
Chemical properties	(ppm)	(ppm)
Fe	<0.5	<1.0
Mn	<0.3	<0.5
Cu	<1.0	<1.5
Zn	<5.0	<15.0
SO ₄	<200	<250
Cl	<200	<600
F	<1.0	<1.5
NO ₃	<45	<45
Total Hardness (as CaCO ₃)	<300	<500
Non-carbonate Hardness (as CaCO ₃)	<200	<250
Total Solids	<750	<1500

Table 6.2 Standard of water allowed to be disposed in wells according to the Ministry of Industry Notification No. 5 (BE 2521)

Property	Maximum allowable (ppm)
Color	50 (Platinum-Cobalt Unit)
Turbidity	50 (Turbidity Unit)
pH	5.0 - 9.2
Total solids	2,000
BOD	40
Oil and grease	5.0
Free chlorine	5.0
Cu	1.5
Zn	15.0
Cr	2.0
As	0.05
CN	0.2
Hg	0.002
Pb	0.1
Cd	0.1
Ba	1.0

Furthermore in order to solve the problems of salt water intrusion and land subsidence in Bangkok and its vicinities because of excessive groundwater extraction, the cabinet on 15 March 1983 approved a proposal by the National Environmental Board to set up a multi-department project to prevent and regulate the groundwater crisis and land subsidence in Bangkok and its vicinities.

An accomplishment of groundwater management in Thailand is the reduction in the groundwater demand by the Metropolitan Water Works Authority. In 1954 about 3 million cubic metres of groundwater was used to make tap water in Bangkok and the rate increased to a peak in 1979 when 176 million cubic metres was used per year. After that the rate declined and in 1987 MWWA used only 67 million cubic metres of groundwater as its raw water. The proportion of groundwater used to make tap water in Bangkok and its vicinities decreased from 51.1 per cent in 1961 to only 8 per cent at present.

Most interventions from the Government, especially the Department of Mineral Resources, are primarily aimed at minimizing land subsidence especially in the Bangkok area. Mathematical models are being experimented with for prediction purposes. For the other parts of the country, potential groundwater has been evaluated since 1994 for management purposes. Pollution and contamination studies and monitoring are also carried out by various agencies such as the Department of Mineral Resources, the Pollution Control Department and local municipalities.

6.3 MARINE/COASTAL HABITAT/ECOSYSTEM DESTRUCTION

6.3.1 Mangrove ecosystem

Thailand was the first country in the world to establish a national agency on mangroves, the National Mangrove Resource Committee being set up on 5 January 1977. The activities of this committee over the past years have been summarized by Thanasukarn (1995):

- (a) The committee has the authority to approve or reject all applications for any activities in mangrove areas. Out of 291 applicants (28,223 hectares), 121 have been approved (16,343 hectares);
- (b) The Committee proposed to the Government a zoning system which was approved and became effective in 1987;
- (c) The Committee resolved the problem of encroachment on the Gulf east coast;
- (d) The Committee proposed that Ko Surin should be a National Park; this was approved in 1981;
- (e) The Committee proposed that the Sixth National Economic and Social Development Plan and subsequent ones should include mangrove resources;
- (f) The Committee promotes research, funding about 40 research projects;
- (g) The Committee coordinated several international/bilateral research programmes;
- (h) The Committee supported the participation of Thai scientists in international meetings, study tours, and postgraduate studies abroad;
- (i) The Committee established a research centre in Ranong;
- (j) The Committee established a mangrove data centre at the National Research Council;
- (k) The Committee organizes a National Mangrove Symposium every three years, with occasional training and workshops;
- (l) The Committee has promoted public awareness of mangroves.

Influence by the National Mangrove Committee, the Government issued about 12 cabinet resolutions concerning mangroves between 1978 and 1996. Among those, probably the most significant one is that of 15 December 1987 that divided all public mangroves (372,390 hectares) into three zones according to their condition and degree of utilization at that time:

The Conservation Zone (42,620 hectares or 11.46 per cent) where all utilization and disturbances are prohibited; this includes:

- (a) Areas for preservation of economic plants and animals;
- (b) Nursing grounds for plant and animals;
- (c) Areas susceptible to damage and erosion;
- (d) Historic areas;
- (e) Area with local uniqueness;
- (f) National parks, tourist areas, wildlife sanctuaries, non-hunting areas;
- (g) Wind shield areas;
- (h) Area significant for research;
- (i) Area significant for environmental and ecological preservation;
- (j) Areas more than 20 metres from natural rivers or streams, or more than 70 metres from the sea coast.

Economic Zone A in which only sustainable uses of mangrove trees are permitted (199,690 hectares or 53.61 per cent); this includes:

- (a) Concession areas;
- (b) Community forests;
- (c) Mangrove plantations.

Economic Zone B for degraded mangroves in which other land uses and developments are allowed but which must consider the environment (130,080 hectares or 34.93 per cent); this includes:

- (a) Agriculture (cash crops, husbandry, fisheries, salt farms);
- (b) Industry (mining, factories);
- (c) Urban areas;
- (d) Trading and commercial areas;
- (e) Piers and harbours;
- (f) Others.

According to this cabinet resolution, shrimp farms will be allowed only in Economic Zone B and by renting or concession from the Government only. However, as of 23 July 1991 the cabinet issued another resolution to prohibit any new concessions of any kind in any mangrove zone.

Another cabinet resolution on 4 June 1991 outlined the following urgent measures to manage mangrove resources:

- Provincial mangrove management plans to be drawn up;
- Local conditions and requirements in each plan to be taken into account; Mangrove areas to be defined and marked;
- Remote sensing techniques to be applied;
- Ground surveys and marking to be conducted every two years;
- Seed production to be encouraged through replanting;
- Disturbed forests to be restored and replanted;
- Privately owned mangrove plantations to be supported;
- Seed source areas in conservation forests and plantations to be developed;
- Encroachment to be reduced;
- Patrolling to be intensified and public awareness built up;
- Support from the navy to be requested and certain navy officers assigned as additional forestry officers according to the Forestry Act;
- Intensive aquaculture to be promoted outside mangrove areas;

- Programme evaluations to be conducted by inspectors from the Prime Minister's Office;
- The necessary budget to be allocated from the Budget Bureau.

As far as shrimp farming is concerned, the national policies on mangrove management and conservation were summarized by Prakobboon (1997) as:

- (a) The suspension of all charcoal concessions in Economic Zone A;
- (b) The replanting of mangrove trees and establishment of seed production centres at Trad, Phangnga, Nakorn Sri Thammarat and Satun provinces. The goal was to replant 8,000 hectares annually between 1992 -1996;
- (c) The establishment of a buffer zone around conservation areas;
- (d) The introduction of environmental friendly shrimp farming techniques and techniques to increase the number of shrimps per unit area instead of acquiring more land. The shrimp farming area was set at 80,000 hectares;
- (e) The restriction of shrimp farms to the back of mangrove forests. The Department of Fisheries will develop seawater irrigation systems and the central treatment of wastes from ponds. Some examples can be seen at Pak Panang, Nakorn Sri Thammarat and Ranode, Songkhla;
- (f) The registration of tiger prawn farmers. Every year farmers must register and present land right documents or rental contracts at the district fisheries office. Farmers are also obligated to protect the environment by:
 - (i) Not disposing saltwater into freshwater canals or agricultural areas;
 - (ii) Not disposing dredged mud into canals or public areas. Each farm must set aside at least 10 per cent of the land to store dredged muds;
 - (iii) Controlling the BOD level of wastewater so as to be under 10 mg/l before release into public waterways.

The Department of Fisheries will regularly monitor water quality in the aquaculture area.

6.3.2 Forest laws and regulations

Laws and regulations affecting mangrove forests are:

- (1) Acts, such as the Forest Acts and the National Forest Reserved Acts;
- (2) Rules and regulations issued for the special use of mangrove forests as well as to facilitate the supervision and control of the use of mangrove forests by field officials;
- (3) Terms and conditions specified in the concession agreement.

Forest Acts

Laws and regulations concerning mangrove resources management can be categorized into forest laws and regulations, mining regulations under the Department of Mineral Resources and Cabinet resolutions.

Forest Act

This Act was enacted in 1941 and the latest revision was in 1975. It regulates the use of timber and forest products in national forests. It provides guidelines for the Royal Forest Department in supervising the exploitation of the forest as well as in supervising various activities concerning timber forest products, from the time of harvesting to the sale of the final products. The main use of mangrove forests has been the harvesting of wood for charcoal production.

National Forest Reserved Act

The National Forest Reserved Act was enacted in 1964. All mangrove forests are declared reserved forests under this Act.

Rules and regulations

In mangrove forests there are two types of standard set by the Royal Forest Department: (1) Standard procedures for field officials administering concessions; (2) Standard procedures for the use of mangrove forest for other purposes.

In administering mangrove concessions, mangrove management units have been created to supervise the work of the concessionaire. There are 34 mangrove management units all over the coastal provinces. The main functions of the mangrove management units include: supervising logging in the concession area; measuring firewood for royalty assessment; controlling charcoal production by concessionaires and measuring charcoal output for issuance of transit forms; calculating annual yield route and log pond siting; selecting the site for replanting; and estimating the cost of such planting. There are two major uses of mangrove forest for other purposes, namely for mining and for shrimp culture farming.

The Forest Act B.E. 2484 (1941) and 2503 (1960) is mainly geared to exploitation rather than conservation. The Act controls the exploitation of forest products through a permit system (involving government royalties) and also regulates road and river transport and the processing of forest products. Under the Forest Act, mangrove forests have been treated and managed as national forests. The zoning of mangrove forest has been made to allocate the development, conservation and preservation zones.

The National Parks Act B.E. 2504 (1961), representing a specific area policy, covers all natural resources in identified areas called national parks. All natural resources, including mangrove forest, seashore land, tin, fishery, coral reefs and coastal sea water in the national park are to be strictly conserved.

The National Forest Reserves Act B.E. 2507 (1964), was promulgated when it was realized that Thailand's forests were not being adequately protected under the Forest Act. As the title implies, the Act provides for the establishment of forest reserve areas including parks (by means of ministerial decrees). Within such areas it is prohibited to hold or own land, clear land, burn the forest, fell timber, gather forest products or commit any other act detrimental to the nature of the forest except with special permits to work timber, for temporary dwelling, mining, or research.

