



## CHAPTER 4

# INDUSTRIAL ENVIRONMENTAL MANAGEMENT ORGANIZATIONS AND REGULATIONS

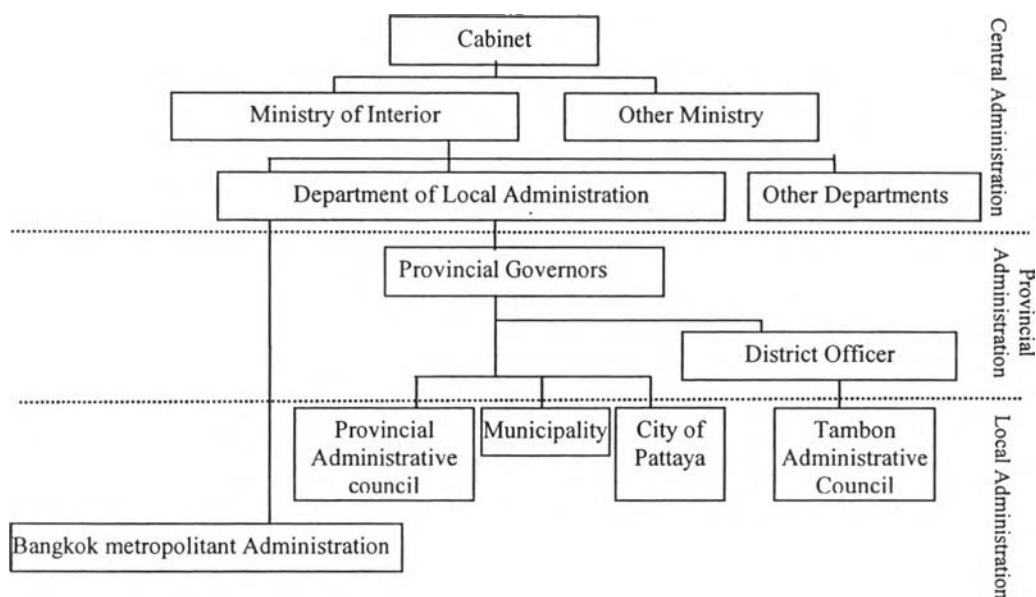
### 4.1 Introduction

At present, most Thai industries are still resource-based, e.g. agro-processing, and mineral processing such as cement, power generation and natural gas production, instead of science-based. Thus economic growth and industrial development have been achieved at the expense of the environment and the country's natural resource base (Reutergardh and Yen, 1997). Hillebrand (1998) reported that there are three reasons for Thai industry to improve its environmental performance. First, the pollution load from manufacturing has reached unsustainable levels. Second, export-oriented companies which are not moving to cleaner production are likely to face enormous difficulties in surviving in export markets. Third, Thailand needs to meet its obligations under Agenda 21.

This chapter will present an overview of the Thai environmental policy framework that companies are embedded in. In section 4.2, the organizational structure and the role that different actors play in environmental policy and management are described. The subsequent section presents the development and actual state of Thailand's environmental law and policy, with an emphasis on the legislation concerning pollution control, cleaner production and industrial ecology. The governmental policy towards palm oil industry is addressed in section 4.4. Finally, in the last section the main conclusions on the existing environmental policy and management structure in Thailand are drawn.

### 4.2 Governmental Environmental Organization and Actors

Until 1991, the National Public Administration Act was promulgated which provided three basic levels of public administration in Thailand: central, provincial, and local administration, (see Figure 4.1). Thailand is divided administratively into provinces, districts and sub districts. The provincial governors and district officers are the main authorities in the provincial administration and act as the representatives of the central government in the provinces. Administrative power is, however, centralized at the level of the national administration. The Department of Local Administration, under the Ministry of the Interior, is in charge of provincial as well as local administration. Other ministries and departments of the central government also have their branch offices in the provinces. The provincial administration has the authority and functions as local governments and is essentially an appointed agent of the central government, through the Ministry of the Interior. At present, there are 2 types of local administrative organizations in Thailand. The general type, which exists in every province, is composed of: 1) Provincial Administration Organization, which covers all areas in the province, 2) Municipalities, urban areas with a crowded population and high level of development; and 3) Tombol (sub district) Administration Organization whose jurisdiction is over the area of a particular sub district outside the boundaries of municipalities. The second special type of local administrative organization consists of two forms of local government: 1) Bangkok Metropolitan Administration; and 2) the City of Pattaya (Tummakird, 2001).



