

Sub-district, Panomsarakram District, Chachoengsao Province can be open or any other appropriate method.

Presently, the said transfer sub-station and waste disposal plant have been completely constructed since Year 2000 (B.E. 2543) but they could not be open for operation because the waste disposal plant had entrance problem and was protested by the people in the area of the said plant with the reason that it would cause the wastewater from the said refuse.

Nowadays, a private company proposes the project to generate electricity from biochemical gas for Chachoengsao Town Municipality's consideration. The said company needs to use some areas of transfer sub-station around not exceeding 10% to construct the waste composition for electricity generation at its own costs and expenses. The same company requests 30 year concessions and needs the waste 100 ton/day for the said electricity generation without any compensation in waste disposal from the Municipality. If this project is successful, this company will give some compensation to the Municipality.

#### **3.4.2.6 Community Groups in Solid Waste Management Activities**

Chacheongsao Town Municipality established 15 community groups and their committees. It would expand their networks to cover all areas to strengthen their communities and cause people participation in management and solution on waste problems and develop people in the areas to cause sub-consciousness and responsibility of the communities to promote sustainable development.

### **3.5 Koh Wai Sub-District Municipality**

#### **3.5.1 Technical System**

##### **3.5.1.1 Discharge and Storage**

Koh Wai Sub-district Municipality (KWSM), a newly upgraded sub-district municipality from the sanitary district in 1999, is located in Pak Phli District, Nakhonnayok Province. The municipal area covers 2.2 square kilometers, registered population of 2,167 (December 2002) and 560 households. Land use pattern in KWSM is largely agricultural area representing 88% of the total area, while the remaining part consists of residential households, commercials, local government offices, schools etc. Hence the generated waste in the community is quite low, and is mostly originated from households and merchandized stores.

Solid waste generated from households and merchandized shops is largely contained in plastic bags and discharged in 200-liter steel drums or worn-tire collection bins placed in the community. A cluster of 200-liter drums is also placed at large generating

sources such as schools, fresh markets, and local government offices.

### **3.5.1.2 Collection and Transportation**

Waste collection and hauling is performed every day by picking up waste from 200-liter drums and large collection bins stationed in the community. Collection efficiency of KWSM in term of waste generation is 100% with no leftover waste in the service area. Existing KWSM's collection vehicles consist of two 10-cubicmeter rear-end compactors (service life about 1 year), and one 10-cubicyard side loader (8 years of service life) with 10 collection crew in the fleet. In addition, KWSM also provides collection service for other nearby sources outside the municipal area like schools; monasteries and tourist attractions as well as 5 adjacent local authorities which have requested KWSM, namely;

- Nong Saeng Tambol Administration Organization
- Kho Po Tambol Administration Organization
- Tha Rua Tambol Administration Organization
- Koh Wai Tambol Administration Organization
- Pak Phli Tambol Administration Organization (to be started in October 2003)

Current waste quantity collected from both inside and outside municipal area is about 3.5 tons per day which is then hauled about 20-kilometer distance to the disposal site belongs to Prachinburi Town Municipality. For waste collection fee, 10 Baht/household/month is presently imposed on each dwelling unit. KWSM plans to double current collection fee in 2004 in order to cope with the collection and disposal expenses. The imposed collection fee particularly for adjacent local governments is 50 Baht per month per 200-litre drum.

### **3.5.1.3 Road Sweeping and Drain Cleansing**

Responsibility for keeping public places and roads cleanliness in the municipal area is deployed to 3 sweeping workers who perform daily duty during 6-8 A.M. particularly on the main roads, and once in every two days on minor roads.

The duty of drain cleansing on trunk roads is normally arranged for 2 workers. Normal planned operation is twice a year and additional work loads during flooding period or upon request from local residents. The inadequate appointed staff and allocated budget is typically a major bottleneck for this agency since each operating staff always performs a multi-tasking duty.

### **3.5.1.4 Intermediate Treatment and Recycling**

Waste recycling practice at generation source in KWSM is scarce due to lacking efficient recycling program from KWSM. It is found that there is no tricycle buyer or Saleng in the

community but one recyclable buyer shop. However, waste collection crews always segregate recyclable wastes during waste pick-up and hauling in the route for the sake to add their normal wages. The recovered recyclables mostly include plastic and glass bottles, and aluminum cans.

At present, KWSM has held several meetings with concerned party of a nearby monastery (Wat Fang Klong) in an effort to launch a waste reduction program in the community. The program aims to initiate the establishment of recyclable banks and to utilize a composting application of organic waste which is a major component in the waste stream due to the community located in agricultural area.

#### **3.5.1.5 Final Disposal**

Previous dumping site for final disposal of KWSM is located at Ban Koh Krachai, Muang District, Nakhonnayok Province. However, the nearby local residents complained and opposed the *offensive odor created at the dumping ground*, and demanded to cease its operation. Hence the dumping site was no longer in operation since then. Presently, KWSM hauls all collected waste to the existing disposal site of Prachinburi Town Municipality located at 20 kilometers away from KWSM for disposal service at a tipping fee rate of 230 Baht per ton.

#### **3.5.1.6 Maintenance of Vehicles and Equipment**

Maintenance and repair work of the 3 available collection trucks particularly the routine and simple job is normally maintained by the collection staff while any complicated repair work will be serviced by private operators. Since two available collection vehicles are newly purchased (1 year in service) hence the maintenance expense is nevertheless still low. The allocated budget for maintenance expense in last year was about 50,000 Baht.

#### **3.5.1.7 Medical Solid Waste Management**

Medical-care and treatment institution in the municipal area comprises only one government public health service center; private clinic is not available. KWSM provides collection service for only the segregated general waste from the medical-care center; the infectious waste is incinerated by a small self-fabricated incinerator in the center.

### **3.5.2 Institutional System**

#### **3.5.2.1 Administration and Organization**

Koh Wai Sub-district Municipality provided its structure and administration as follows:

- Office of Under Secretary;
- Finance Division;
- Engineering Division;
- Public Health and Environment Division;
- Education Division;
- Internal Audit Unit.

The organization structure and administration of Koh Wai Sub-District Municipality is shown in Figure 3-6.

### 3.5.2.2 Human Resources

Koh Wai Sub-district Municipality has 27 positions (5 attended and 22 vacant) as follows:

- Office of Under Secretary General            11 positions
- Finance Division                                    5 positions
- Engineering Division                            4 positions
- Public Health and Environment Division   3 positions
- Education Division                                3 positions
- Internal Audit Unit                                1 positions
- There are 5 permanent employees and 15 temporary employees.