The Wild Animals Reservation and Protection Act B.E. 2507 (1964) is designed not only to protect wildlife by outlawing hunting, setting up trade controls (applicable throughout the country) and protecting wildlife reserves and non-hunting areas, but also within reserve areas, it prevents specifically prohibited persons from possessing or holding land, cutting, felling, destroying or burning trees or other vegetation, digging for minerals, pasturing animals, and diverting or otherwise affecting watercourses. The legislation, therefore, affects the management of mangrove forest, seashore land and tin resources, especially within the reserve areas.

The Town Planning Act B.E. 2518 (1975) provides for the designation of selected urban and rural areas to be the subject of either general plans or specific plans. As the terms imply, a general plan is to be used for guidance in the development and maintenance of the resources in designated area while a specific plan provides the actual details for such development and maintenance in a portion of the area. The Town Planning Act, therefore, covers natural resources in the planned area, including mangrove forest, seashore land and tin.

The National Forest Policy (3 December 1985) proposed by the National Forest Policy Committee aims to control the management of forest and other natural resources and to preserve not less than 40 per cent of the total affected area as national forests reserved for economic purposes. Thus, the National Forest Policy includes the management of mangrove forest, seashore land and tin resources within forest reservations.

The Cabinet Resolution (28 May 1985) proposed by the National Environment Board identifies river basins made up of five classes. This cabinet resolution, therefore, regulates the management of several natural resources, especially mangrove forest, seashore land and tin.

The Cabinet Resolution (28 May 1985), National Forest Reserves Act B.E. 2507 (1964), Wild Animals Reservation and Protection Act B.E. 2504 (1961) and Town Planning Act B.E. 2518 (1975), reflect specific area policies on mangrove forests, seashore land, and tin resources. Since 1978, there have been many Cabinet resolutions regarding the preservation and use of mangrove areas. In 1987, mangrove areas were divided into three zones: Conservation, Economic Zone A, and Economic Zone B. Cabinet decrees prohibiting the locating of development projects in certain mangrove areas were utilized up to 1991.

6.4 DECLINE IN FISHERIES RESOURCES

Marine capture fisheries has been recognized as a major food source for the country since the launching of the First National Economic and Social Development Plan in 1961. Yet the contribution of fisheries to GDP has declined steadily since the period of the First Plan (1961-1966) and at present represents only about 2 per cent of GDP. The most recent and very comprehensive analyses of government fishery policy; laws and regulations; fisheries management authorities; mechanisms, programmes and projects in support of fisheries management; international cooperation; problems and constraints in fisheries management; and resolution of problems and constraints in fisheries management were carried out by Menasveta (1997) and will be summarized here. In the same report Menasveta (1997) also analysed the marine capture fisheries status and policy in Cambodia, Malaysia and Viet Nam. This report is strongly recommended for anyone wishing to understand the fisheries problem in this region.

6.4.1 Government policy with respect to the fisheries sector

The important contribution of the fisheries sector to the economy and food security of Thailand has been recognized by the Government. Since the launching in 1961 of the first five-year National Economic and Social Development Plan (1961-66), fisheries development has been an integral part of the National Economic and Social Development Plan of the country.

Phasuk (1993, 1996 and 1997) gives an analysis of the objectives, policies and strategies for fisheries development since the implementation of the First National Economic and Social Development Plan. His analysis is summarized below.

Under the first two National Economic and Social Development Plans (1961-1971), the overall objective was to increase fisheries production for domestic consumption to ensure food security. The policy direction was to promote the exploitation of untapped marine fisheries resources, i.e., demersal fish resources in Thai waters through the development of trawl fisheries. The strategy was to give concessions to those investors who were interested in investing in trawl fisheries, including soft loans, a grace period for taxation, and the reduction of import and export duties. This strategy resulted in the increase of marine fishery production from approximately 200,000 tons in 1961 to 1.5 million tons at the end of the Second Plan in 1971.

Under the Third National Economic and Social Development Plan (1972-76), the objective of increasing foreign currency income through the export of fish and fishery products was added. Under this Plan, the policy was to give primary attention to coastal aquaculture development with an emphasis on shrimp culture. While the physical target set for the fisheries production increase of 7 per cent by the end of the Third Plan was achieved, the target for increasing production from coastal aquaculture was not achieved. The objectives of the Fourth National Economic and Social Development Plan (1977-1981) were the same as those of the Third Plan. While accelerated coastal aquaculture development was the main policy, another important policy appeared for the first time, i.e., the conservation of marine fishery resources and their habitats. The strategies under this Plan included continued support for accelerated coastal aquaculture development and the strengthening of the country's fisheries management framework including the issuance of various governmental regulations for the conservation and management of marine fishery resources. At the end of this Plan, marine fishery production reached a level of two million metric tons, mainly owing to the rapid expansion of trawl fisheries into adjacent waters. However, the abundance of demersal fishery resources in the Gulf of Thailand decreased drastically as indicated by the decline of the index of abundance of these resources from 297.6 kg/hr trawling in 1961 to 49.8 kg/hr in 1981.

The objectives of fisheries development under the Fifth and Sixth National Economic and Social Development Plans (1982-1991) were basically the same as those of the Third and Fourth Plans, namely to increase fisheries production for both domestic consumption and for export, but the policies and strategies emphasized the promotion of fishing activities of the Thai fleets outside the Thai exclusive economic zone (EEZ) through joint ventures; and the development of culture-based fisheries in freshwater areas of the country to reinforce food security for the rural population. Fisheries production continued to increase to 2.8 million tons in 1990. Of this total, the contribution from the aquaculture subsector increased to about 10.4 per cent. The contribution of the inland capture fisheries was only about 4.6 per cent. Overfishing became evident in the Gulf of Thailand with a drastic decline in the abundance of demersal fishery resources and about one million tons of low value species and juveniles of commercial species (trash fish) caught by trawlers annually.

Although the overall objectives for fisheries development under the Seventh National Economic and Social Development Plan (1992-96) were similar to those of the Fifth and Sixth Plans, increased attention was given to the rehabilitation of the fishery resources and fish habitats in the Thai EEZ through more effective fisheries and environmental management measures. The physical target was to maintain the marine fishery production at not less than 1.7 million tons annually in the Thai EEZ. Outside Thai waters, the policy was to support fisheries under fishing or joint venture agreements with neighbouring countries and to manage the Thai fleets in strict compliance with these agreements with a view to obtaining at least 1.8 million tons accelerated aquaculture development in inland and marine waters and the attainment of high standards for Thai fish and fishery products in response to the requirements of foreign markets.

During this Seventh Plan, the strategies covered the reinforcement of various marine fisheries management measures, including the construction of artificial reefs in many coastal areas; fishery resources conservation; and the setting up of pilot projects on coastal area management with more active participation from small-scale fishing communities in the management of the fishery resources in waters adjacent to their villages to ensure their sustainable yields. Other priorities included the strengthening of the country's monitoring, control and surveillance system and the establishment of regulations for those vessels fishing outside Thai waters under joint ventures or fishing agreements. The Government also set up a national fisheries policy committee, a standing committee chaired by the Deputy Prime Minister. The committee includes members of both the government and private sectors.

Under this Plan, the Thai marine fisheries production was estimated at 3 million metric tons in 1993 of which approximately 10 per cent was contributed by coastal aquaculture. The development of deep sea fisheries, for example, tuna fisheries, did not achieve the anticipated target. Total marine production was short of the target by about 500,000 tons because of conflicts in the pursuance of joint ventures. Coastal mariculture was higher than the anticipated target, resulting in significant foreign currency gains from the export of prime aquaculture products such as shrimps.

As directed by the National Fisheries Policy Committee mentioned earlier, fisheries development under the current Eighth National Economic and Social Development Plan (1997-2001) has four policy directives:

- (a) In Thai internal waters and EEZ: To endeavour to attain fisheries sustainability by maintaining at least 1.58 million tons of marine fishery production a year during the current Plan, with the rehabilitation of the fishery resources and environment and a reduction in by-catch and low-value catch by about 100,000 tons a year.
- (b) Outside Thai waters: To implement regulations governing the conduct of the Thai fleets in compliance with fishing or joint venture agreements with other coastal States. The target is to make available approximately 3,500 fishing vessels of more than 18 million tons annually outside Thai waters.
- (c) Aquaculture development: To accelerate coastal aquaculture development with the diversification of cultivable species; and the prevention and control of environmental degradation from aquaculture development. The target is to increase the aquaculture production by about 5 per cent annually.
- (d) Post-harvest technology development: To improve the quality assurance and control of the Thai fish and fishery products to enable them to compete in foreign markets; and to resolve fish marketing and export problems. The target is to produce for export at least one million tons annually.

In order to implement the above policies the following strategies have been proposed by the Thai Department of Fisheries for consideration by the National Fisheries Policy Committee and the National Economic and Social Development Board:

Fisheries in Thai waters

Stressing the importance of fisheries management as a means of conserving and rehabilitating the depleted marine fishery resources in Thai waters, the Government will strengthen fisheries management measures, including reducing the number of fishing vessels, especially trawlers and push netters commensurate with the capacity of the demersal fishery resources. Other conventional management measures such as the closure of fishing grounds and seasons as well as the regulation of types of fishing gear will also be implemented as appropriate. New measures including the granting of fishing and aquaculture rights to coastal fishing communities will be tried on an experimental basis. The strengthening of the monitoring, control and surveillance system will be carried out by enhancing the capacities of the agencies concerned.

Environmental protection and the rehabilitation of fish habitats will be another important strategy in this overall endeavour. Efforts will be made to enhance the standards for fishing operations of boat crews with a view to bringing them closer to international standards.

Efforts will also be made to familiarize fishermen with the current rules and regulations for the sustainable development of the fisheries through THE enhancement of mass media communication.

Fisheries outside Thai waters

The strategies include the promotion and support of negotiations for fishing and joint venture agreements with other coastal States; promotion of deep sea fishing such as the provision of credit facilities for investment in such endeavours; enhancement of closer cooperation between government agencies, private sector and non-governmental organizations; protection of and assistance to the Thai fleets fishing in other waters and the high seas; and the provision of international rules and regulations governing fishing in international waters.

Coastal and marine aquaculture

The strategy is to enhance the efficiency and productivity of various aquaculture systems; the prevention and control of environmental degradation caused by aquaculture activities, such as the management of saltwater irrigation in brackish water shrimp culture; and the procurement and support of basic prerequisites for accelerated aquaculture development.