**Figure 4.1** Thailand's Administrative structure.

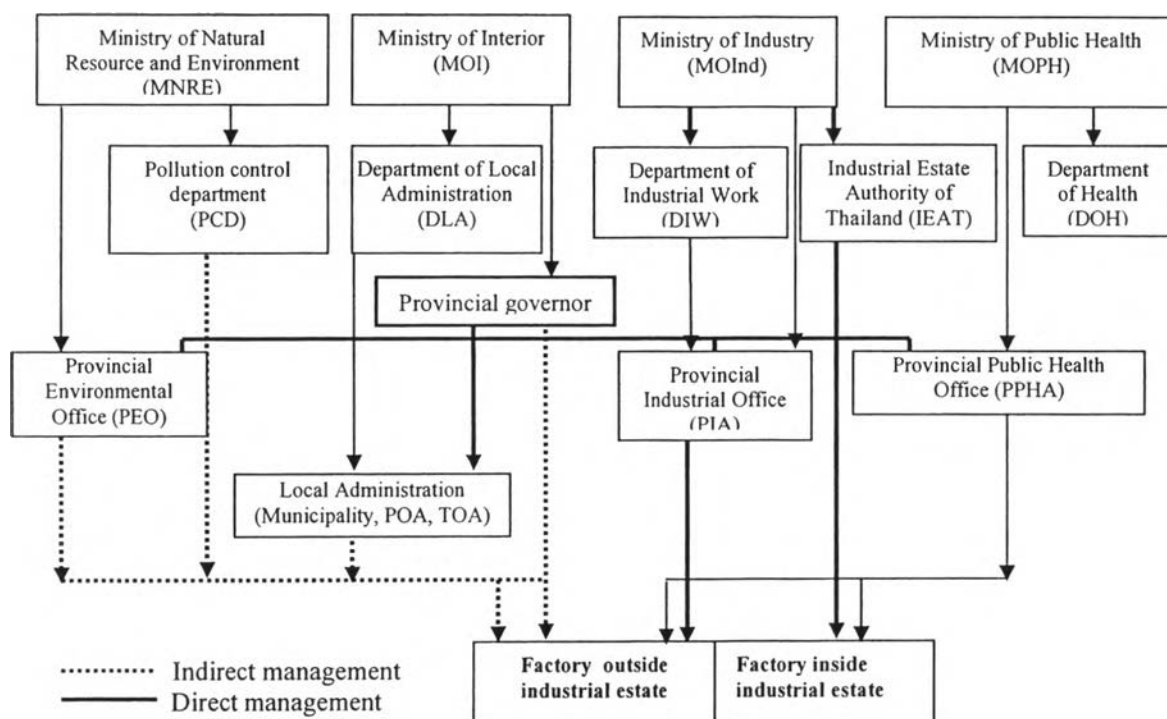
The provincial administration is headed by provincial governors and district officers. The country is administratively divided into 75 provinces. A governor and his deputies head the administration of a province. Provinces are administratively divided into a number of districts, headed by district officers falling under the responsibility of the Provincial governor. A district is divided into sub districts (*Tambon*) which are headed by a sub district chief (*Kamnan*). A sub district consists of several villages, headed by village heads. This form of administration comes under the concept of decentralization, which means that the central government delegates some of its power and authority to officers who work in provinces and districts. These officers are working for various ministries and departments and carry out their work according to laws and regulations assigned by the central government. At present, the provincial administration consists of 75 provinces (excluding Bangkok), 795 districts, 81 minor districts, 7,255 subdistricts and 70,865 villages (data of February 2001). Under the 1997 Constitution, decentralization of responsibility for environmental actions to the provincial governor was implemented and environmentally protected areas where sound environmental management actions are urgently required were identified.

The 1997 Constitution started decentralization of public service functions to local governments. The Constitution aims to facilitate public service delivery and ensures that they are responsive to the needs of the community. Local government in Thailand is organized in 6 different forms, equally distributed among urban and rural areas. Urban-based forms of local government include: The Bangkok Metropolitan Administration, the Municipality, and the City of Pattaya. Rural-based forms of local government include :

- The Provincial Administrative Organization (PAO) that constituting local government at a provincial level ;
- The Tambon Administrative Organization (TAO) constituting local government at a subdistrict level; and ;
- The Sukhapiban or Sanitary Committee, a local government in a rural centre, often referred to as a sanitary district.

Local Administration in Thailand is based upon the concept of decentralization, which allows local people to participate in local affairs under specified laws and regulations. People can elect their own leaders to run their own local government. Each PAO and TAO draws up its own development plan that details the problems and proposes solutions for its locality. The provincial administration superimposes the authority and functions of local governments and local government is essentially an appointed agent of the central government, through the Ministry of the Interior.

Environmental policy and management with respect to industry in Thailand can be divided into 4 main levels: (1) national level, (2) Provincial level, (3) local level and (4) company level. The general organization chart of industrial environmental management in Thailand (in 2003) is visualized in Figure 4.2.



**Figure 4.2** General organization flowchart of environmental management of industry in Thailand.

The different tasks on industrial environmental policy and management are fragmented over various governmental organizations. The Ministry of Industry (MOInd) is the main agency for environmental policy towards industry. It is directly responsible for the formulation and operation of environment policies towards industries. The Ministry of Natural Resources and Environment (MNRE) is responsible for the formulation of emission / effluent standards and is required to take action on public complaints related to pollution. The Ministry of Interior (MOI) has authority in the management of local authority. Meanwhile the Ministry of Public Health (MOPH) has responsibility for the provision of public health of both workers and the community. The central administration has a main role in developing the policy framework, standards and guidelines and as a control and enforcement agency. These policies and guidelines are implemented by the Provincial Agencies. At the provincial level, the Provincial Industrial Agency (PIA) has

responsibility for the regulation of the discharges and other nuisances from factories. The PIA is under direct management of the Provincial Agency. Below we elaborate on the tasks and responsibilities of the various governmental environmental organizations:

#### **4.2.1 National Level**

At the national level, environmental management is conducted on a national basis by the Ministry of Natural Resources and Environment (MNRE). In addition, the MOInd, MOI and MOPH together with their constituent departments, enjoy broad jurisdiction over numerous natural resource sectors. However, the environmental regulation of industrial production is the responsibility of Department of Industrial Works (DIW) under MOInd.

##### **4.2.1.1 Ministry of Industry**

The Ministry of Industry considers itself to be the leading agency in helping to strengthen large industries, small and medium enterprises, and entrepreneurs to be more competitive in the world market, and to assist them in the development of a better quality of life of Thai people. The main duties of MOInd are as following (MOInd, 2004):

- “To provide guidance for up-to-date industrial business and advice related to industrial business.
- To create business opportunities and an environment that is conducive to investment and business.
- To promote and extend the competitive potential at the global level of industry, small and medium enterprises, community enterprises and entrepreneurs.
- To supervise industrial business to insure the achievement of balanced and sustainable development”.