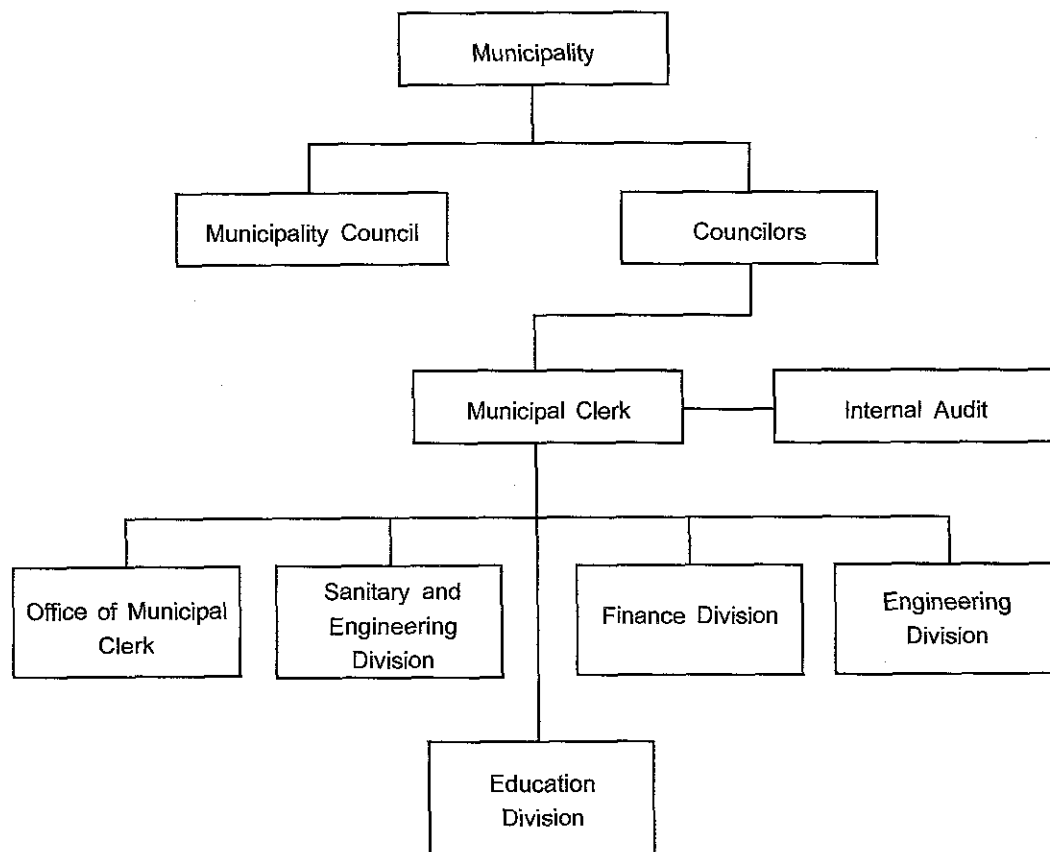


Figure 3-6: Organization Structure and Administration of Koh Wai Sub-district Municipality

### 3.5.2.3 Legislation and Enforcement

There are the same municipal regulations as Sriracha Town Municipality.

### 3.5.2.4 Financial Status and Refuse Collection Charge

In fiscal year 2002 (B.E. 2545) Koh Wai Sub-district Municipality had income totally Baht 8,174,350.12 and expenses totally bath 4,188,997.08

In fiscal year 2001 (B.E. 2544) Koh Wai Sub-district Municipality could collect the fees of waste collection and transportation amounting Baht 77,740 ,and in fiscal year 2002 (B.E. 2545) and 2003 (B.E. 2546) it estimated income from the said fees amounting Baht 50,000 and Baht 65,000 respectively.

Koh Wai Sub-district Municipality could collect 100% of the said fees in its boundary at 10 Baht/month/house (formerly 5 Baht/month) and out its boundary at 50 Baht/tank. It has policy to increase the said fees in B.E. 2547 at 20 Baht/month/house (maximum fee not exceeding 40 Baht/month/house under the law)

## 3.6 Prachantakham Sub-District Municipality

### 3.6.1 Technical System

#### 3.6.1.1 Discharge and Storage

Prachantakam Sub-district Municipality (PSM), upgraded from the sanitary district in 1999, is situated in Prachantakam Sub-district, Prachantakam District, Prachinburi Province. Total municipal area covers 4.68 square kilometers, with registered population and households of 5,105 and 1,782 (March 2003) respectively. Existing land use pattern in PSM contains the majority area of residential and commercial categories (60%), 30% area accounts for agricultural land, and the remaining proportion is for public uses. Major sources of municipal solid waste in PSM include households, merchandized stores and business establishments totaling about 300, 9 small factories, schools, and fresh market.

Presently, discharged waste from residential and merchandized stores origins are habitually contained in wrapped-plastic-bag before discharging to small collection bins or either put it directly to the bins. For large generation sources such as schools and fresh markets, a cluster of 200-liter drums is placed for waste collection. Additionally PSM also provides and places 70 plastic bins (120 liters) at various points of major roads for collection of discharged waste from the passers-by and road sweeping activity.

### **3.6.1.2 Collection and Transportation**

Waste collection and hauling service in the community is undertaken by two collection trucks consisting of 5-cubic-meter rear-end compactor and a small pick-up. Each vehicle is typically attended with 3 collection workers whose daily working hours are 8.30 A.M. – 4.30 P.M. with an average of 2-3 trips a day. The amount of waste collected is about 3 tons a day or estimated collection efficiency rate of 80% of total waste generated in the community. All collected waste is then hauled to the PSM-owned dumping site located 2 kilometers away from the municipal area. Current waste collection fee imposed on household at a minimum charge is 20 Baht/household/month.

Existing major problems of waste collection and transportation of PSM include insufficient budget allocation and appointed staff, as well as additional discharged waste carried in the municipal area by outlying communities resulting in added collection-disposal burden and unsightly littering.

### **3.6.1.3 Road Sweeping and Drain Cleansing**

The duty of keeping public cleanliness in major roads and urban municipal area is undertaken by 3 sweeping workers whose daily operating hours are 5-7 A.M. and 8.30 A.M. – 4.30 P.M.

At present, PSM has not set up a routine work plan for sewer cleansing on trunk roads but an on-call duty for emergency case such as area flooding or sewer clog problem due to unavailability of working staff.