Post-harvest technology development

The strategy includes the identification of the sources of supply and procurement of raw materials such as fresh or frozen tuna for the manufacturing industry; fish marketing and fish product development; strengthened quality assurance and control of manufactured fish and fishery products for export; and the prevention and control of environmental degradation resulting from the manufacturing industry.

6.4.2 Laws and regulations

Laws governing fishing activities in Thailand (with primary attention to inland waters) are believed to have been in force for more than 160 years. However, the first fisheries law, the Water Tax Act R.S. 120, was enacted on 14 March 1901. This law contained 22 articles, empowering the Minister of the Interior and the Minister of the City (Bangkok) to be responsible for its implementation. The Act contained legal provisions for the conservation of aquatic resources; the collection of water tax (fishing activities); and punitive measures. Because of the many inherent problems relating to the implementation of fishery resources conservation under this Act, the Government in 1921 decided to reassign the responsibilities for technical matters relating to the aquaculture and capture fisheries (mainly inland fisheries) to the Ministry of Agriculture and for the protection of fishing areas and tax collection of the fisheries to the Ministry of Finance.

The Government enacted a new fisheries law, the Fisheries Act, B.E. 2490 on 14 June 1947 to cope with the rapid development of fisheries after the second world war. Two amendments have since been made to this Act in 1953 and 1985 with a view to improving various measures, notably those for the effective conservation and management of aquatic resources, especially marine fishery security. The Fisheries Act comprises six chapters with 73 articles that cover fisheries management; fishery resources conservation; aquaculture; registration and application for permission; and collection of revenue from fishing activities.

It is generally agreed by the officials concerned that the Fisheries Act B.E. 2490 can accommodate the important provisions of major international instruments and initiatives which are concerned with the sustainable development of fisheries and environmental protection. Among several important articles in the Fisheries Act, Article 32 empowered the Minister of Agriculture and Cooperatives or provincial governors with the consent of the Minister to issue regulations for the management of fisheries and conservation of fishery resources as appropriate. The ministerial and/or provincial regulations concerning fisheries management which are currently in force can be classified broadly as follows:

- (a) Limitation of entry to fisheries through fishing licenses;
- (b) Prohibition of the use of certain types of fishing gear during the spawning and breeding seasons of some commercially important species;
- (c) Prohibition of certain types and sizes of fishing boats and gear in some areas;
- (d) Declaration of protected areas;
- (e) Protection of endangered and threatened species;
- (f) Prohibition of the use of poisons, stupefying chemicals, explosives and electric stunning.

Article 28 of the Fisheries Act deals with the licensing of fishing gear. In the amended Fisheries Act B.E. 2538, Article 28 states that the owner of a fishing vessel fishing illegally in foreign waters is responsible for paying all expenses for the return of the boat and crew to Thailand if such a vessel is arrested for illegal activities.

A number of articles under the current Fisheries Act would facilitate the enactment of rules and regulations for the implementation of a community-based fisheries management system of fishing rights in the country. These include Article 6 which categorizes the types of fisheries; Article 7 which empowers a provincial governor, with the approval of the Minister of Agriculture, to make notification about the types of fisheries within his/her province; Article 12 which defines a reserved area for a person or an entity who is permitted to fish or to cultivate aquatic animals (licensee); Article 13 which prohibits any person other than the licensee to fish in the reserved fisheries area; and finally Article 52, which empowers a provincial governor, with the consent of the Minister of Agriculture, to forbid any person other than the licensee to enter any reserved fisheries area unless permission has been obtained from the licensee or a competent official.

In addition to the Fisheries Act, other fisheries-related laws include the Act Governing the Right to Fish in Thai Fisheries Water B.E. 2482 (1939) and the Thai Navigation Act for which the Harbour Department, Ministry of Transport and Communications, is responsible. Reference should be made to the Wildlife Reservation and Protection Act, B.E. 2535 (1992) which empowers the Department of Fisheries to protect all aquatic animals listed as reserved and protected, including marine mammals, turtles, corals and several endangered or rare fish species. This Act also has provisions for the control of international trade of endangered species in compliance with CITES.

As regards environmental protection prior to 1974, responsibility for the control of marine pollution from both sea-based and land-based sources in Thailand was discharged by several governmental agencies. In 1975, the Enhancement and Conservation of National Environment Quality Act was promulgated by the Government, under which the Office of the National Environmental Board was established within the Office of the Prime Minister. This environment act was subsequently strengthened and in 1992 the amended Enhancement and Conservation of National Environmental Quality Act came into force with the Office of the National Environment Board being transferred to the Ministry of Science, Technology and Energy and upgraded. This Office develops policy for the control of environmental matters but the policy is implemented by various operating agencies.

There are a number of laws concerning environmental matters in Thailand, including water management; the control of animal and plant introduction; wildlife conservation; forest protection; and the creation of national parks and reserves. Thailand also has legislation on environmental impact assessments for development projects and the control of pollution and toxic chemicals. However, there is no general legislation governing all aspects of the environment. Thus, the problem is not the lack of legislation, but coordination among the authorities in administering the laws and regulations.

6.4.3 Fisheries management authorities

Under the current Eighth National Economic and Social Development Plan, it is expected that general policy guidance will come from the Standing Committee for the Policy and the Restoration of the Thai Seas, chaired by the Prime Minister, and more specific fisheries policy from the National Fisheries Policy Committee, chaired by the Deputy Prime Minister (this committee has the participation of the private sector). As indicated earlier, the Ministry of Agriculture and Cooperatives is the responsible agency for enforcing the Fisheries Act, while the Ministry of Transport and Communications is responsible for the Thai Navigation Act.

The principal governmental agency which is directly responsible for fisheries management is the Department of Fisheries under the Ministry of Agriculture and Cooperatives, in particular the Fishery Resources Conservation Division, and at the provincial level, the Provincial Fisheries Offices and the District Royal Thai Navy; the Royal Customs Department; the Police Department; the Office of the National Environmental Board and the Harbour Department. At times, problems arise but no concerted action is taken as several agencies claim that such problems are outside their jurisdiction. There is definitely a lack of close coordination among these agencies.

6.4.4 Mechanisms, programmes and projects in support of fisheries management

As programmes and projects in support of marine fisheries management involve the work of several divisions and research units within the Department of Fisheries, a Standing Committee for Considering Management Measures Required for Aquatic Resources Conservation was established in 1991 by the Director-General of the Department of Fisheries to coordinate the work of these various units.

The strategies and action plans for a more effective fisheries management regime which will be implemented during the Eighth National Economic and Social Development Plan have already been mentioned. They are highlighted below:

Commercial marine fisheries

Accelerated action required to amend the relevant laws and regulations, particularly disparate regulations concerning the control of fishing activities and fishing fleets

Promotion of fishermen's associations

Reinforcement of regulatory management measures

Improvement in fisheries information and statistical systems as well as communication through the mass media to familiarize the public with the need for sustainable development of fishery resources

Limitation in the number of fishing vessels and regulation of mesh size

Installation of artificial reefs in coastal areas

Strengthening of research relevant to the conservation of fishery resources and fisheries management

Formulation of area/community-based master plans for fisheries management at the local level

Promotion of closer cooperation among researchers, resources managers and fishermen in the endeavour to restore resource productivity

At the regional level, promotion of cooperative research especially on commonly exploited or transboundary fish stocks.

Small-scale fisheries

Implementation of pilot projects on integrated coastal area management

Construction of more artificial reefs along the coast

Declaration of more marine reserves

Overseas fisheries

Promotion of joint ventures in fisheries

Promotion of deep sea fisheries with a special emphasis on tuna fisheries

Amendments to the regulations under the Fisheries Act with a view to ensuring more compatibility with relevant international instruments and initiatives concerning fisheries in the high seas

Promotion of the development and rational management of straddling or transboundary fish stocks in the Thai EEZ.

Monitoring, control and surveillance system (MCS)

The Department of Fisheries has endeavoured, especially during the past decade, to strengthen the fisheries management capability of the Fishery Resources Conservation Division, the Offices of the Provincial Fisheries Officers and District Fisheries Officers by increasing their budgets and providing more facilities. More than 40 patrol vessels are now in operation for enforcing various fisheries management measures. However, there is a need to strengthen further the monitoring and surveillance systems, especially the possible deployment of satellite communication to ascertain the position of fishing vessels, in particular those fishing outside the Thai EEZ, and the strengthening of information technology for rapid communication. There is also a need to harmonize the systems employed among the countries in the region to facilitate better assistance to those fishermen who have complied with the rules and regulations and to reduce the incidence of illegal activities.

Fisheries information and statistical database

During the past two decades, there has been a remarkable improvement of marine fisheries statistics, thanks to the attempts made some thirty years ago to improve the marine fisheries statistics of the country, employing periodic marine fisheries census and sampling techniques. The Department of Fisheries now computerizes fisheries data and maintains a fairly good fisheries statistical database. However, there is still a need to continue to improve catch and effort statistics, especially in the fishing grounds outside Thai waters. The Department of Fisheries has also recognized the need to strengthen socio-economic information which may be of value in setting up improved fisheries management measures.

Fisheries information has also been improved in the past two decades. Unfortunately the fisheries information has a limited distribution as it is written mostly in Thai. Attempts should be made to publish information, at least a resume, in English to facilitate better communications with neighbouring countries. There is a need to improve the fisheries information database so that up-to-date information can be readily disseminated to the private sector, fishermen, industries and abroad.

Fishery research

Fishery research of relevance to marine fisheries management is conducted primarily by the Marine Fisheries Division and its various centres, such as the Marine Fisheries Development Centre for the Upper Part of the Gulf of Thailand (Bangkok, formerly the Marine Fisheries Laboratory); Marine Fisheries Development Centre for the Eastern Part of the Gulf of Thailand (Rayong); Marine Fisheries Development Centre for the Lower Part of the Gulf of Thailand (Songkhla); and Marine Fisheries Development Centre for the Andaman Sea (Phuket).

While satisfactory progress has been made especially on the assessment of the state of the fish stocks in Thai waters, there is a need to update the assessment of their abundance and the rate of removal by fisheries on a regular basis. More importantly, information regarding the abundance of the fishery resources exploited by Thai fleets in fishing grounds outside the Thai EEZ must be acquired without delay, for example from the fishing logs of the Thai vessels fishing in those waters.