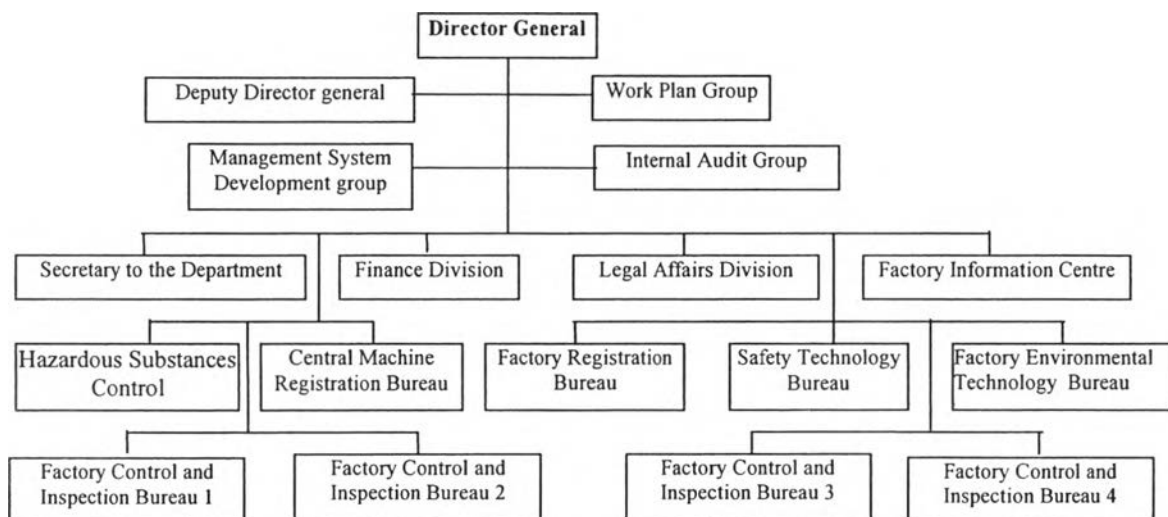
By 2003, the MOInd had 9 departments with 5,650 staff (MOI, 2004). These departments include Office of the Permanent Secretary, Office of the Minister, Department of Industrial Works, Department of Industrial Promotion, Department of Primary Industry and Mines, Thai Industrial Standard Institute, Office of Industrial Economics, The Official Thailand Board of Investment, Cane and Sugar Board. One of the more powerful departments within the ministry is the Department of Industrial works.

##### **Department of Industrial Works**

The DIW under MOInd is directly responsible for regulating industrial pollution and giving support for industrial operations in the country. DIW has authority to control, oversee, promote and support Thailand industrial operations according to the Factory Act (B.E. 2535), the Dangerous Substances Act (B.E. 2535), Gaseous Prevention Acts (B.E. 2535), and The Machinery Registration Act (B.E. 2514 and B.E. 2533). The organization of diagram of DIW is shown in Figure 4.3. Its main duties are as follows (DIW, 1992) :

- “To enhance the capacity and efficiency of industrial operations in Thailand to grow and remain competitive in world market.
- To provide information on industrial inventory.
- To be the center of information on industrial machines, chemicals, hazardous Substances and volatile substances.

- To represent and protect the benefits of the Kingdom in international arena for concerning issues on environment, safety and security of the country.
- To regulate pollutant discharge and other nuisances from factories.
- To control, oversee and engage in industrial businesses in the area of environment, preservation, sanitation and energy saving”.



**Figure 4.3** Organization chart of Department of Industrial works (DIW,2004).

There are 13 divisions within the department. The responsibilities and authorities of each division are summarized in Table 4.1. Currently (2004), the enforcement of industrial pollution regulation rests with the DIW's Factory Control and Inspection Bureau 1 to 4. The provincial Industrial Administration (PIA) is a representative agency of MOInd in each province. The regulation of pollution from industrial production in each province is part of their responsibility. The Factory Environmental Technology Bureau is responsible for research and development on industrial production, including clean technology. The Clean Technology unit with 6 staffs under the Factory Environmental Technology Bureau is responsible for the promotion of clean technology for Thailand's industry. They have formulated a policy and a program on CP promotion (2000-2006). The policy has been elaborated by the DIW staff, representatives from the industry, several governmental organizations, and experts from various institutions, along with advisors from abroad. The program has received support from the Danish Cooperation for Environment and Development (DANCED), since August 1998. This CP policy comprises objectives, targets and action plans for implementing Cleaner Technology in the Thai industry. It also indicates a timeframe, responsible parties and supporting organizations for each CP activity (DIW, 2000).

**Table 4.1** Responsibility of the divisions within Department of Industrial Works (DIW, 2004).

Division	Responsibility
1. Secretariat of the Department	-Link between the MOInd's policys on Industrial and the policy implementation by relevant agencies within the Department
2. Finance Division	- Finance
3. Legal Affairs Division	- Law and Legal affairs
4. Factory Information Center	- Center of national information and data on industry, environment, safety and machine
5. Hazardous substances control	- Responsible for controlling chemical in order to prevention impact and dangerous from chemical and other activity according to Dangerous Substance Act (B.E.2535)
6. Central Machine Registration Bureau	- Responsible for controlling machine and other activity according to The Machinery Registration Act (B.E. 2514 and B.E. 2533)
7. Factory Registration Bureau	- Responsible for issuing, checking and revoking factory licenses and activity according to Factory Act (B.E.2535)
8. Safety Technology Bureau	- Responsible for controlling, checking and developing safety and health in factory activity
9. Factory Environmental Technology Bureau	- Responsible for setting policy on industrial environmental management and promoting the application of innovation technology in industry
10. Factory Control and Inspection Bureau 1	- Responsible for controlling and checking industrial works of the factory in the Central region according to the Factory Act (B.E.2535)
11. Factory Control and Inspection Bureau 2	-Responsible for controlling and checking industrial works of the factory in the North-East region according to the Factory Act (B.E.2535)
12. Factory Control and Inspection Bureau 3	- Responsible for controlling and checking industrial works of the factory in the Northern region according to the Factory Act (B.E.2535)
13. Factory Control and Inspection Bureau 4	- Responsible for controlling and checking industrial works of the factory in the Southern region according to the Factory Act (B.E.2535)

The Factory Registration Bureau is responsible for the formulation of policy and plans for the registration of a factory, and checking and certifying factory licenses and activities according to Factory Act B.E.2535. Only factories that have installed more than 50 horses-power- machinery have to apply for a license before starting construction and operation. After registration, the company has to apply for a renewed license every 5 years. There are about 62,433 factories that need to have a license in Thailand (DIW, 2001).