### **3.6.1.4 Intermediate Treatment and Recycling**

According to the current waste management plan of PSM. It is found that there is no regular and continuous waste reduction campaign or recycling program to implement in the community. This may be due to the fact that the waste volume generated in the municipal area is so small to be worried about in term of management aspect. Nevertheless, some local residents voluntarily separate recyclables prior to discharging into collection bins. The main saleable recyclables include newspaper, plastic and glass bottles. There are about 10 tricycle waste buyers (Saleng) and only one recyclable buyer shop in the community.

Waste collection crew is another group involved in waste recycling of mixed waste from various generation sources so as to add their wages. Major saleable recyclables consist of papers, glass and plastic bottles. It is reported that each worker can earn 120 Baht a day from selling recyclables.

### **3.6.1.5 Final Disposal**

The disposal site owned by PSM (Picture 3-6) is located in Prachantakam Sub-district, Prachantakam District, covering a small area of 4 rais and is about 2 kilometers away from the municipal area. The site is previously an earth pit of about 3 meters in depth. The disposal operation starts with dumping waste on ground next to the pit; as the stockpile of waste is large enough in a few months, it would be pushed into the pit by a private operator service. Presently, the site has been used up about 60% of total area, and is expected to accept more waste in 5 years.

This disposal site also accepts other outside waste sources for disposal upon request particularly adjacent local governments namely Koh Loy TAO and Pho Ngam TAO. The disposal service is for a temporary period of only one year as well as for an adjacent local government office (Public Disaster Protection and Relief Center). Since there is no available disposal staff regularly stationed at the site, unauthorized dumping of unwelcome solid waste or industrial waste including infectious waste is occasionally seen at the site.

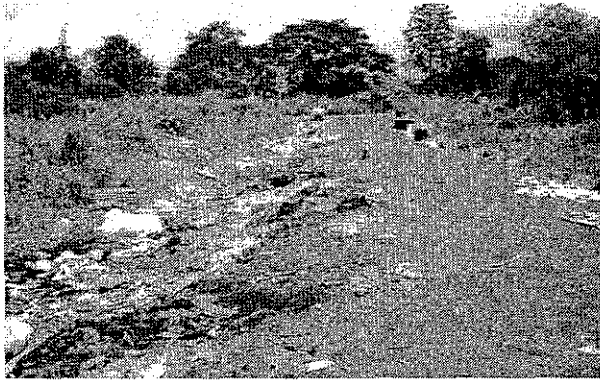
According to our survey, this dumping site has no fence, entrance gate, nor any security guard to prevent invasion. There were 4-5 scavengers and many strayed dogs in the site. Waste like syringes, piles of furniture woods seemed to be discarded by illegal individual waste producers. All wastes were dumped and burnt away here in disorderly and unhealthy manner.

### **3.6.1.6 Maintenance of Vehicles and Equipment**

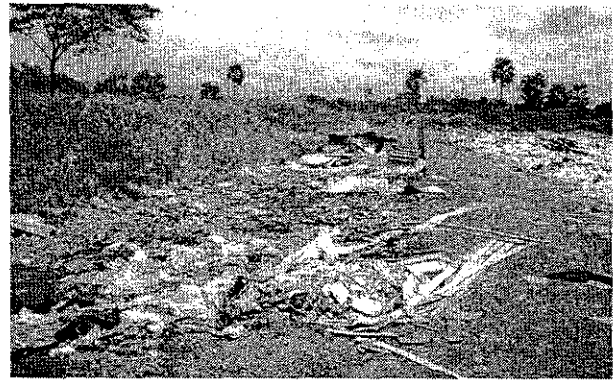
Maintenance and repair task of vehicles is presently arranged only for two available collection trucks since the disposal operation is operated by private operators. For any routine and simple maintenance job, the waste collection staff will be responsible; while complicated repair task will be serviced by skilled private operators. Regarding the annual allocated budget of maintenance and repair task, it is quite low and insufficient to manage at about 50,000 Baht while the actual expenditure is about 100,000 Baht

### **3.6.1.7 Medical Solid Waste Management**

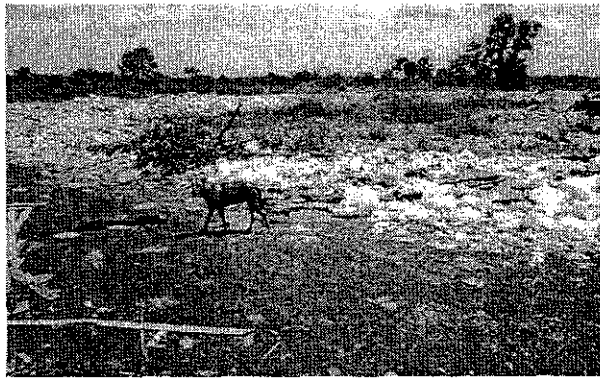
At present, there is no hospital or medical-care institution providing public health service in the municipal area except 3 private clinics. Fortunately, a government's Prachantakam Hospital located 2 kilometers away and outside the municipal area, generally provides public health service to the local population.