6.4.5 International cooperation problems and constraints in fisheries management

Thailand has been an active member of several international and regional organizations concerned with fisheries conservation and management as well as marine affairs, including the Asia-Pacific Fishery Commission (APFIC) and its subsidiary bodies and the Southeast Asian Fisheries Development Centre (SEAFDEC) which have a broad mandate for fisheries management and rational development.

Thailand has expressed interest in a number of international and regional fisheries forums concerned with cooperative research to ascertain the economic viability of new fishing grounds within the ASEAN waters and to conduct biological and ecological studies on straddling and highly migratory fish stocks as well as on shared, transboundary fish stocks in South-East Asian waters, with a view to ensuring the sustainability of fisheries in the ASEAN region. The Government has also expressed its willingness to negotiate at the bilateral or multilateral level for joint management of shared stocks in South-East Asian waters. The feasibility of cooperative research, development and management of transboundary fish stocks inhabiting the eastern part of the Gulf of Thailand has been recently discussed with Cambodia and Viet Nam.

The Government has approved Thailand's membership in the recently established Indian Ocean Tuna Commission (IOTC). In its Eighth National Economic and Social Development Plan, the Government will promote investment in deep sea tuna fishing in the Indian Ocean. The Agreement for the Implementation of the Provisions of the United Nations Conference on the Law of the Sea of 10 December 1982 in relation to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks is being studied by the responsible agencies of the Government with a view to ratifying it in due course.

Fisheries policy in Thailand is governed by two basic acts: the Act Governing the Right to Fish in Thai Waters of 1939 and the Fisheries Act of 1947. They administer fisheries resources to maximize benefits from the utilization of these resources rather than to reserve them for future natural wealth. There are several other related acts and regulations concerning navigation (1913), fish markets (1953), fish processing factories (1963), fish exports (1980) and fishermen's cooperatives (proposed).

The Thai Waters Act of 1939 defines the Thai fishery waters as the territorial waters of 12 miles from shore and any other waters in which Thailand is entitled to exercise fishing rights. According to this act all fishing vessels in Thai territorial waters are required to hold a fishing licence. Fishing licences are to be issued only to Thai nationals or to partnerships and companies in which 70 per cent of the capital is owned by Thai nationals. Foreign vessels are not allowed to fish in Thai fishery waters except where there is an agreement with foreign countries. The authorities are empowered to seize any vessel operating in violation of the Act, to confiscate its catch and to prosecute the individuals or companies involved.

The Fisheries Act of 1947 deals with fishing areas, licences, fishery statistics and fisheries control and prosecution of offenders as well as fish culture. This Act classifies fishing areas into: (a) sanctuaries where fishing is prohibited; (b) leasable and reserved areas both of which are reserved for individual licence holders, but the former permit unlicensed fishing with certain gear for home consumption as well; and (c) public areas for which no license is specified but fishing is subject to compliance with conditions imposed by the Minister of Agriculture and Cooperatives.

The Act covers reptiles, aquatic mammals and molluscs, as well as fish. The Act also empowers the Ministry to issue regulations on fishery matters such as the closing of fishing areas or the establishment of seasons, the issuance of special fishing rights and the collection of fishery revenues, and the protection for endangered species such as marine turtles, dolphins and dugong, as well as the prohibition of certain fishing practices (for example, a prohibition to catch mackerel during the spawning season from 15 February until 15 May in Prachuab Kiri Khan, Chumpon, Surat Thani and Nakhon Si Thammarat, and also during the period from May to October when the leaf mackerel fry are maturing). Coral reefs are also covered by this act because coral are included as water animals.

In addition to these two acts, the Thai Vessels Act of 1939 requires all mechanically propelled fishing vessels of any size and non-mechanized boat of 6 GT or over to be registered with the Harbour Department to ensure compliance with construction, seaworthiness and equipment standards. In 1983, the Government introduced a new licensing system which aims to freeze the number of trawl fishing vessels at the current level and to reduce it thereafter. According to this new system the construction of new trawl vessels is prohibited and no new trawl licences will be issued, existing licences are made non-transferable except by inheritance, and obsolete vessels cannot be replaced.

In response to the need to raise the income levels of small-scale fishermen and to resolve their conflict with the large-scale fishery, push netting and trawling are prohibited within three kilometres from the shoreline. Efforts are also being made to develop alternative or supplementary employment opportunities such as fish farming, tourism and cottage industries.

6.5 DETERIORATION OF SEAWATER AND MARINE SEDIMENT QUALITY

Inappropriate land use in coastal and sea beds affects the degradation of coastal resources. Rock and sand beaches and mud plains were developed as wharves, recreation areas, and settlements. Waste generated from these activities was released into coastal environments over carrying capacity, resulting in an inability to be rehabilitated, polluting water quality in coastal areas, and affecting coastal seawater and sediment. High risk land use practices in sea beds are impacting on sensitive environments, particularly land fills for land expansion and the construction of sea walls ; that cause an accretion of sand deposits along wave barriers, while causing a loss of sand deposits and coastal erosion from tides and wind, that affects coastal ecosystems.

These problems tend to be intensifying in line with economic development that does not take into proper consideration the resulting environmental impacts. Release of waste is not adequately controlled. There is no management of coastal aquaculture; no coastal rehabilitation programs that are suitable for sustainable development. Laws and regulations are not enforced strictly against encroachers of coastal resources. Also, importantly, there is a lack of conservation awareness among concerned individuals.

The national policy for 1997-2016 concerning seawater and sediment quality are

- Promote development and control land use in coastal areas based on its carrying capacity, including establishing development free areas that are important to maintaining environmental quality.
- Formulate regulations and control development and expansion of communities in coastal areas throughout the country, including beaches; and provide proper solid waste and wastewater treatments in all areas; with continuous monitoring and evaluation of the implementation of these measures.
- Formulate measures to prevent the degradation of seawater quality resulting from government and private sector sponsored development projects.
- Protect and conserve seawater quality in 23 coastal provinces based on water quality standards.
- Formulate short, medium, and long-term measures for strict protection, control, and suppression of destructive coastal encroachment.
- Prohibit landfills at beaches, along coastlines a off-shore, and in public areas, except for government projects of national economic, security, and environmental importance, after approval of the Cabinet and of an environmental impact assessment process.
- Establish zones for the mining industry in coastal areas, on the continental shelf, and in deep sea areas as appropriate, and prepare management plans for all areas, taking into consideration environmental impacts.

In order to implement national policy, these legislative “Instruments” for environmental protection have been developed

- ◆ The environmental Fund
- ◆ Conservation and environmental protected areas
- ◆ Pollution control areas
- ◆ Environmental impact assessment
- ◆ Polluter pay principal
- ◆ Duty reduction for pollution control equipment

To enforce policy and laws relating to seawater quality management the following organizations were assigned with responsibility and authority

- Department of Agriculture and Cooperatives: Department of Fisheries
- Ministry of Transport and Communications: The Harbor Department
- Ministry of Science, Technology and Environment: Department of Environmental Quality Promotion, Pollution Control Department, Office of Environmental Policy and Planning, and The National Research Council of Thailand
- Ministry of Defense: Royal Thai Navy
- Office of the Prime Minister: Office of the National Economic and social Development Board
- Ministry of Interior: Provincial Administration office
- Ministry of Pubic Health: Department of Health
- Ministry of Industry: Department of Industrial Works, Department of Resources and The Industrial Estate Authority of Thailand

More specifically, Pollution Control Department which is a main implementation agency of the national policy, operates under the following policy, target and measures.

Policy

1. Reduce and control the water pollution from domestic, agricultural and industrial activities
2. Pollution Pay Principals
3. Promote and enhance private sectors to invest and operate activities for remedying the coastal pollution.

Target

- ◆ year 2001, at the end of eighth NESD plan

Coastal seawater quality around important tourist area and inner Gulf will meet the National Coastal Water Quality Standard.

- ◆ year 2006, at the end of ninth NESD plan

All coastal seawater will meet the “National Coastal Water Quality Standard”.

Measures

- ◆ Set up the action plan to control the coastal pollution, which target to be really in the year 2006. The action plan include :
 - provide area priority for investment of coastal wastewater treatment plant
 - coastal water quality and prediction
 - database for pollution sources
 - guideline to reduce waste load from important source
- ◆ Set up the emergency response plan for prevention and minimizing the pollutant, which impact to coastal environment.
- ◆ Continuously monitor and assess the coastal water with systematic data.
- ◆ Coordinate with other agencies for controlling the pollution sources
- ◆ Responsible agencies (e.g. Harbor Department, provincial officials) should define the coastline for strictly coastal land use control.
- ◆ Produce the wastewater treatment system in the coastal municipalities
- ◆ Set up and revise the coastal classification for the beneficial use
- ◆ Set up and revise the effluent standards from point sources along coastlines
- ◆ To enhance efficiency of measures in EIA process to be more practical and include local participation
- ◆ To enhance building capacity of organizations to facilitate for point source controlling by using social and economical measures and legal measures
- ◆ To support and develop human resources and budget for pollution control
- ◆ To support and promote private sectors and various organizations for public awareness to understand and responsible for coastal water management
- ◆ To provide the water pollution issue into all academic level
- ◆ To support research and study to develop appropriate technology in the tropical environment
- ◆ To develop mechanisms and equipment to enhance the water quality management and waste control strictly and continuously including GIS, MIS and mathematical model

On-going Implementation plan to control land-based sources of pollution into seas and marine-based sources by Pollution Control Department are:

- ◆ enforcement of domestic effluent standards
- ◆ set-up effluent standards to reduce waste loads from various activities, which discharged into coastal areas such as standards from shrimp farm, from fishing piers.
- ◆ revise coastal water quality standards for whole coast of Thailand for better management
- ◆ improve the penalty for any person who commits an unlawful act and other laws that concern about water environment protection such as laws of violation, Acts of public health, etc.
- ◆ improve rules, principles and control procedures for construction and land use along coastline
- ◆ increase degree of penalty for any person who dump waste illegally into water resources
- ◆ do not permit possessors to dump solid waste, wastewater, and nightsoil as well as chemicals substances into the sea
- ◆ set up priorities of coastal municipalities and major communities for wastewater treatment plant to reduce the waste loads into the coastal areas.
- ◆ construct wastewater treatment plant to remove waste loads from land-based sources of pollution
- ◆ construct treatment plant for solid waste that generate from communities and hospitals
- ◆ develop inventory and GIS (Geographic Information System) for pollution coastal management
- ◆ set up priorities of coastal municipalities for wastewater treatment
- ◆ provide monitoring program for coastal water, sediment and marine organism for 2-3 times/year
- ◆ revise the National Oil Spill Response Plan for better combating the oil spill in the Thai waters
- ◆ set up the Emergency response plan for chemical spill in some particular areas
- ◆ set up recovery plan for natural resources by oil pollution
- ◆ build up the coastal sensitivity mapping in the GIS system for pollution surveillance and contingency planning
- ◆ promote private sectors to conduct industrial estate for facilitate the pollution control
- ◆ promote private sectors to invest and service the central wastewater treatment plant
- ◆ monitor the water quality for detect the increase of phytoplankton for Red Tide phenomena and also aerial survey for Red Tide