The Factory Control and Inspection Bureau 1 to 4 are accountable and responsible for controlling and checking industrial works according to the Factory Act (B.E.2535). They have representatives in the Industrial Works section in PIA. There are 400 officials who work for Factory Control and Inspection Bureau 1 to 4. At the national and provincial levels, they are responsible for monitoring and inspecting all 124,079 factories in the country (DIW, 2001). About 20,000 registered factories are classified as water-polluting, air-polluting and hazardous waste generating companies. In addition, dealing with complaints from community on pollution related to production process is the responsibility of this department and the PIA. Hence, due to the sheer size of their task and their under staffing, the capacity of the officers to enforce existing rules and regulations is very weak (Hillebrand, 1998). They encounter difficulties in enforcement. In addition, the command-and-control nature of the existing environmental legislation does not give many incentives to companies to invest in environmental technologies or to go beyond compliance (Wilderer et al,2004).

### **Industrial Estate Authority of Thailand**

The industrial Estate Authority of Thailand (IEAT) is a state enterprise attached to the Ministry of Industry. It is chartered to implement the government's industrial development policy, especially on the development of industrial estates. Its objective is to ensure orderly and planned industrialization of the industries. Since 1972, twenty-nine industrial estates have been established, solely or jointly managed by IEAT. An industrial estate in Thailand is recognized as a preferential treatment area because the investors are eligible for incentives and privileges from the IEAT Act and Board of Investment's policy. IEAT has responsibility for issuing license for individual factories in the estate, specifying minimum standards for wastewater pretreatment before discharging to the central wastewater treatment plant, stack emission standards according to the MOInd and allowable emission loads based on the area and according to the condition in the environmental impact assessment report of the estate (IEAT, 2004).

The IEAT has responsibility for 29 large industrial parks throughout the country. It has been developing criteria that apply in converse an industrial estate into an eco-industrial estate. These criteria focus on energy and waste conservation, recycling, industrial symbiosis and by-product synergies. IEAT, in collaboration with German Technical Cooperation (GTZ) is the first agency in Thailand to apply the industrial ecology concept. The vision is "to apply the industrial ecology concept as the main strategy for future Thai industrial estate development", with the objective to reduce environmental impacts and enhance business and social performance. Pilot projects started between 2002 and 2005 and take place in 5 locations namely: Map Ta Phut Industrial Estate, Northern Region Industrial Estate, Bang Poo Industrial Estate, Eastern Seaboard Industrial Estate and Amata Nakorn Industrial Estate (IEAT, 2004).

#### **4.2.1.2 Ministry of Natural Resources and Environment**

Ministry of Natural Resource and Environment (MNRE) was created in 2002. The environmental tasks and responsibilities of the former Ministry of Science, Technology and Environment have now been transferred to the new MNRE. MNRE consists of 9 departments namely: The Office of the Permanent Secretary, Office of the Minister,

Department of Environmental Quality Promotion (DEQP), Department of Groundwater Resources, Department of Marine and Coastal Resources, Department of Mineral Resources, Department of National Parks, Wildlife and Plants, Office of the Natural Resources and Environmental Policy and Planning (ONREPP), the Pollution Control Department (PCD). The main departments under MNRE with responsibility for industrial pollution control are ONREPP and PCD (see Table 4.2). These departments are further divided into several divisions and regional offices, which take charge of specific environmental tasks and responsibilities at the national and provincial levels. The responsibility over natural resource management resides primarily with the sectoral ministries.

**Table 4.2** Departments under MNRE and their responsible ( MNRE, 2004).

Department	Responsibility
1. Office of the Natural Resources and Environmental Policy and Planning	<ul style="list-style-type: none"> <li>- To formulate policy and plan for natural resources and environment conservation and administrative management.</li> <li>- To coordinate the formulation of natural resources and environmental management plan.</li> <li>- To appraise Environmental Impact Assessment (EIA) reports on projects.</li> </ul>
2. Department of Pollution Control (PCD)	<ul style="list-style-type: none"> <li>- To support the formulation of national policy and plans of environmental quality conservation and promotion in respect to pollution control,</li> <li>- To formulate and recommend environmental quality and emission/effluent standards,</li> <li>- To monitor the national environmental quality</li> <li>- To develop systems, methodologies and technologies, which are appropriate in application to the better management of water quality, air quality, noise pollution, hazardous substances and solid waste</li> <li>- To take actions on public complaints related to pollution</li> </ul>

### **Office of the Natural Resources and Environmental Policy and Planning**

ONREPP has an important agency overseeing the industrial pollution mitigation is: the Environmental Impact Evaluation Bureau (DEIE). The DEIE acts as the secretariat of the expert committees to scrutinize environmental impact assessment reports according to the Enhancement and Protection of Environmental Act B.E.2535. Another major division related to industrial activity is the Office of Environmental Fund. This office was established in 1992. Its objectives are promotion and conservation of the quality of the environment via financial incentives. This includes support to local administration, state enterprises and the private sector by providing loans with a low interest rate.



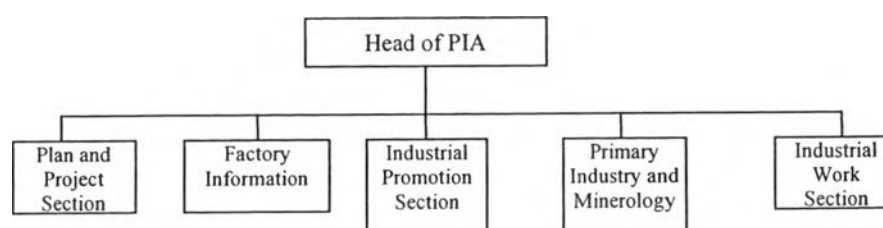
## Pollution Control Department

The PCD was established on June 4, 1992 under the Ministry of Science, Technology and Environment B.E. 2535(1992), as a result of the Enhancement and Conversation of the National Environment Quality Act B.E. 2535 (1992). At the national level PCD is responsible for setting environmental quality standards and emission/effluent standards from various sources. MOInd also applies effluent standards for industrial sources based on PCD's standard. One of the main functions of PCD is to monitor national environmental quality and to prepare an annual report on the state of the environment.

Another function of PCD relate to industrial pollution is to take action following public complaints on pollution. After receiving a complaint, PCD will inspect and sample the environment surrounding the source of pollution. If there is any contamination of the environment due to the factory emission, PCD will sent a report to DIW in order to control and enforce the factory to improve their environmental performance. PCD itself has no control and enforcement responsibilities regarding industrial pollution.