*Entrance is closed to road, without fence and gate*



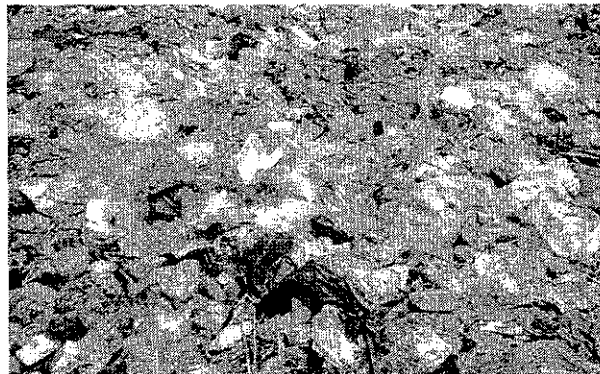
*illegal dumping at the landfill*



*Dog scavenger*



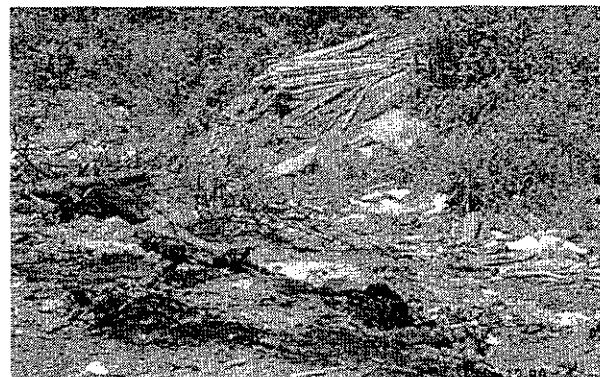
*Scavengers are working*



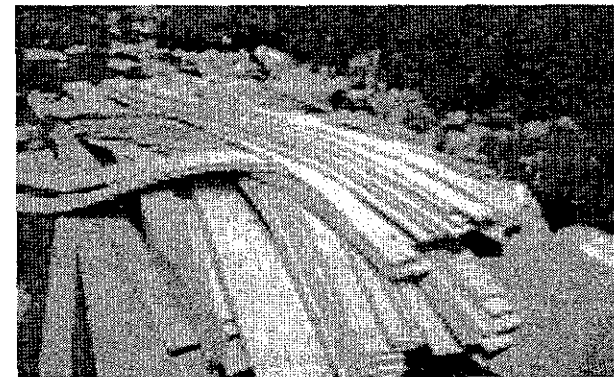
*Plastic waste is the main composition*



*No safety and sanitary manner*



*Wooden waste from furniture factory*



*It may be possibly recycled*

**Picture 3-6: Landfill of Prachantakham Sub-district Municipality**



The segregated general solid waste of the Prachantakam Hospital is routinely collected for disposal by PSM as well as that of private clinics. On the other hand, the infectious waste is disposed of by the hospital's incinerator. However, there is infectious waste is illegally dumped at the municipal landfill sometimes.

### 3.6.2 Institutional System

#### 3.6.2.1 Administration and Organization

Prachantakham Sub-district Municipality provided its structure and administration as follows:

- 1) Office of Under Secretary General;
- 2) Finance Division;
- 3) Engineering Division;
- 4) Public Health and Environment Division;
- 5) Education Division;
- 6) Internal Audit Unit.

Organization structure and administration of Prachantakham Sub-district Municipality is shown in Figure 3-7.

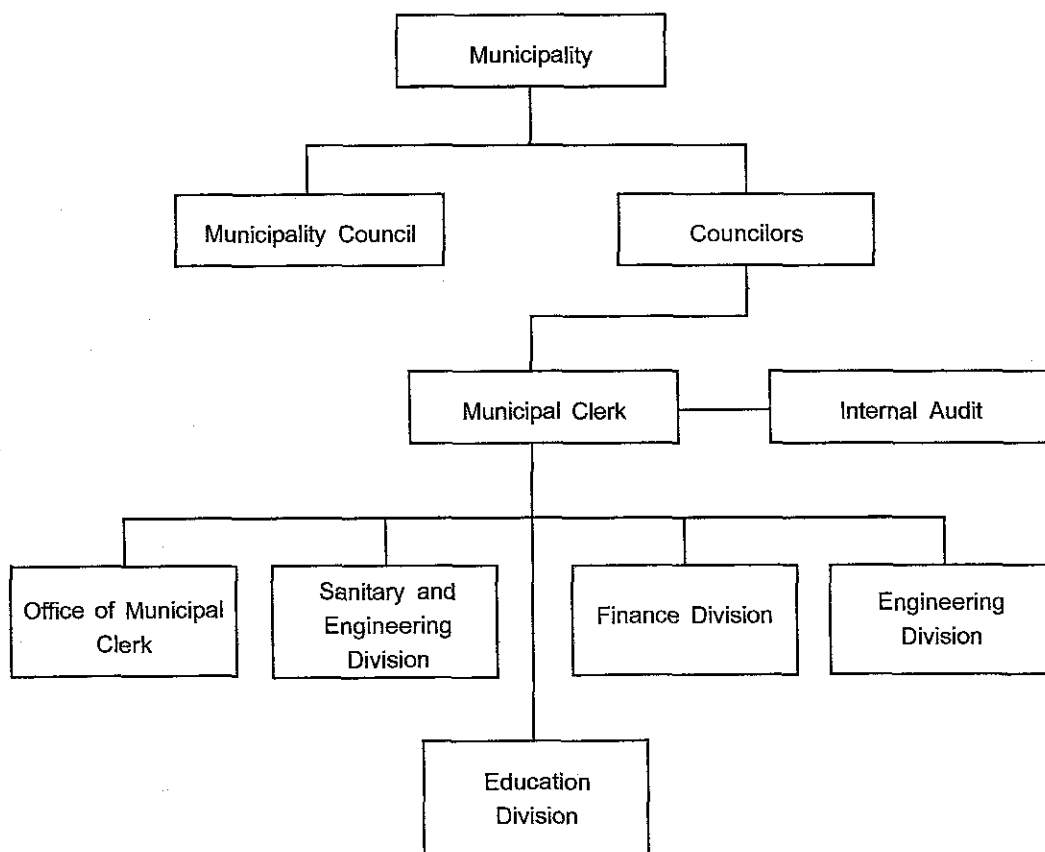


Figure 3-7: Organization Structure and Administration of Prachantakham Sub-district Municipality

### **3.6.2.2 Human Resources**

Prachantakham Sub-district Municipality has 36 officers and employees as follows:

- 1) Office of Under Secretary General 3 officers
- 2) Public Health and Environment Division 1 officer
- 3) Finance Division 1 officer
- 4) Engineering Division 1 officer
- 5) Education Division 1 officer
- 6) Internal Audit Unit 1 officer

### **3.6.2.3 Financial Status and Refuse Collection Charge**

In fiscal years 2001 and 2002 Prachantakham Sub-district Municipality has income totally Baht 16,522,296.69 and Baht 18,039,231.69 respectively, and has expenses totally Baht 13,302,765.78 and Baht 16,178,477.69 respectively.

Prachantakham Sub-district Municipality could collect the fees of waste collection and transportation around 70-80% of total waste (20 Baht/month/house) and no policy to increase the said fees because it is public service.

## **3.7 Ratchaburi Town Municipality**

### **3.7.1 Technical System**

#### **3.7.1.1 Discharge and Storage**

Ratchaburi Town Municipality (RTM) is a major urban community of Ratchaburi Province, covering a total area of 8.7 square kilometers, with registered population and households of 44,506 and 13,031 respectively (December 2002). Major waste sources in the municipal area comprise residences, merchandized stores and business establishments such as department stores, food shops, hotels, factories, etc, fresh markets, schools, medical-care institutions, and local government offices.