Existing laws and regulation on water quality management

- Enhancement and Conservation of National Environmental Quality Act B.E. 2535
- Public Health Act B.E. 2535
- Factory Act B.E. 2535
- The Navigation in Thai Waterways (Vol. 14) Act B.E. 2535
- Poisonous Substance Act B.E. 2510 (Amended B.E. 2516)
- The Mineral Act B.E. 2510
- The Fisheries Act B.E. 2490
- Petroleum Act B.E. 2514
- Port Authority of Thailand Act B.E. 2494

Some highlight activities by the government regarding aquatic environment quality in Thailand

SEAWATCH

SEAWATCH, THAILAND is a complete marine environmental monitoring and forecasting system, which integrates data collection, data analysis, environmental modeling and forecasting with an advanced computerized system for distribution marine information and forecasts to interested operators and/or authorities. This project is being implemented under closed cooperation between the National Research Council of Thailand (NRCT), OCEANOR, the oceanographic company of Norway, and other involving parties, including the Harbor Department, the Meteorological Department, Port Authority of Thailand, Naval Hydrographic Department, Department of Fisheries, the Petroleum Authority of Thailand, Marine Police Division, Chulalongkorn University, Prince of Songkla University, Burapha University, etc.

This program is being established through networking of data collection buoys. The observed data can be integrated with data from other sources or used as an input to various numerical models. Results from the models can be further combined with marine environmental data and forecasts are a PC based system that would allow users to log on and retrieve the information directly.

Survey and Database Preparation of Pollution Sources and Development of An Action Plan to Improve the Marine Water Quality in the Gulf of Thailand and the Andaman Sea. Due to the rapid economic growth and population expansion in Thailand in the last few decades, the rivers, seas and coastlines and natural resources are under increasing risk of aquatic pollution from industrial, agricultural and domestic wastewater sources. In order to establish the extent of this threat, and to develop an integrated and comprehensive approach to water quality improvement, the Pollution Control Department (PCD) have initiated various projects to investigate water quality problems and devise appropriate management solutions. Water Quality Management Planning has been initiated in several inland rivers and catchments including those on the Eastern, Central and Southern Regions of Thailand and the declaration of Pollution Control Zones (PCZ'S) at Pattaya, Phuket, PhiPhi Island, Hat Yai/Songkhla and Samut Prakarn.

Coastal Sensitivity Mapping Project with its Application for Pollution Surveillance and Contingency Planning. To use mote sensing and GIS as tools for effective collection, compilation of environment data. Transfer of knowledge to the officials through the training. Also, to apply appropriate remote sensing techniques using satellite born systems supplemented with aerial photographs for coastal inventories and the future surveillance. The output of the project will be a database that integrates of the coastal information and setting up the sensitivity index for the whole coastline and also the aerial surveillance system for pollution Control in specific area.

Water Quality Standard

In order to minimize the pollution loads in the waterways and the sea, quantity of waste from pollution sources are needed. PCD has already declared many standards for effluent and for ambient environment. At the moment, PCD are preparing information for more effluent standards to control other potential pollution sources such as discharged water from small ports and fish landings, and effluent standard for oil cargo and gas station.

7.0 SPECIFIC ACTION PROPOSED FOR EACH IDENTIFIED ISSUE

Policy formulation and management of marine resources and environment will be the main focus of the action plan for the country. This policy formulation is a complicated task and require cooperation and integration among agencies of government, non-government and communities.

7.1 ISSUES/PROBLEMS

From the transboundary diagnostic analysis of national information, it can be seen that the transboundary issues in relation to the South China Sea stem from these major problems:

1. Overfishing by Thai vessels, both in Thai waters and the territorial waters and EEZ of other countries;
2. Land-based pollution, from domestic, industrial and agriculture (aquaculture) sources;
3. Inability to manage, control and predict the dispersion of large-scale and offshore pollution, mainly oil and other contaminants.
4. Lack of appropriate and effective laws and other legal instruments that empower government agencies to control and manage the environment and natural resources in the EEZ and continental shelf outside territorial water of Thailand (i.e., 12 miles)
5. Insufficient inputs and participation by local communities and stake holders, mainly due to the lack of awareness and technology know-how

7.2 OVERALL OBJECTIVES

1. To designate strategic management and utilization policy and planning in national waters, EEZs, and international waters of the South China Sea
2. To reduce conflicts among sectors, individuals, communities, countries regarding marine resource utilization
3. To draft a laws concerning management and control of environment and resources in the EEZ and continental shelf that conform with the UN Convention on Laws of the Sea
4. To generate practice guidelines related to marine environmental and resource management.

7.3 ACTIONS/ACTIVITIES

7.3.1 Development of a sea classification system

Conflicts related to marine resource utilization in the past were almost entirely due to the lack of a clear, well-accepted and fair classification of resources and areas. It is therefore necessary to have such a system to which all sectors involved agree.

Some participating agencies

Office of the National Economic and Social Development Board
Office of Environmental Policy and Planning

Activities	GEF	National*
• Data compilation and analysis		500k
• Meetings, experts/consulting and other project coordination	100k	60k

* National figures indicate estimated in-kind and in-cash contribution

7.3.2 Network of marine geographical information system for resource and environmental management

Geographic Information System (GIS) has been introduced for environmental and resource management in Thailand for quite some time and several types of data are now in this format. Yet, the lack of coordination among agencies cause redundancies, duplication, and incompatibility among datasets. To facilitate a more efficient use of these existing information resources, it requires an effective network as well as appropriate linkages between scientists and policy makers.

Some participating agencies

Department of Fisheries
Department of Land Development
Department of Forestry
Pollution Control Department
National Research Council of Thailand
Office of the National Economic and Social Development Board
Office of Environmental Policy and Planning

Activities	GEF	National*
• Coastal aquaculture data	200k	200k
• Coastal land information	125k	100k
• Other information systems, such as pollution sources, coastal ecosystem etc	100k	>5,000k
• National sensitive mapping	60k	
• Networking, meetings, expert/consulting and other project coordination	100k	50k

* National figures indicate estimated in-kind and in-cash contribution

7.3.3 Formulation of national policy, action plans and strategy

In Thailand, nine issues related to marine resources need to have clear policy, effective action plans and practicable strategy. These issues are: living resources, non-living resources, environment, navigation and transportation, tourism, law and regulation, human and institutional capacity/technology, financial and monetary measures, and public awareness/participation. To accomplish these tasks experience from pilot sites, new technology and realistic recommendations from academicians and communities must be integrated and discussed. National policy concerning marine resources must be transparent at both the national and regional level, and it needs to bring in considerations from other countries in the region.

Some participating agencies

Office of the National Economic and Social Development Board
Office of Environmental Policy and Planning

Activities	GEF	National*
• International experts/consulting	300k	
• Meetings	200k	50k
• Publication production	50k	
• Coordinating activities	100k	50k

* National figures indicate estimated in-kind and in-cash contribution

7.3.4 Drafting of the EEZ and Continental Shelf Laws for Thailand

Under the international law of the sea all coastal States have an entitlement to a 200 mile exclusive economic zone (EEZ), measured from the baseline of its territorial sea and to a continental shelf, beyond EEZ limits if applicable, up to a distance determined by the formula provided in Article 76 of the 1982 United Nations Convention on the Law of the Sea. It is acknowledged that these entitlements, such as the right to a 12-mile territorial sea, exist under general or customary international law, independent of the Convention.

In 1973 Thailand defined its continental shelf in the Gulf of Thailand and Andaman Sea, and in 1981 its EEZ. However, to date Thailand, unlike many other countries including some of its neighbours, has not yet enacted its own legislation for these areas under its jurisdiction. Without specific national legislation the authority of Thai enforcement officers remains uncertain, making it difficult for them to respond effectively to violations of international law in these waters. The need for Thailand to enact legislation, an EEZ and Continental Shelf Act (or two separate statutes), has become urgent not only for the sake of Thais but also for the benefit of foreigners using these areas.

Since it is important that Thai legislation of this kind should be compatible with that of its neighbours and of other countries around the world, it will have to be framed around the relevant provisions of the 1982 Convention, to which Thailand has not yet become a party: principally the provisions of Part V on the EEZ (Articles 55-75) and of Part VI on the continental shelf (Articles 76-85). But since the new legislation will have to be explained to Thai fishermen, oil industry workers, and others who will be affected by it, the drafting exercise is also seen as an educational process whereby consultation between the drafters and interest groups can be conducted and perhaps some insights elicited that might influence the precise wording to be adopted.

Some participating agencies

Thailand Institute of Marine Affairs Development
 Department of Treaties and Legal Affairs
 Harbour Department
 Royal Thai Navy
 Pollution Control Department
 National Security Council
 Supreme Attorney-General Office
 Fisheries Association of Thailand
 The Southeast Asian Programme in Ocean Law, Policy and Management
 Office of the National Economic and Social Development Board
 Office of Environmental Policy and Planning

Activities	GEF	National*
• Drafting	150k	100k
• Public hearing	100k	20k
• National plenary conference	150k	50k
• Project administration	50k	
• Deliberation and legislative processes		100k

* National figures indicate estimated in-kind and in-cash contribution

7.3.5 New Technology Research and Development

Technologies in environmental protection and conservation from developed countries in other parts of the world will have to be modified to suit the conditions and requirements of countries in the South China Sea region. One of the most important issues commonly encountered in this region is the massive expansion of coastal aquaculture (mainly for marine shrimps) which causes the uncontrolled release of high nitrogen wastes (water and sludge) into coastal waters as well as the unmanaged encroachment into mangrove forest and coastal wetlands. International concern about the impacts of coastal aquaculture can be clearly seen from the recent movement by some countries, such as the United States, to ban products that cannot be proven to have been produced by environmental technology. It is foreseen that if appropriate technology to reduce threats from coastal aquaculture can not be developed shortly, this multi-billion industry of the South China Sea countries will certainly encounter a major set back very soon.