### 4.2.2 Provincial Level

Decentralized government agencies including Provincial Industrial Office (PIA), Provincial Environmental Office (PEA) and Provincial Public Health Office (PPHA), all under the provincial administration, have responsibilities in the management of industrial operations, environmental quality and public health, respectively (as described previously in section 4.2). PIA is the branch office of MOInd in the province. DIW also has their representatives in PIA office, in the Industrial Work Section. The scope of tasks related to industries of PIA includes: issuing and revoking factory licenses for each enterprise in the province; controlling, checking and developing safety and health quality in factory activity, controlling and checking production process of the factory in the province according to the Factory Act (B.E.2535). The number of staff in Industrial Work Section differs between different provincial, for instance 5 in the case of Trang and Suratthani Province, 6 in case of Chumporm, 3 in case of Krabi Province. These staff members are responsible for production activities including waste treatment and environmental issue in all factories in the province. Factory inspection results, problems and compliants are reported monthly to DIW. In the 4 provinces included in this study, Industrial work section in each PIA report to the Factory Control and Inspection Bureau 4 of the DIW.



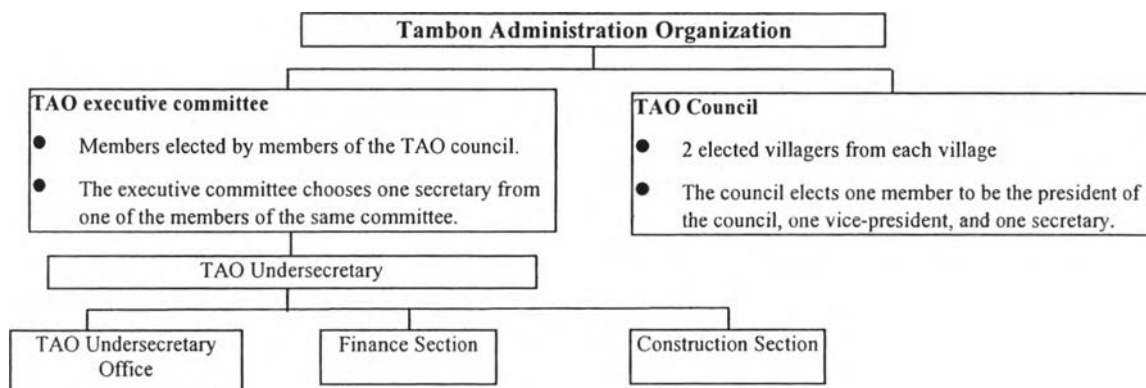
**Figure 4.4** Organization chart of the Provincial Industrial Office.

### 4.2.3 Local Level

#### 4.2.3.1 The Tambon Administration Organization

##### Structure and administration of TAO

The Tambon Council and Tambon Administration Organization Act of B.E.2537 (1994) raised the status of Tambon councils to juridical persons and Tambon councils with a certain income level set by the law were upgraded to TAOs. This Act provides the functions, both mandatory and optional, that are under the responsibility of the TAO. The TAO consists of the TAO Council and the executive committee of the TAO (Figure 4.5).

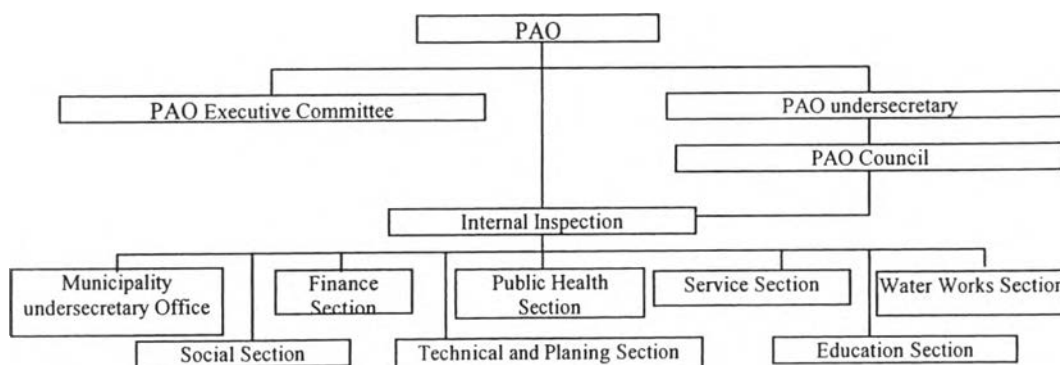


**Figure 4.5** Structure of the TAO according to the Tambon Administration Organization Act, 1994.

The TAO executive committee has the function of drafting local development plans, preparing an annual budget, and administering and implementing the tasks specified in the plan. The TAO executive committee works with the TAO council to draft rules and regulations for the locality. In addition, the TAO may pass regulations concerning the functions mentioned above, to the extent that these rules do not conflict with existing laws. Functions are also assigned to the local administration by various laws, such as Public Health Act, 1992, the Building Control Act, 1979, amended in 1992, Local Support tax Act, 1965, etc.

#### 4.2.3.2 Province Administration Organization

PAO and municipality has the same mandatory and operational functions as TOA. The organization chart of a POA is shown in Figure 4.6.



**Figure 4.6** The organization chart of PAO.

### **4.2.3.3 Environmental Management by Local Government**

According to the Enhancement and Conservation of National Environmental Quality Act of 1992, provincial and local authorities are allowed to formulate their own environmental management plans.

Due to the Enhancement and Conservation of National Environmental Quality Act of 1992 any province which has its territory designated as an environmentally protected area or pollution control area or any province which desires to enhance and conserve the environmental quality, is eligible to formulate an action plan and submit it to the National Environment Board (NEB) for approval. The NEB is set up for controlling and supervising these plans at the national level. At the provincial and local government levels, the Sub-Committee for Provincial Environmental Quality Management under the Committee for Provincial Development is set up as an advisory committee for environmental management. The Provincial Action Plan should be in accordance with the Environmental Quality Management Plan and should take into account social conditions in the area. Crucially, it emphasizes public participation from all parties and at all levels.