Waste discharge and collection practice in the community particularly at residential area and business establishments largely employs plastic-bag collection and discharge in waste bins in each premises. In some other densely populated areas like fresh markets, schools, hospitals, department stores, etc., large collection containers are provided at public places. The allocated large containers for waste collection consist of 50 200-liter steel drums, 700 200-liter plastic bins, and 75 units of 3.8 – cubic meter container for hoist truck. Moreover RTM currently initiates a campaign on free black plastic bag distributed to householders in an effort to seek cooperation in tackling the

problems of waste littering, inconvenient waste collection and foul order nuisance.

### **3.7.1.2 Collection and Transportation**

The task of keeping public places cleanliness in the municipal area is under the responsibility of the Public Cleansing Work which is subdivided into waste collection service and road sweeping service.

Presently, the waste collection service utilizes a fleet of 10 collection trucks consisting of 4 12-cubicyard side-loaders, 4 12-cubicyard rear-end compactors, and 2 hoist trucks, with average service lives of 5-7 years. Additional collection vehicles are also provided including 2 of 10-wheeled trucks, and 2 of 6-wheeled trucks. Normal collection hours usually start in the early morning at 4 A.M., and in the afternoon from 5 P.M. Total waste collected in the municipal area is about 60 tons a day which is equivalent to 90% of total households in the community; and is further hauled to temporarily stockpile at a reserved area in RTM's wastewater treatment ponds waiting for final disposal. For existing collection fee rate imposed on households, the minimum charge is 15 Baht/household/month which has been applied since 1989.

### **3.7.1.3 Road Sweeping and Drain Cleansing**

The task of road sweeping and maintaining cleanliness at public places in the municipal area is assigned to 64 sweeping workers. The municipal area is further divided into 3 responsible zones where each zone area will be maintained by a group of sweeping workers. Normal daily working hours in the morning are 4-8 A.M., and the afternoon shift is 2-6 P.M. For other responsible task like collection of tree branch and twig, cleansing work for road pavement or fresh market area, it is assigned to a speedy task group of 19 workers whose operation hours are 8 A.M. – 4.30 P.M.

### **3.7.1.4 Intermediate Treatment and Recycling**

Waste recycling at sources and from mixed waste of collection crew during waste pick-up is a common practice in the municipal area since a number of Saleng is easily seen as well as about 5-6 large recyclable buyer shops are active in the market. At present, RTM has realized the benefits of waste minimization in the community. Therefore several solid waste management work plans are being prepared for implementation such as public education and waste recycling at sources campaign; recyclable buying program; recyclable sorting from mixed waste project prior to disposal by open bidding for private operators.

### **3.7.1.5 Final Disposal**

The collected municipal waste of 60 tons per day is presently transferred to a 1 rai stockpile area reserved within the RTM's wastewater treatment plant. The construction by PWD of three treatment ponds are already finished, but not yet handed over to the RTM as the wastewater interceptor system is not yet finished. The temporary dump corner is next to a paddy field. Hence, the RTM makes a temporary earth beam to prevent leaching and also a leachate holding compartment and pumps it to the waste water treatment plant from time to time. (Picture 3-7)

As the collected waste from the municipal area at 60 tons per day is transferred to stockpile at a reserved area at the RTM's wastewater treatment plant, the accumulated waste will be mechanically packed to facilitate loading on 10-wheeled truck. The loaded trucks will haul the waste to a private dumping site for a disposal service contract at a charge rate of 1,700 Baht per trip. Available operating heavy equipment for waste disposal of RTM includes backhoe, bulldozer, wheel loader, 10-wheeled and 6-wheeled trucks, water tanker, etc.

In the meantime, RTM is in the process of land purchase bidding for constructing a waste disposal facility. The major criteria of land procurement are the site location must be within 30-kilometer road distance from the municipal area; a stretch of land area not less than 150 rai; the site must be natural, undisturbed or unexcavated to use the site from the local authority where the site is located, etc.

### **3.7.1.6 Maintenance of Vehicles and Equipment**

For maintenance and repair work of waste collection and disposal service, any routine and simple maintenance job is usually undertaken by the operating staff while complicated repair task will be serviced by private skilled operators. It is found from the survey that the actual maintenance and repair expense of vehicles and equipment for each year is considerably high, and the annual allocated budget is mostly inadequate. In 2001, the actual maintenance and repair expense was about 2 million Baht.

### **3.7.1.7 Medical Solid Waste Management**

Medical-care and treatment institutions available in the municipal area comprise 9 hospitals of which 2 hospitals are government-own and the remaining are private hospitals, and about 30 private clinics. In general, RTM provides collection and disposal service for the segregated general solid waste from the hospitals by providing large containers for waste collection. On the other hand, infectious waste of the hospital is incinerated by small incinerator while some private clinics also use the hospital's disposal service for infectious waste.



Waste water treatment plant



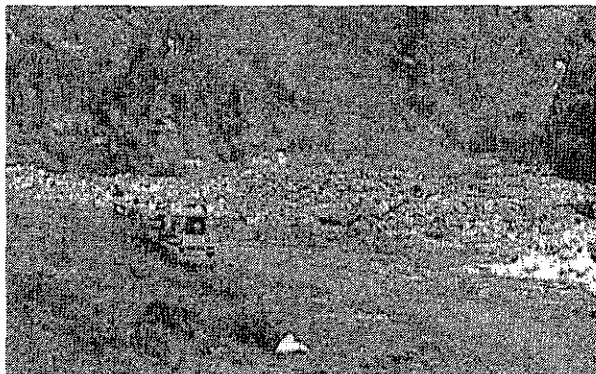
Ratchaburi municipality uses as transfer station



Loading waste before going to private disposal site



Channel to collect leachate to waste water pond



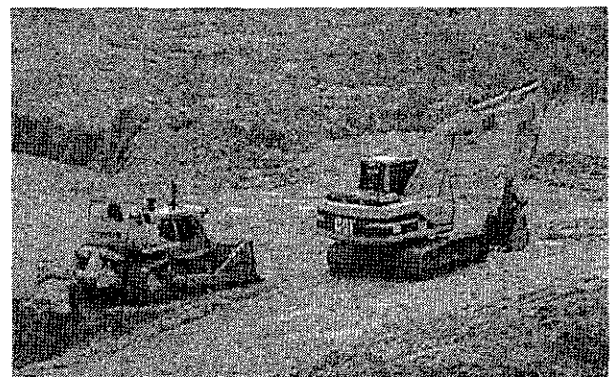
Private excavated land receiving municipal waste



Smoke from burning activity



Scavenger is going to sell his recyclable materials.