In addition to aquaculture, tourism development also increase pressure to marine and coastal environmental. It is timely now that appropriate technology to cope with wastes and impact for tourism has to be developed and implemented.

Some participating agencies

Pollution Control Department
 Tourism Authority of Thailand
 Irrigation Department
 Fisheries Department
 Naval Operation Department
 Office of Environmental Policy and Planning

Activities	GEF	National*
• Appropriate waste treatment technology for coastal aquaculture	300k	
• Methodologies for damage assessment system for natural resource	500k	
• Water treatment system in some tourism areas	500k	
• Solid waste management and treatment in some tourism areas	250k	
• Database for tourism management and access control	500k	
• Hydrological control system for coastal wetlands	1,800k	
• Survey, planing and policy development for new marine protected areas	200k	

* National figures indicate estimated in-kind and in-cash contribution

7.3.6 Institutional capacity enhancement

Several agencies in Thailand are now responsible for regional environmental issues that cover the South China Sea, such as offshore oil spill patrolling and clean-up by the navy and regional meteorological forecasting by the Meteorological Department. However, even with responsibilities delegated to them, these agencies have not been provided with sufficient equipment, technology and know-how to do the job efficiently.

Some participating agencies

Naval Operation Department
 Harbour Department
 Meteorology Department

Activities	GEF	National*
• Offshore oil spill clean-up capability	1,000k	10,000k
• Long-term meteorological forecasting	150k	500k

* National figures indicate estimated in-kind and in-cash contribution

7.3.7 Demonstration Program and Technical Support for Local Community Management and Conservation Programme

The failure of central Government in the past to conserve and manage coastal resources and ecosystems by ignoring local communities clearly indicates the inappropriateness of the approach. The new constitution of Thailand clearly states that community involvement is now necessary for all resource management programmes. However owing to the lack of previous experience such community involvement will have to be developed and modified to suit the local conditions, constraints and requirements.

Some participating agencies

Department Environmental Quality Promotion
 Federation of Thai Industry
 Tourism Authority of Thailand
 Department of Fisheries
 Forestry Department
 Office of Environmental Policy and Planning
 Naval Operation Department

Activities	GEF	National*
• "Coastal Detective" network for protection of coastal resources	120k	
• "Green Industry" program for clean technology promotion	1,000k	
• Marine ecotourism	250k	
• "Green Hotel" Program	120k	
• Sustainable fisheries programme for coastal villages (20 village)	1,000k	
• Sustainable linkage between community and community mangrove	320k	
• Seagrass and subtidal conservation by local communities	65k	
• Upland island ecosystem	50k	
• Marine turtle conservation	100k	

* National figures indicate estimated in-kind and in-cash contribution

7.4 APPENDIX TO CHAPTER 7--PROPOSED ACTION SUMMARY/BRIEF

Action	Zoning for coastal aquaculture
Agencies	Marine Shrimp Research and Development Institute, Department of Fisheries
Contact person	Mr. Siri Tookwinas, Tel (662) 5793682, 5792421, Fax (662) 5610786
Objectives/goals	1. A complete GIS for coastal aquaculture in Thailand
Activities	1. Mapping of different types of coastal aquaculture 2. Water quality and oceanography of coastal aquaculture areas 3. Zoning and planning for future expansion of coastal aquaculture
Specific areas	22 coastal provinces
Time frame	3 years
Budget	27.508 million baht

Action	Community-based fisheries management
Agencies	Marine Fisheries Division, Department of Fisheries
Contact person	Mr. Rangsan Chayakul, Tel (662) 2123441, Fax (662) 5620543
Objectives/goals	1. To reduce inefficient resource harvesting by at least 100,000 tons per year 2. To maintain fisheries production in Thai waters at 1.7 million tons per year
Activities	1. Data collection for fisheries management 2. Monitoring of spawning grounds 3. Construction of artificial habitats for fisheries 4. Elimination and conversion of destruction/non-selective fishing methods
Specific areas	Gulf of Thailand and Andaman Sea
Time frame	5 years
Budget	158.885 millions baht
Action	Restructuring of destructive fishing gear in the Gulf of Thailand
Agencies	Marine Fisheries Division, Department of Fisheries
Contact person	Mr. Rangsan Chayakul, Tel (662) 2123441, Fax (662) 5620543
Objectives/goals	1. To eliminate all push net? and replace by more selective gear
Activities	1.
Specific areas	Gulf of Thailand
Time frame	
Budget	

Action	Establishment of a conservation area in the Gulf of Thailand
Agencies	Marine Fisheries Division, Department of Fisheries
Contact person	Mr. Rangsan Chayakul, Tel (662) 2123441, Fax (662) 5620543
Objectives/goals	1.
Activities	1.
Specific areas	Gulf of Thailand
Time frame	
Budget	

Action	Management and conservation of seagrass in Thailand by local communities
Agencies	Office of Environment Policy and Planning
Contact person	Mr. Rames Sookpoom, Tel (662) 2795202, Fax (662) 2713226, 2718088
Objectives/goals	1.
Activities	1. Establishment of community-based organizations to manage and use seagrass beds 2. Seminar/workshops among stakeholders 3. Public education 4. Public campaigns 5. Conversion of fishing practices
Specific areas	Khung Kraben Bay, Chantaburi (Gulf of Thailand, East Coast)
Time frame	1 year
Budget	2.5 million baht

Action	Public awareness and public participation in the protection of coastal resources
Agencies	Department of Environmental Quality Promotion
Contact person	Ms Savitree Srisuk, Tel (662) 2723020 ext 706, Fax 2794791
Objectives/goals	1. A network of "coastal detectives" 2. A manual to test the environmental quality for volunteers 3. Capacity-building for "coastal detectives" 4. Data/information networking
Activities	1. Seminars/workshops 2. Manual preparation, testing 3. Newsletter
Specific areas	Songkhla, Western Coast of the Gulf of Thailand
Time frame	3 years
Budget	4.03 million baht

Action	Water regulation system for the Sam Roi Yod coastal wetland (a CITES site?)
Agencies	Royal Irrigation Department
Contact person	Mr. Niwat Chankul, Tel/Fax (662) 2414421
Objectives/goals	1. A sustainable coastal wetland?
Activities	1. Feasibility study 2. Design of a water regulation system 3. Construction of a water regulation system
Specific areas	Sam Roi Yod, Prachuab Kirikhan (Western Coast of the Gulf of Thailand)
Time frame	
Budget	71.5 million baht

Action	Replantation of mangrove forests
Agencies	Royal Forestry Department Naval Operation Department
Contact person	Mr. Chalermchai Chotimas, Tel (662) 2798236, (662) 5797583 Capt. Bancherd Sriphraram RTN, Tel (662) 4754537, Fax (662) 4180413
Objectives/goals	1. Replantation of mangrove forest for a total area of 220 ha (by NOD) and ???ha (by RFD)
Activities	1. Replantation of mangrove trees 2. Maintenance of replanted forest 3. Seed production
Specific areas	Samut Prakarn, Nahorn Sri Thammarat, Trad, Rayong (Gulf of Thailand)
Time frame	5 years
Budget	12.9 (RFD) + ??? (NOD) million baht

Action	Underwater parks
Agencies	Naval Operation Department
Contact person:	Capt. Bancherd Sriphraram RTN, Tel (662) 4754537, Fax (662) 4180413
Objectives/goals	1. Three underwater parks
Activities	1.
Specific areas	Cholburi, Chumporn, Ang Thong Islands (Gulf of Thailand)
Time frame	
Budget	

Action	Conservation of island biodiversity
Agencies	Naval Operation Department
Contact person	Capt. Bancherd Sriphraram RTN, Tel (662) 4754537, Fax (662) 4180413
Objectives/goals	1. An island biodiversity conservation area 2. Education centre
Activities	1. Construction of infrastructure 2. Informal education programmes
Specific areas	Samae Sarn Island (Cholburi, Gulf of Thailand)
Time frame	5 years
Budget	

Action	Sea turtle conservation
Agencies	Naval Operation Department
Contact person	Capt. Bancherd Sriphraram RTN, Tel (662) 4754537, Fax (662) 4180413
Objectives/goals	1. To increase the natural population of sea turtles
Activities	1. To collect turtle eggs from the natural laying site and incubate/hatch at a naval protected location 2. To release adolescent turtles back into the sea
Specific areas	Cholburi (Gulf of Thailand)
Time frame	
Budget	

Action	Capacity-building for offshore oil spill clean-up
Agencies	Naval Operation Department
Contact person	Capt. Bancherd Sriphraram RTN, Tel (662) 4754537, Fax (662) 4180413
Objectives/goals	1. To enhance the capacity of the existing oil spill clean-up units to operate more offshore and handle larger scale oil spills
Activities	1. Acquiring more equipment to be located at naval stations in the Gulf of Thailand 2. Training of personnel 3. Public education
Specific areas	Gulf of Thailand
Time frame	
Budget	40 million baht

Action	Damage assessment system for natural resources
Agencies	Pollution Control Department
Contact person	Dr Pornsook Chongprasith, Tel (662) 6192312, Fax (662) 6192210
Objectives/goals	1. Manual for field damage assessment 2. Damage calculation and valuation system
Activities	1.
Specific areas	
Time frame	
Budget	20 million baht

Action	Water treatment system for marine shrimp culture
Agencies	Pollution Control Department
Contact person	Dr Pornsook Chongprasith, Tel (662) 6192312, Fax (662) 6192210
Objectives/goals	1. Appropriate water treatment system for individual ponds 2. Central water treatment system
Activities	1. Research and development 2. Engineering design 3. Code of practice for waste from shrimp farming
Specific areas	
Time frame	
Budget	15 million baht

Action	Monitoring of bilge water from international ships
Agencies	Pollution Control Department
Contact person	Dr Pornsook Chongprasith, Tel (662) 6192312, Fax (662) 6192210
Objectives/goals	1.
Activities	1.
Specific areas	
Time frame	
Budget	