#### **The Roles and Functions of local government in Managing the Local Environment**

The roles and authorities of the TAOs in managing the environment are specified in the TAO act, 1994. The law empowers the TAOs to provide for waterways and walkways, maintain roads, waterways, and public parks, dispose of trash, and protect and maintain the environment. The Department of local Administration Ministry of Interior proposed an operational guideline, 1998-2000, to comply with the Constitution and to follow the policy of decentralizing authority to the local levels. This guideline significantly improves the roles position and functions of the Department of Local Administration, its local staffs, sub-district chiefs, and village heads, and put them in line with the Constitution. It means among other that :

- The central authorities must change their operations from a commander to a facilitator.
- Provinces and districts must act as supporters and coordinators of the various local governments in the area.

According to the The Tambon Council and Tambon Administration Organization Act (B.E.2537), local government has the authority to collect land tax from the factory, so that TOAs can increase their income from those factories. With these and other finds, TOA have to manage their environmental quality effectively. Since the villagers have the power to remove TAO executive members from office, there is a strong tendency to be more transparent and effective in both industrial and environmental management. The important task of TOA is to balance between industrial development and the management of natural resource in their area.

#### 4.2.4 Company Level

Similar to most enterprises in Asia, many factories in Thailand also have :

- Lack of information on environmental management as well as environmental technologies.
- Time constraints of company management who are responsible for many tasks.
- Lack of human resources with direct responsibility for environmental protection.
- Lack of manpower and awareness for environmentally sound production.

Illustrative of the role of actors in company environmental management, are the results of a survey of 16 crude palm oil mills in Thailand. Only some of the 16 companies conduct environmental protection activities voluntarily. One of the surveyed mills had a separate environmental management section. Environmental management of mills is usually an additional task of the production section or the management board of the mill. In most cases, the chief engineer has responsibility for environmental pollution in the factories, they have often not been trained on environmental knowledge or have only participated in some short training courses. Table 4.3 presents the position of environmental management tasks in the organization structure of the 5 selected case study enterprises.

**Table 4.3** Environmental Management at enterprise level in the case studies.

Factory	Place of environmental management tasks	Main environmental protection activities
Factory A	- Production engineer (by engineer) and - Quality control section (by Chemist)	- Applying cleaner production - Operation of waste treatment plant
Factory B	- Production engineer (by engineer) and - Quality control section (by Chemist)	- Applying cleaner production - Operation of waste treatment plant
Factory C	-Environmental management section	- Operation of waste treatment plant
Factory D	- Production engineer (by engineer)	- Operation of waste treatment plant
Factory E	- Production engineer (by engineer)	- Operation of waste treatment plant

### 4.3 Environmental Legislation

#### 4.3.1 General Introduction to Industrial Pollution Control Policy in Thailand

The concept of industrial pollution control in manufacturing was first addressed in the 3<sup>rd</sup> National Economic and Social Development Plan(1971-1976). The Fourth Plan (1977-1981) called for measures including the issuing of environmental impact assessment (EIA) as part of the procedure for issuing industrial permits. During the Fifth Plan (1982-1986) environmental problems related to industry were identified. The Sixth (1987-1991) and Seventh plan (1992-1996) started to address more directly and proactively the environmental consequences of the rapid economic and industrial growth in Thailand (Reutergarh and Yen, 1997). Although the 7<sup>th</sup> National Plan assigns high priority to environmental issues, the actions are geared heavily toward end-of-pipe treatment with

little emphasis on pollution prevention. It is apparent that pollution prevention policies and guidelines were lacking. However, cleaner production policy has been addressed in the 8<sup>th</sup> and 9<sup>th</sup> National Economic and Social Development Plan. The 9th National Economic and Social Development Plan (2001-2006) emphasizes on the importance of Thailand's competitiveness and cites cleaner production as one of the principal strategies to achieve this. The National Master Plan on Cleaner Production, developed in accordance with the International Declaration on Cleaner Production, was signed between Thailand and UNEP in 1998. The National Plan, enacted on 17 January 2002 and approved by the Government on March 26, 2002, seeks to introduce cleaner production principles that can be applied on various activities and sectors, and to identify measures and tools to ensure consistency in their application.

### **4.3.2 Development of Environmental Law and Legislation**

This section will briefly review the historical development of the national environmental laws and policy. In 1969, the Factory Act was established to regulate environmental disruption by factories. The Thai government entered the environmental protection field for the first time in 1971 when pollution of the Mae Klong River by sugar mill wastes became a source of controversy. However, more systematic introduction of environmental management and environmental laws really started in Thailand in 1975, when Thailand's first National Environmental Quality Act was passed (Reutergarh and Yen, 1997). As a result of this, the Office of the National Environmental Board (ONEB) and the National Environmental Board (NEB) was set up as a central agency to coordinate environmental management among governmental agencies. ONEB has authority in policy coordination, while implementation and enforcement were and still are the responsibility of other agencies such as DIW.

Around 1978, the new laws to mitigate pollution and environmental damage was set up. An environmental impact assessment system was created under provision of the 1978 Enhancement and Conservation of National Environmental Quality Act. However, the existing laws and regulations failed to reduce pollution from industrial production. During 1975-1992, the pollution and environmental problems from economic development continues to increase. The government recognized that the command and control approach alone is inadequate and ineffective to control the pollution load from the industrial sector. There is no incentive for the industry to reduce its pollution or go beyond compliance. In 1992, the government passed new laws and revised existing laws, such as the Factory Act 1992, the Enhancement and Conservation of National Environmental Quality Act 1992, the Hazardous Substances Acts, the Public Health Act 1992. The adjustment of the regulatory framework focused-among others- on the application of economic instruments by introducing the polluter-pays-principle. The new Acts radically changed the organizational structure on environmental protection in Thailand. The National Environmental Board (NEB) was upgraded, with the Prime Minister as Chairman, and the ONEB was replaced by three environmental departments under MOSTE: OEPP, EQP and PCD. PCD forms the present secretariat of the new NEB. Under the Constitution, the Decentralization Act and the 9<sup>th</sup> National Economic and Social Development Plan (2001-2006) include significant reforms for MOI, MOInd and MNRE, among which the reorganization and decentralization of departments and the development of innovative environmental policies and programs.