Private's heavy maching is excavating soil for sell.

Picture 3-7: Waste Disposal Management of Ratchaburi Town Municipality

### 3.7.2 Institutional System

#### 3.7.2.1 Administration and Organization

Ratchaburi Town Municipality provided its structure and administration as same as Sriracha Town Municipality. But owing that Water Works Division did not transfer to the Provincial Water Works, Ratchaburi Town Municipality then still existed the said Division as one its part.

Organization structure and Administration of Ratchaburi Town Municipality is shown in Figure 3-8.

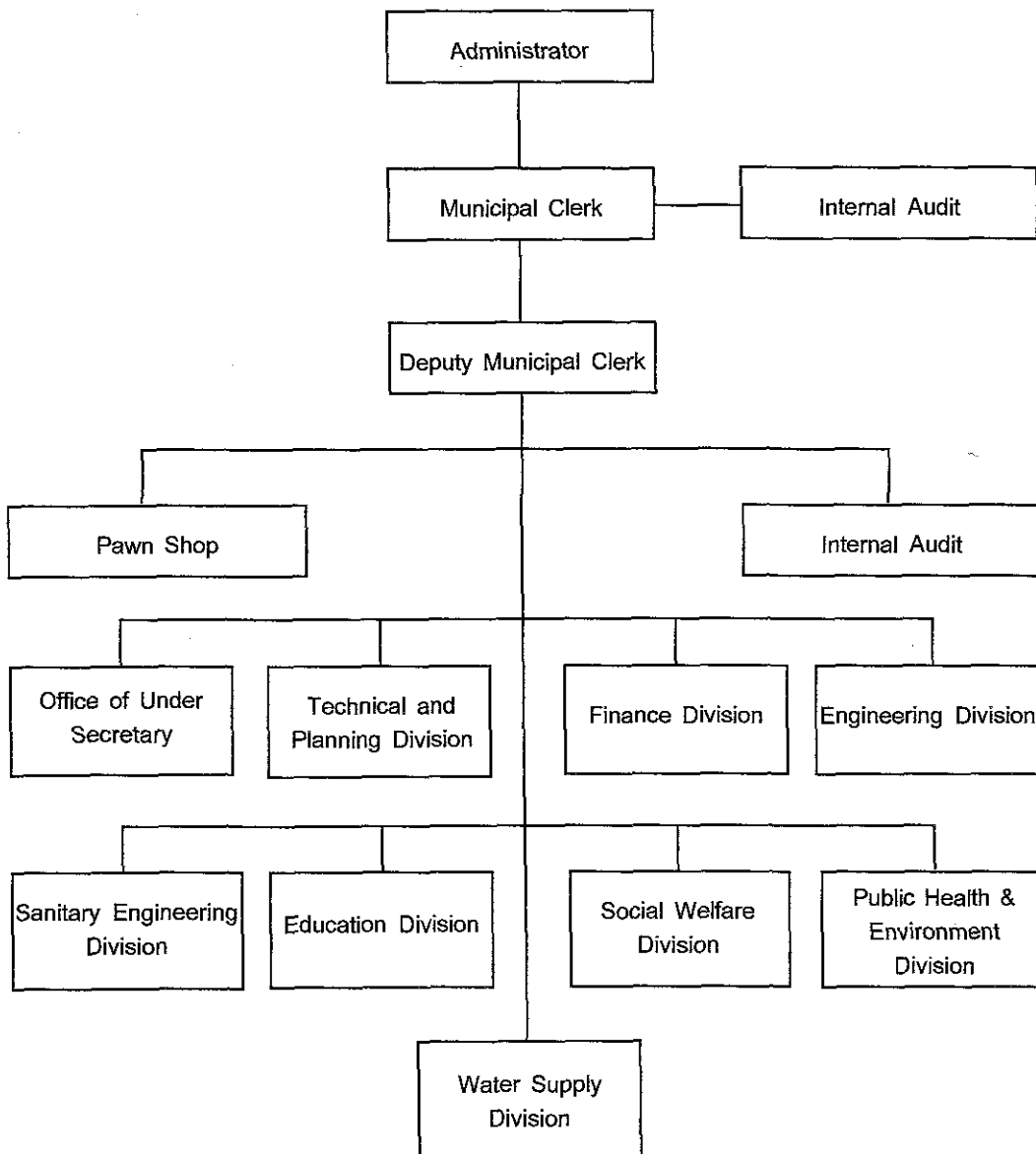


Figure 3-8: Organization Structure and Administration of Ratchaburi Town Municipality

### **3.7.2.2 Human Resources**

Ratchaburi Town Municipality has 125 positions (69 vacant), 1 extra-ordinary officer, 59 permanent employees and 348 temporary employees.

### **3.7.2.3 Legislation and Enforcement**

There are the same municipal regulations as Sriracha Town Municipality.

### **3.7.2.4 Financial Status and Refuse Collection Charge**

In fiscal year 2002 Ratchaburi Town Municipality had income totally Baht 206,204,730.78 and had expenses totally Baht 197,730,459.14.

In fiscal year 2001 Ratchaburi Town Municipality had expenses in waste collection and disposal totally Baht 15,204,633/year. The expenses of waste collection (street sweeping) were Baht 5,020,826/year and of waste disposal were Baht 10,183,807/year.

Ratchaburi Town Municipality had income from collection the fees for waste collection and transportation amounting Baht 2,460,415 for fiscal year 2001, and amounting Baht 2,477,205 for fiscal year 2002. The fees for waste collection have been Baht 15/month/house since 1989.

### **3.7.2.5 Privatization and Contracting System**

Owing that Ratchaburi Town Municipality had not have the official waste transfer station, therefore the municipality is using the area of wastewater treatment plant as transfer station. The daily collected waste is dumped to the vacant area of waste water treatment plant and then it will be reloading to a bigger truck in order to transport to private landfill located in Huay-yang-tone Sub-district, Paktho District, Ratchaburi Province. The private landfill charged for disposal fee at Baht 1,7000/truck.

The municipality is still trying to solve this problem by open bidding for purchasing the land for waste disposal several times. But it has not success yet. This may due to a condition set in the municipality's bidding that the land owner must get approval from local administrations that the land located to use as disposal site which the private land owner facing difficulties to do that. In order to solve this problem, the municipality should coordinate with local administration that the land located to get approval. This may include allowing the local administration for using landfill together without any charge.