Action	Drafting of the EEZ and Continental Shelf Laws for Thailand
Agencies	Thailand Institute of Marine Affairs Development/SEAPOL
Contact person	
Objectives/goals	To draft the first laws that control and manage environment and resource of Thailand's EEZ and continental shelf
Activities	
Specific areas	
Time frame	2 years
Budget	5 million Baht

Action	Medium and long-term weather forecasting
Agencies	Meteorology Department
Contact person	Mrs. Wanida Sooksuwan, Tel (662) 3989929, Fax (662) 3838824
Objectives/goals	1. To enable the department to make weather forecasts beyond the current three days
Activities	1. Acquiring a new numerical model
Specific areas	
Time frame	
Budget	5 million baht

Action	Green Factory Award: Promotion of Clean Technology in Thailand
Agencies	The Industrial Environment Institute, The Federation of Thai Industries
Contact person	Mr. Pongsatorn Arthornurasuk, Tel (662) 2294930-4 Fax (662) 2294940
Objectives/goals	1. To reduce industrial waste by ??? 2. To build institutional and human capacity on clean technology 3. To increase awareness
Activities	1. Technical support to industries 2. Training and other forms of capacity-building 3. Green Factory Award
Specific areas	
Time frame	
Budget	40 million baht

Action	Coastal resources management
Agencies	Office of Coastal Land Development, Department of Land Development
Contact person	Mr. Kamron Saifah, Tel/Fax (662) 5796658
Objectives/goals	1. Database for coastal resources
Activities	1. Data conversion into digital format (soil, land use, socio-economic) 2. Data analysis for potential land use, integrated land use, and land and coastal resources development
Specific areas	17 provinces of the Gulf of Thailand (3,200,000 ha)
Time frame	
Budget	5 million baht

Action	Sea classification
Agencies	National Economic and Social Development Board
Contact person	Mrs. Chuleeporn Boonyamalik, Tel (662) 2814059, 2820838 Fax (662) 2817268
Objectives/goals	1. Sensitivity maps 2. To reduce conflicts between sectors 3. To reduce conflicts with neighbouring countries
Activities	1. Implementation of sea classification 2. GIS for pollution sources, natural resources and sensitivity
Specific areas	
Time frame	
Budget	2.4 million baht

Action	Promotion and development of marine ecotourism
Agencies	Tourism Authority of Thailand
Contact person	Ms Yuwadee Nirattrakul, Tel (662) 6941222 ext 1855, Fax (662) 6941392
Objectives/goals	1.
Activities	1.
Specific areas	
Time frame	
Budget	10 million baht

Action	Mooring buoys for tourist boats at coral reefs
Agencies	Tourism Authority of Thailand
Contact person	Ms Yuwadee Nirattrakul, Tel (662) 6941222 ext 1855, Fax (662) 6941392
Objectives/goals	1.
Activities	1.
Specific areas	
Time frame	
Budget	15 million baht

Action	Database for tourism management and tourist control
Agencies	Tourism Authority of Thailand
Contact person	Ms Yuwadee Nirattrakul, Tel (662) 6941222 ext 1855, Fax (662) 6941392
Objectives/goals	1.
Activities	1.
Specific areas	
Time frame	
Budget	20 million baht

Action	Green Hotel Award
Agencies	Tourism Authority of Thailand
Contact person	Ms Yuwadee Nirattrakul, Tel (662) 6941222 ext 1855, Fax (662) 6941392
Objectives/goals	1.
Activities	1.
Specific areas	
Time frame	
Budget	5 million baht

Action	Water treatment system in some tourism areas
Agencies	Tourism Authority of Thailand
Contact person	Ms. Yuwadee Nirattrakul, Tel (662) 6941222 ext 1855, Fax (662) 6941392
Objectives/goals	1.
Activities	1.
Specific areas	
Time frame	
Budget	20 million baht

Action	Solid waste management and treatment in some tourism areas
Agencies	Tourism Authority of Thailand
Contact person	Ms Yuwadee Nirattrakul, Tel (662) 6941222 ext 1855, Fax (662) 6941392
Objectives/goals	1.
Activities	1.
Specific areas	
Time frame	
Budget	10 million baht

Project proposal

Topic: Drafting of the EEZ and Continental Shelf Acts of Thailand

1. Background

Under the international law of the sea all coastal States have an entitlement to a 200 mile exclusive economic zone (EEZ), measured from the baseline of its territorial sea and to a continental shelf, beyond EEZ limits if applicable, up to a distance determined by the formula provided in Article 76 of the 1982 United Nations Convention on the Law of the Sea. It is acknowledged that these entitlements, such as the right to a 12-mile territorial sea, exist under general or customary international law, independent of the Convention.

In 1973 Thailand defined its continental shelf in the Gulf of Thailand and Andaman Sea, and in 1981 its EEZ. However, to date Thailand, unlike many other countries including some of its neighbours, has not yet enacted its own legislation for these areas under its jurisdiction. Without specific national legislation the authority of Thai enforcement officers remains uncertain, making it difficult for them to respond effectively to violations of international law in these waters. The need for Thailand to enact legislation, an EEZ and Continental Shelf Act (or two separate statutes), has become urgent not only for the sake of Thais but also for the benefit of foreigners using these areas.

Since it is important that Thai legislation of this kind should be compatible with that of its neighbours and of other countries around the world, it will have to be framed around the relevant provisions of the 1982 Convention, to which Thailand has not yet become a party: principally the provisions of Part V on the EEZ (Articles 55-75) and of Part VI on the continental shelf (Articles 76-85). But since the new legislation will have to be explained to Thai fishermen, oil industry workers, and others who will be affected by it, the drafting exercise is also seen as an educational process whereby consultation between the drafters and interest groups can be conducted and perhaps some insights elicited that might influence the precise wording to be adopted.

2. Responsible institution

This project will be carried out under the supervisory authority of the Thailand Institute of Marine Affairs Development (Director: Dr Phiphat Tangsubkul). In its implementation he will have the assistance of:

Dr Chumporn Pachusanond, Faculty of Law, Chulalongkorn University
Dr Virachai Plasai, Counsellor, Dept of Treaties and Legal Affairs, Ministry of Foreign Affairs
Capt. Siriwat Thanapate, Director, Judge Advocate Division Administration Dept., Royal Thai Navy

3. Time frame

This project will be completed within two years, beginning preferably before the end of 1998.

4. Advisory Committee

The Institute will establish an Advisory Committee consisting of representatives of the following departments and other bodies:

Department of Treaties and Legal Affairs, Ministry of Foreign Affairs
Harbour Department, Ministry of Transport and Communication
Naval Chief of Staff, Royal Thai Navy
Secretariat of the National Security Council, Office of the Prime Minister
Naval Hydrographic Department, Royal Thai Navy
Supreme Attorney-General Office
Fisheries Association of Thailand
The Southeast Asian Programme in Ocean Law, Policy and Management
Dr Arun Panupong, Director, International Studies Centre, Ministry of Foreign Affairs
Admiral Thanom Charoenlaph, Consultant to the Royal Thai Navy on maritime boundary matters

5. Working Group

The Institute will appoint a Working Group, consisting of the best qualified experts from government, the academic community and the corporate sector, to (i) study all aspects of the problem of implementation of the above provisions in light of similar national legislation enacted elsewhere; (ii) participate in public hearings; (iii) draft a report including the proposed legislation; (iv) report to a national plenary conference; and (v) submit the final revised report to the Standing Committee of Parliament for enactment.

6. Public Hearings

On behalf of the Institute the Working Group will organize public hearings in various regions of Thailand for discussion of the relevant issues that pertain to:

- (i) Living resources;
- (ii) Non-living resources;
- (iii) Protection of the marine environment;
- (iv) Navigational rights;
- (v) Boundary delineation;
- (vi) Marine scientific research;
- (vii) Enforcement.

7. National Plenary Conference

On completion of its draft report, the Working Group will convene a national plenary conference of up to 500 persons to discuss the text and suggest revisions. Participants will be invited from the Standing Committees of the Government, Advisory Boards, the relevant Ministries, the various sectors of the ocean industry, and the academic community.

8. Benefits

Thailand has not yet ratified the 1982 United Nations Convention on the Law of the Sea, but its policy is to continue the process of implementation in conformity with the spirit, and as far as practicable the letter, of that important instrument. It is of operational importance to Thailand that the relevant rights and duties set out in Parts V and VI of the 1982 Convention should be clearly reflected in its national legislation, as they are in the national legislation of many other countries around the world. The proposed legislation will form the legal basis for law enforcement in Thailand's EEZ and continental shelf, and ensure its compliance with international law in the sustainable use of natural resources, protection of the marine environment, regulation of shipping, marine scientific research, and suppression of any activities harmful to the interests of Thailand and its neighbours. Thus, the

drafting of this legislation will clarify the remaining boundary issues in these waters and hopefully facilitate the negotiation of transboundary arrangements between Thailand and neighbouring countries in such contexts as transboundary pollution and the management of straddling and migratory stocks and scientific research. The project is seen as an important contribution to the avoidance of conflicts that tend to arise from legal uncertainty or obscurity. For example, it will help to reduce piracy, drug and arms smuggling and oil thefts, which are all serious problems in the transboundary seas around Thailand.

9. Budget

- A. Research personnel
- B. Travel (within Thailand)
- C. Data acquisition
- D. Public hearings
- E. National conference
- F. Communications
- G. Office supplies
- H. Other administrative services

8.0 IMPLICATIONS OF THE PROPOSED ACTIONS BY SECTOR

8.1 FINANCE

Finance is the key driving factor for all action proposed in Chapter 7. In this analysis, the implication by the following 3 sub-sectors will be discussed.

8.1.1 Government

The government, through its financial arms such as Ministry of Finance and Budget Bureau should allocate a certain portion of the annual budget to support activities of government and non government agencies and groups concerning regional and transboundary environmental issues. The size of the appropriation should be based on the economic and social values that the country receives benefit from transboundary resource and environment. An accurate assessment and valuation of transboundary resource will be an important information leading to this national financial policy.

The government, when possible, must continue to give support to non-government organizations involving in community development and public awareness, since community involvement is the key for sustainable management of natural resource and protection of environment.

8.1.2 Donors

During the economic crisis period, funding from donor agencies will be very crucial for maintaining several environmental and resource conservation and management programs in Thailand, while the government support to those activities is substantially decreased. Donation may come in the forms of unconditional gift or low interest loan. These donations will also very important for research & development, capacity building and demonstration activities concerning transboundary resource and environment.