### 4.3.3 Environmental Legislation Concerning Pollution Control

Industrial pollution control was initially addressed by the Factory Act of 1969. In 1975, The Enhancement and Conservation of National Environmental Quality Act (NEQA) enacted the National Environment Board as the main policy, planning and coordination body, with ONEB as its secretariat. Under this Act, ambient quality standards (including guidelines for their use) and Environmental Impact Assessments (EIAs) procedure and regulation were developed and established. Implementation of pollution control policies, including the establishment of emissions standards, monitoring of sources and enforcement of regulations, were the responsibility of DIW in the Ministry of Industry.

Hence, NEQA was revised in 1978 and 1992 with the following key features (ONEB, 1992): Broadening the scope of environmental and pollution control.

- Upgrading NEB to become an active policy making center and establishing the Environmental Fund to assist polluters in controlling the eliminating of pollutants.
- Decentralizing the environmental management authority to provincial and local levels
- Promoting participation of the private sector in managing the environment. Promoting the role of the NGOs in environmental matters.
- Expanding the role of the Department of Pollution Control in MOSTE in establishing effluent and emission standards, monitoring and enforcement actions.
- Implementing a “Polluters Pay Principle”.

Table 4.4 shows a selection of the most relevant environmental laws for industrial pollution control :

### 4.3.4 Environmental Legislation Concerning Cleaner Production

Cleaner production is in line with existing national policies that emphasis the promotion of industrial development; such as :

- 8<sup>th</sup> National Economic and Social Development Plan (1997-2001).
- 5 year Industrial Restructuring Plan (1998-2002).
- Environmental Management Plan (1999-2006).
- 9th National Economic and Social Development Plan (2002 -2006).
- National Master Plan on Cleaner Production (2002-2011).

A list of the main policies involved in cleaner production is shown in Table 4.5.

**Table 4.4** Major environmental legislation regarding industry.

	<b>Purpose</b>
<b>Framework Laws</b> -Enhancement and Conservation of the National Environmental Quality Act 1975, amended in 1978 and 1992 -Notification of MOSTE on Types and Sizes of Projects or Activities of Government Agencies, State Enterprises or Private Persons Required to Prepare an Environmental Impact Assessment Report 1992	-Established ambient quality standards, EIAs, emissions standards, and monitoring of sources and enforcement of regulations -Implementing a "Polluters Pay Principle". -Decentralizing the environmental management authority to the provincial and local levels
<b>Pollution Control</b> -Factories Act 1969, amended in 1975 and 1992.  -Hazardous Substances Act 1967, amended in 1976, and 1992 -Poisonous Substances Act 1967, amended in 1973  - The Machinery Registration Acts 1971 and 1990) -Notification of Ministry of Industry Concerning Industrial Effluent Standards 1982 -Notification of Ministry of Industry concerning manufacture and use of toxic substances 1982 -Notification of Ministry of Industry Concerning Storage and Disposal of Toxic Substances 1982 - Notification of Ministry of Industry Concerning Tax exception for ISO certified factory 2004 -Public Health Act 1941, amended in 1992.	-Regulates and prescribes the location and environmental pollution control of factories -Control over the full range of hazardous substances used in industrial processes -Control of the import, export, manufacture, marketing, storage, transport and use of toxic substances. - Control and monitor the equipment employed in factory works - Setting industrial effluence standards.  - Setting standards for manufacturing and use of toxic substances  - Setting standards for storage and disposal of toxic substances  - Tax exception for ISO 14000 and ISO 18000 certified factories  -Monitoring and preventive measures for environmental health
<b>Energy</b> -Energy Conservation Promotion Act 1992 -Notification Concerning Duty Reduction on Energy Efficiency and Environmental Technology 1998	-Regulations for energy conservation in factories and large buildings

**Table 4.5** Main policies involved in cleaner production ( PCD, 2002).

	<b>Year</b>	<b>Strategies/ measures</b>
1. 8 <sup>th</sup> National Economic and Social Development Plan	1997-2001	<ul style="list-style-type: none"> <li>• Created balance between production and natural resource/environment protection</li> <li>• Promote industries with low environmental impacts by providing special support to industries who employ reduction, re-cycling and reuse technology.</li> <li>• Science and technology development to create a foundation for sustainable development Transfer of production and environmental technology to industrial sectors, clean technology implementation, as well as development of environmentally sound and product design.</li> </ul>
2. 5 year Industrial Restructuring Plan	1998-2002	<ul style="list-style-type: none"> <li>• Promote clean technology implementation to reduce pollution in 13 industrial sectors.</li> </ul>
3. National Environmental Management Plan	1999-2006	<ul style="list-style-type: none"> <li>• Support for clean technology implementation and energy conservation, to solve urgent environmental problems.</li> </ul>
4. 9th National Economic and Social Development Plan	2002 -2006	<ul style="list-style-type: none"> <li>• Cleaner production as one of the principal strategies to achieve competitiveness.</li> </ul>
5. National Master Plan on Cleaner Production	2002-2011	<ul style="list-style-type: none"> <li>• Implementation of cleaner production in the sectors of industry, agriculture, tourism and services, financial , and banking, education</li> </ul>

Since 1994, the government and private sector have undertaken various projects and activities to promote cleaner production in major industries. During the initial phase, projects obtained both financial and technical support from international organizations through governmental agencies (DIW), private organizations, associations and academic institutions. Therefore, DIW, under the Ministry of Industry, formulated Policy and a Program on Cleaner Production Promotion (2002-2006). The policy and program aim at developing competitive capacity of the industrial sector through the use of clean technology that would reduce production cost as well as pollution. It aims at establishing tools to respond and promote the adoption of CP in wider ranges of industries. These policies and activities were consistent with a number of policies emphasizing industrial development promotion, for example, the Industrial Restructuring Plan of the MOI, the Master Plan on Small and Medium Enterprises (SMEs) Development of the Department of Industrial Promotion (DIP), and the Energy Conservation Program under the Energy Conservation Act (En Con Act B.E. 2535. The Plan and Program was approved by the Industrial and Environmental Management Sub-Committee on June 20, 2000 (PCD,2002).