### **3.7.2.6 Community Groups in Solid Waste Management Activities**

Ratchaburi Town Municipality established 21 community groups and the chairman of each group was elected by its people such as Santi community group, Prôm Pattana community group, Donkratai community group, etc. in order to strengthen its community and cause the people participation in management and solution of waste problems.

## **3.8 Evaluation of Present Municipal Solid Waste Management**

### **3.8.1 Technical System**

Based on the study survey and data collection at the target local governments, the technical aspect evaluation is made on the existing solid waste management particularly on 4 significant topics of waste collection and transportation, waste recycling, final disposal, and medical solid waste management. For the 6 target local governments, Cholburi PAO is excluded in the technical evaluation since Cholburi PAO is the key implementing agency in establishing the first central waste disposal facility which is now in the construction stage.

In waste collection and transportation aspect, the overall collection efficiencies of the 5 target municipalities are quite high in the range of 80-100% of total waste generated in the communities. It is found that Koh Wai Sub-district Municipality shows the highest collection efficiency of 100%, and added collection service for adjacent local governments. Collection efficiencies of 80-90% are accomplished by the 4 target municipalities.

For waste separation and recycling aspect, this is one of the vital waste reduction steps in the solid waste management in the community. It is a common practice and easily seen throughout the country (as well as the 5 target municipalities) for waste separation and recycling activity particularly from waste collection crew during waste pickup interval or from scavengers at dumping sites. However the most important and efficient waste recycling activity should be implemented at generation sources prior to discharging. It is found from the survey that voluntary waste recycling at source is a common practice particularly for householders. Nevertheless the number of participants in source recycling activity was still small and scattered as there is no incentive and real support from the local authority. In the past, all the target municipalities administrators still lack keen perception and always pay less attention on waste reduction and recycling program in the communities resulting in low recycling rates and inefficient waste reduction scheme.

In the aspect of final disposal, among the 5 target municipalities, only Sriracha Town Municipality currently employs a sanitary landfill method for disposal of all collected waste in the community. Other target municipalities still use improper and unsanitary disposal means by dumping on ground or in pit where the area is not well prepared and



managed with adequate environmental protection and mitigation measures. Consequently, anticipated adverse impacts can be expected and accumulated on groundwater and surface water sources, soil, adjacent communities and surrounding environment in the vicinity of the dumping site.

For the medical solid management aspect, it is found that segregated infectious waste from the hospitals in the target municipalities is in place. The municipality provides collection and disposal service for only general solid waste. Nevertheless non-segregated waste from private clinics receiving collection and disposal service from the municipalities is a growing concerned problem since infectious waste will eventually be spread and contaminate at the disposal site.

Furthermore the team found that “coordination” among public health service and hospital in the same district is in unsatisfactorily level. The public health service has never requested the hospital nearby that have incinerator for infectious waste to manage its infectious waste. The public health service is only used a simple fabricated stove to incinerate its infectious waste for about 10 years ago.

### **3.8.2 Institutional System**

*In overall the said organizations as mentioned above are summarized as follows:*

- The local administration, either in form of municipality or PAO, has duties and responsibilities in the waste disposal management under the laws.
- The local administration has the same or similar internal body in charge with duty of waste collection and transportation such as Public Health and Environment Division in Municipality (or Sanitary Engineering Division) or Engineering Division in PAO.
- Every local administration has local regulation for waste management but its regulation does not update and not increase the fee rate of collection and transportation, and no provisions of fees for waste disposal and no law enforcement.
- The Financial status of local administration is not good. Specially expenses of waste collection and disposal does not balance with the income from collection of fees for collection and transportation. Then it causes big financial problem to almost of the local administrations,
- The private involvement in some local administrations may have good results such as reduce state burdens, more efficiency by private operation, etc. but may have bad results as well such as high cost and expense, corruption problem, etc.
- Some staff positions of local administration are vacant especially municipal/PAO officers. In practical it employs the temporary or permanent employees to do the works. Besides, the knowledge and

ability of its staff in waste disposal is just a few owing that no incentive for good persons to join the works in local administration.

- Public cooperation in waste management in local administration is in good position.
- Community groups in local administration participate in related projects on natural resources and environment especially selection of waste, maintenance of cleanliness and public order;
- The local administration has not medical waste management system but it still collect only the general waste from the hospitals. The management of medical waste will be responsibility of the state hospitals which have incinerator for medical waste.

### **3.9 Financial System**

#### **3.9.1 Money Stream from the Central Government to Local Governments (Intergovernmental Transfer)**

Intergovernmental Transfer means the transfer of income form government's earnings to the local administration (LA). The processes are in the following ways: -

- 1) Revenue – sharing transfer means share of the government income which is distributed to the local administration according to the 'Share Taxation' law which is a share source of income between the central government and LA. The proportion of which is specified by law.
- 2) Budgetary Transfer is the proportion of government budget which is allocated to LA through the government budgetary expenditure system or as generally called "Grant". There could be the several ways, such as conditional and unconditional ways in receiving and/or spending the money. The said conditions can be closed as well as open.

Table 3-2: Intergovernmental Transfer of Year 2000-2001

(Unit: million Baht)

Grant's Category	2000	2001		Gain/loss in 2000
	Amount	Amount	%	Amount
Tax which the government collected, and or allocated to LA	50,638	59,054	59.0	8,416
Local grant allocated through the DLA	34,800	40,954	41.0	6,154
Total	85,438	100,008	100.0	14,570
Allocated budget by the center with LA's share in budgetary administration	3,833	32,332	-	28,499

Source: Budget Bureau, Budget in the Fiscal Year of B.E. 2544 (Year 2001)

According to the "Decentralization to Local Administration Act B.E.2542" The government has specified the plan in distribution of the power by transferring the tasks and monetary resources to Las in amount of three times higher than the former within the next 6 years (so that the proportion of Las' income should be no less than 20% of government income within the year 2001 and 2006 respectively). The effect of which is a prompt and drastic change in the fiscal balance status between the central government and local administrations. That is the government will have the reduced expenditures as a result of the transfer of public services work to local administrations. At the sometime, the government also has a reduced income from allocating increased budget to local authorities. For local administrations, they will receive higher income as a result of the increased local income-allocating plan from the government. At the same time, local administrations will also incur higher expenditures in services provisions because they have to take on the tasks of providing services from the government

In addition, it is for the government to allocate the Annual Expenditure Budget for public services within LAs' responsibility to the need of LA.