8.1.3 Private and business sub-sectors

Private and business sector usually has certain interests. However with recent concern on environment and international trade barrier, environment and resource conservation is now a significant cost of production of both industrial and agricultural products. In Thailand several private and business establishments are now willing to invest money for research and development concerning natural resource and environment. However, there are still no clear practical guideline exist at this moment.

Banks and other types of financial institution should also play more active roles in environmental conservation by providing financial supports to capacity building and R&D projects. Moreover, support such as no interest loan to certain local community can facilitate public participation and harmony existence between human and natural resources.

8.2 NATIONAL SOCIAL AND ECONOMIC DEVELOPMENT POLICY

Economic and social development policy and actions in Thailand are layout by the National Economic and Social Development Board (NESDB). The board, which comprises of members from government, business and independent scholars, is one the most influential policy making body of the country. In its eighth Plan (1997 - 2001), which is also the country's policy, emphasis is on the coping with both the positive and negative impacts of globalization and to devise a new economic and social order upon which to base national development. Yet in this plan, which is quite similar to the 7 previous one, little is mentioned about the role of the country in the regional and transboundary resource and environmental management beside the last sentence that says "Thailand should also play a greater role in international resource management at both regional and global levels" but without any policy or strategy to achieve this goal.

Because the social and economic situation of the country are highly dynamic, NESDB also has an implementation strategy to monitor and readjust the national policy according to the present situation. This flexibility is therefor provide channel that policy adjustment to reflect transboundary issues is possible, providing that accurate and convincing information are shown to the board.

The National Committee for Restoration of the Sea which is under the NESDB Secretariat will also need to play a much more proactive role than previous. National master plan and policy on resource and environment in the national waters and EEZ must be drafted and adopted. In addition, the committee should also improve its coordinating role by encourage participation and input from expand to the non-government agencies and local communities.

Good policy and good operational strategy require accurate and up-to-date data and information. Different types and formats of data and information archived in various databases inside and outside of Thailand must be linked via some kind of networking, preferable electronically but may be replaced by a more appropriate alternative. Because much of the information are spatial data, comprehensive tools such as geographic information system and maps are appropriate visualization that can convey technical information to support decision making.

8.3 FISHERIES

Fisheries sector involved in almost every issue outlined in Chapter 7, and will play active operational role in several actions proposed in that chapter. Roles and implementations by sub-sectors will be discussed.

8.3.1 Governmental and intergovernmental

Department of Fisheries, in particular, has to lead several activities related to fisheries, namely to do research and development on sustainable fisheries; to promote and encourage sustainable fishing practices; to issue policy and regulation on sustainable fishing; to collect, update and disseminate data/information on fisheries and management; and to enforce all relevant laws and regulation. In these regards the navy and marine police force must provide support fisheries officers especially in offshore area where the capability of fishery patrol vessels are limited. Regional organizations, such as Southeast Asian Fisheries Development Center and FAO, through their active programs in the region, should render additional technical support as well as facilitate information networking and regional cooperation.

The country needs more conservation zone especially spawning grounds of major species must be protected. Research survey must be conducted by Department of Fisheries. Conservation guideline and regulation for each specific area must be drafted with input from various sectors. Centralized regulation must be kept minimum while involvement from local communities must be encouraged.

8.3.2 Large and small scale fishing fleets and fishing cooperatives

These non-government groups will be an important link between national policy/regulation and the actual fishing operators. These agencies should on the one hand make inputs and comment concerning R&D and policy making by the government, on the other hand convey new technology and understanding to fishing community. Environmental awareness and sustainability fisheries should always be promoted among fishermen of all scales.

8.3.3 Education

Both formal education and public education programs must be tailored made to match the audience of different backgrounds. Education institutes from all level, especially those in each local community, are strongly encouraged to provide different forms of education. Other agencies such as Department of Environmental Quality Promotion, Department of Public Relations, and public media, must participate in the nationwide campaign on sustainable fisheries. Technical information for making teaching and campaign materials could be made or synthesized by various organization inside and outside of the country.

8.3.4 Independent Think-Tank

In Thailand and Southeast Asia, there are several "Think-Tank" organizations that independent from government and business, such as the Thailand Development Research Institute, Thailand Environmental Institute, and Thailand Institute for Marine Affairs Development. These organizations have an objective to conduct research and make neutral recommendation for issues related to fisheries and living resources. The country should utilize these existing academic resource to compliment with suggestion made by government and fishery unions.

8.4 AGRICULTURE (COASTAL AQUACULTURE)

A sub-sector in agriculture that has most direct implications with the actions proposed in Chapter 7 would be the aquaculture, especially coastal aquaculture.

8.4.1 Government

Zoning of coastal area as well as inland areas where intensive aquaculture is allowed must be clearly defined based on scientific and socioeconomic information. Government offices, especially Fisheries Department and universities, must do research for aquaculture practice most friendly to the environment while yield most profit to farmers. Appropriate waste and sludge treatment method for each area must be developed and promoted.

The government sector also need to initiate some incentive programs, such as award or tax reduction, for good practice farmers or cooperatives.

8.4.2 Farmers

Large scale farms must have research and development unit to search for farming techniques that cause least harm to the environment. Small farms may have to join together and form cooperatives that will support technology to members as well as representing them in the negotiation with other sectors. Farmers must also establish an internal monitoring program to detect and punish violators so that to protect the other good practitioners.

8.4.3 Educational

All level of formal education institutes need to emphasize with environmental friendly aquaculture practice. More education programs on environmental friendly aquaculture must be developed in local university and colleges, with technical help initially from universities with established such a program.

8.4.4 Independent Think-Tank

Because aquaculture in Thailand is a very large business involving wide ranges of interested groups, it is a good practice to have independent opinions from groups of experts.

8.5 FORESTRY

8.5.1 Government

Both inland forests and coastal mangrove and swamps have been greatly reduced during the last few decades due to the failure of centralized government regulation system that excluded inputs and involvement from local community. The present idea of forestry management would be encouraging more involvement from stakeholders while central government must remain maintain the national framework for management through laws and regulation.

Zoning system based on accurate information must be developed and regularly updated. Research and development for conservation must be done by government sector with close relation with each local community. The research on resource valuation must be included as a major mechanism for supporting decision making by all levels of administration.

Network of citizen patrol is another approach to protect natural resource and environment. Government agencies such as Department of Environmental Quality Promotion is now having a plan for "coastal detective" program that can fit with this concept.

8.5.2 Community

Community will play a vital role in the management of forestry resource of the country. The concept of community forest, where man and forest live harmoniously must be promoted. Control for central government must be kept minimum. Technology transfer from research institute will be used. Local elected administration especially at Tambon level must be given more authority to manage forestry resource within its jurisdiction.

8.5.3 Education

Education program on community forestry must be established especially in local universities and colleges, though existing networks of colleges such as Rajapat and Rajamongkol where more than 30 nodes exist throughout the country.

Courses on community forestry and conservation must be included in all level of schools. Informal and public education will be another important mechanism for promoting community involvement and thus counter balance with influence from local influential people.

8.6 MANUFACTURING

Pollution and overuse of natural resource by manufacturing must be reduced by combined efforts of following sub-sectors.

8.6.1 Government

Roles of government must include research and development for new technology for minimize wasting of all natural resource and energy. Laws and regulation concerning impacts to the environment must be carefully issued and reviewed to make sure they are within the possibility that factories can conform to. The concept of ISO14000 must be followed.

The government should keep update information about international environmental issues. All issues must be carefully analyzed and separate between trade barrier and actual environmental issues. All steps in the government system must be transparent and fully accessible by general public (e.g. good governance system).

8.6.2 Industrial

Small factories that can not developed and maintain technology individually must be supported by the Federation of Thai Industry (FTI) research and development facilities. In addition, incentive program such as the "Green Factory Award" and other kinds of incentives must be promoted.

8.6.3 Independent Think-Tanks

Independent institutions such TDRI and TEI should be consulted for conducting independent studies on issues related to manufacturing and transboundary environment. Institutes at regional level would also provide good pictures of transboundary international situation to support national programs and projects to minimize transboundary issues.

8.7 SERVICE

Service sector especially those related to tourism which is a very important source of hard currency for the country must have a common goal in sustainable management of natural resource.

8.7.1 Government

Tourism Authority of Thailand (TAT) should have an efficient system to collect and update information about tourism. These information will be distributed to all relevant agencies, government and non-government, to support decision and policy issued.

Zoning of natural ecosystem with respected to tourism and visitors must be made and enforced. Holding capacity of each zone must be quantified. Effective monitoring program is also important for maintaining sustainability of the tourism industry.

Incentive program such as the "Green Hotel" as well as other kinds of incentives will encourage operator to concern more with the environment. TAT should also provide alternative technology for ecotourism that have been proven to be appropriate for situation and condition in Thailand.

Research on ecotourism and adaptation of such concept to different ecosystem in Thailand must be supported by government. It may be necessary to have a national committee or working group on ecotourism to be a consultant to the government on issues related to tourism and natural resources.

8.7.2 Operation

Hotels must be operated in an environmental friendly fashion. Self regulation through the Thai Hotel Association and other cooperatives would be a more effective way than the government in controlling all hotels especially small resorts in remote areas.

Tour operations in natural area and wilderness must strictly follow the regulation issued by government and local authorities. All operators must also help by observe and report any violations.

8.7.3 Education

The concept and approach for ecotourism must be promoted in all level of education. It is also important that operators in tourism industry understand and aware of the importance of environment and natural resources in their industry.

Education centers on different types of ecosystem will be an effective means of public education. These education centers could be cooperated by government, non-government and local community sector.

8.8 LEGISLATIVE

Laws are at least equally important to money in terms of environmental and resource management. Without suitable laws, effective enforcement can not be achieved.

Local laws and regulations on environment should consider and encourage more involvement by local authority and community in the management of resources. In addition, a law concerning the

exclusive economic zone and continental shelf must be issued as soon as possible to equip the enforcement agencies with a legal tool to combat with activities causing transboundary environmental problems.

To issue a good law or regulation, all parties involved, which are the Senate and House of Representatives on the legislative side and the Council of State on the government side, must be informed on all situation and condition, including state-of-the-art technology concerning marine environment. Inputs from enforcing agencies, business, and community make be taken into consideration. Public hearing is an effective approach to obtain such inputs.

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