In January 2002, the National Environmental Board approved the National Master Plan on Cleaner Production prepared by PCD. It forms part of the 9<sup>th</sup> National Environmental Management Plan (2002 -2006), which has as Strategy No. 2: to protect the environment by using specific management and technology, eco-efficiency, and cleaner production which reduce pollution and production costs. This cleaner production plan contains 6 main strategies and 103 operational measures for the years 2002-2011. The plan gives an integrated vision for the nation to proceed with implementation of cleaner production in the public and private sectors, including industry, agriculture, tourism and service, finance and banking, and research and development. The main responsible organization for implementation is the Ministry of Natural Resources and Environment.

The six main strategies of the plan to enable cleaner production development and implementation in Thailand are :

- Strategy 1: Changes in Laws and regulation.
- Strategy 2: Policy and budget changes.
- Strategy 3: Promotion of cleaner production in industry, agriculture, tourism and service, finance and banking, and research and development.
- Strategy 4: Use of Economic instruments.
- Strategy 5: Human resource development.
- Strategy 6: Public relations.

There are governmental, financial, academic and non-governmental organizations that promote clean technology activities. The governmental institution responsible for cleaner production for industrial sector is MOInd. Measures for industrial sector which are implemented by MOInd are (DIW,2002) :

- “Prioritize the significance and establish database on industries where cleaner production will be promoted.
- Establish code of practice and manual on the implementation of cleaner production for industries, according to its significant priority.
- Establish a system of monitoring and certifying industrial operators that implement cleaner production.
- Establish a registration system for cleaner production (CP) auditors.



- Support industries in the Industrial Estate Zone to implement cleaner production
- Support SMEs to implement cleaner production .
- Increase the role of large industrial operators to be a leader who could help support smaller ones in implementing cleaner production”.

#### **4.3.5 Legislation Concerning Industrial Ecology**

Thailand has embraced industrial ecology as a potential approach to economic development of industrial estates through cooperation between the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) and the Industrial Estate Authority of Thailand (IEAT). IEAT has been the first agency in Thailand to work with this concept and has begun preparation plans for implementation year 2000, with the first operational phase set for 2002-2005. Locations for 5 eco-industrial pilot projects have been identified Map Ta Phut industrial estate, Northern Region Industrial Estate, Amata Nakhon Industrial estate and Bang Poo Industrial estate and Eastern Seaboard Industrial estate. The organizational structure of IEAT shows a division in 4 working groups (IEAT,2003) :

Group 1 Policy support for Eco-Industrial Development (EID).

Group 2 Capacity Building in EID.

Group 3 Pilot projects at 5 industrial estates.

Group 4 New Eco-industrial estates, with pilot project of Rubber City.

In Thailand the industrial ecology concept has been applied in Industrial estates, but not in individual companies. But waste exchange has been one of the operational measures in the National Master Plan on Cleaner Production. The main implementing agency there is MOInd. However, there is no law governing the reuse/recycling of industrial waste in Thailand. This is different in Taiwan, where Taiwan's EPA, in cooperation with the ministry of Economic Affairs, has changed the regulatory system to promote industrial waste reuse and pollution prevention. This program in Taiwan not only provides technical assistance and financial incentives, but also enhances resource reuse and conservation through an Industrial Waste Exchange Information Service Center (Tsai and Chou, 2004).

#### **4.4. National Policy on CPO Industry**

Though the oil palm industry started its development in 1968, the government initiated the promotion of palm oil extracting factories in 1974 and palm oil refinery factories in 1977. Serious government concern, with the efficiency of palm oil production emerged when palm oil became one of the core economic sector in the Fifth Social and Economic Development Plan (1983-1986). The government announced the establishment of palm oil Agro- Economic Zones in 10 provinces in the southern part of Thailand in order to enhance the plantation area and to improve the efficiency of oil palm production. (Oil Palm Development Plan, 1984).

The Board of Investment (BOI) has promoted the vegetable oil industry, including palm oil, since 1962. In 1984 BOI granted investment promotion to the integrated and export-oriented businesses and industries that used palm oil as raw material. This BOI promotion resulted to the establishment of 10 palm oil plantation companies, 14 extraction plants and 3 refinery plants by 1994.

The current policy of the Ministry of Agricultural and the Cooperatives, outlined in the oil palm and palm oil development plan of 2000-2006, has an objective to increase the average production to 3 ton/ rai and to increase oil content from 17% to 19%. It also aims to further expand the area for plantation. It is expected that in 2006, the area will increase to 2 million Rais. In Surajthani province, 4.3 million rais are currently used to grow palm oil and the area could be increased with 4 million rais. It is expected that in the future Surajthani will be the most important province in the for the palm oil production in Thailand.

When the comparative advantage index (RCA) is applied, Thailand's potential to compete in the world market shows to be lower than 1. Thailand is not able to meet the domestic demand. The cost for production is still high because Thailand has to import oil palm seed from other countries and the plantation system is not efficient. Malaysia has a noticeable higher production result 18.33 ton FFB per ha compared to 16.5 tons FFB/ha for Thailand.

At present, the existing cumulative production capacity of all Thai palm oil mills is more than the FFB productivity. In 2003, the FFB production was approximately 4 million ton FFB, but maximum production capacity of all 25 wet-process factories is approximately 740 ton FFB/ hr or 5.3 million ton FFB/ year ( with 300 operation days/ year and 24 hour/ day ). Therefore average factories currently operate at 75% of their full design capacity. However, the government, through the Ministry of Agriculture and Cooperatives, aims to increase oil palm production by promoting oil palm plantation. A budget of 2,400 million Baht is arranged in the 9<sup>th</sup> National Economic and Social Development Plan (B.E. 2545-2549) for this.

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$$RCA = \frac{X_{ij}}{W_j / \sum W_j} \quad \text{where: } X_{ij} = \text{Value of export product } j \text{ by country } i$$

$$\sum X_{ij} = \text{Total value of all export of country } i$$

$$W_j = \text{Total value of product } j \text{ in the world}$$

$$\sum W_j = \text{Total value of all products in the world}$$

The RCA concept is based on the idea that a country that can produce a goods at lower cost than other country, that country should export the goods in higher ratio than average value of world export.