Table 3-3: Estimate Total Grants in Year 2001-2006

(Unit: Million Baht)

Grant	2544	2545	2545	2547	2548	2549
The grant for previous year	40,954	40,954	52,675	74,780	106,846	172,806
The increase or decreasing grant which protect the vertical fiscal balance	0	11,721	22,105	32,066	65,960	100,103
Total grants	40,954	52,675	74,780	106,846	172,806	272,910

Source: Budget Bureau, Budget in the Fiscal Year of B.E. 2544 (Year 2001)

The budgetary managements of services to the service allocate unit and service provider unit are to be run in 3 local grant systems: (1) General grant or general block grant; (2) Sectoral block grant; and (3) Project grants.

Each particular grant has its objective for LA to manage each public service differently.

### 3.9.2 Budget of Five Model Municipalities

This part presents only revenues and expenditures of 5 model municipalities in the study area while Cholburi PAO is not mentioned due to the central waste disposal facility is under construction.

Table 3-4 and Table 3-5 show revenues and expenditures of 5 model municipalities.

Table 3-4: Revenue in 2002

(Unit: '000 Baht)

Item	Description	Sriracha Town	Chachoengsao Town	Koh Wai	Prachan -takham	Ratchaburi Town
1	Tax	16,320	85,671	7,866	734	81,198
2	Not Tax Revenue					
	- Charges of Services	2,226	3,484	434	293	5,396
	- Asset Revenue	3,663	821	40	-	3,263
	- Public Utilities	514	5,003	-	-	906
	- Miscellaneous	2,458	2,399	159	238	1,640
	- Capital Revenue	-	-	-	479	-
3	Revenue Sharing Transfer	41,372	-	-	8,540	-
4	Subsidy from Gov. (B)	36,940	39,566	7,769	10,406	20,050
	Total (A)	103,493	136,944	16,268	20,690	112,453
	(B/A) %	35.7%	28.9%	47.8%	50.3%	17.8%

Source: Budgetary Legislation of Target Municipalities in the Study Area and Interview by JICA Study Team

Table 3-5: Expenditure in 2002

(Unit: '000 Baht)

Item	Description	Sriracha Town	Chachoengsao Town	Koh Wai	Prachan -takham	Ratchaburi Town
1	General Admin.					
	- General Admin.	23,830	29,237	1,823	2,829	16,058
	- Security	3,357	5,701	334	730	5,571
2	Social Services					
	- Education	9,890	7,933	20	474	9,595
	- Public Health (D)	2,384	2,428	747	247	18,942
	- Social Welfare	805	-	-	50	860
	- Housing and Community	19,406	67,551	11	13,643	43,230
	- Strengthening Community	-	964	-	16	1,164
	- Religion and Culture	8,904	4,812	81	544	2,234
3	Economic					
	- Industry and Civil	93	-	-	-	-
	- Commerce	892	526	2	69	556
4	Others	4,130	9,694	383	460	6,007
	Total (A)	73,691	119,146	3,401	19,602	104,217
	(D/A) %	3.2%	2.0%	22.0%	12.6%	18.2%

Source: Budgetary Legislation of Target Municipalities in the Study Area and Interview by JICA Study Team

The dependence rate of model municipalities on the subsidy ranges from 17.8% to 50.3% of local administration's budgets.

As for the expenditure in accordance with work plan, sanitary work plan with closely related to public health and public cleansing activities including waste management ranges from 2% to 22% of the total expenditure.

### 3.9.3 Solid Waste Management Budget

The SWM budgets are generally not separately controlled under the present accounting system. Therefore, it seems to be difficult for municipal executives to get enough data for cost analysis in order to evaluate collection and disposal efficiency of their municipal staff. However, all 5 model municipalities try their best for supplying information response to JICA Study Team requested. The data and its analysis is shown as below;

Table 3-6: SWM Expenditure in 2002

(Unit: Baht/Year)

Municipality	Popula- tion	Waste Management Expenditure			Cost/person/year		Collected Waste Amount (ton/year)	Cost per Ton (Baht)
		Collection	Disposal	Total	SWM Cost	Collectio n Cost		
Sriracha	26,299	5,874,351	1,525,804	7,400,155	281	223	16,060	461
Chachoengsao	42,872	3,657,504	3,240,000	6,897,504	161	85	21,900	315
Koh Wai	2,167	455,200	168,000	623,200	288	210	1,278	488
Prachantakham	5,105	793,387	33,800	827,187	162	155	1,460	567
Ratchaburi	44,404	7,913,394	2,158,478	10,071,872	227	178	21,900	460

It can be noticed that SWM expenditure that 5 model municipalities spent per head is not big difference. However, from this basic information we can further observe that the collection efficiency of Chachoengsao Town Municipality might be better than Ratchaburi Town Municipality. Because both municipalities collect annual waste at the same amount but Chachoengsao Town Municipality spends less than 50% that Ratchaburi Town Municipality pays. Furthermore, after taking area of both municipalities into consideration, the Chachoengsao Town municipality occupies bigger municipal area (12.76 sq.km.) comparing to Ratchaburi town municipal area (8.7 sq.km.). Therefore, Ratchaburi Town Municipality should take this observe for further consideration. However, several factors have to be considered for collection cost effects such as population density, area condition, collection truck condition, collection method, etc.

### 3.9.4 Budget of TAOs

In the Annex 2 Budgetary Data of TAOs in the Study Area, the JICA study team has collected data regarding budget of 127 TAOs from 5 provinces in the study area. Summary of the TAOs budget and SWM expenditure are tabulated in Table 3-7.

Table 3-7: Summary of TAOs Budget Year 2001

Item	TAO in	Number of TAO	Total Expenditure Average to		Total Cleansing Expenditure Aver. to	
			TAO	Population	Population	Total Expen.
			(บาท/แห่ง/ปี)	(บาท/คน/ปี)	(บาท/คน/ปี)	(%)
1	Cholburi Province	75	6,038,476	777	20.72	2.67
2	Muang Chachoengsao District	18	3,565,384	694	0.00	0.00
3	Pak Phli District	7	2,383,524	714	11.70	1.64
4	Prachantakham District	9	2,760,604	528	0.00	0.00
5	Muang Ratchaburi District	18	3,639,360	610	6.76	1.11
	Total	127				

From the Table 3-7, it reflects the whole picture of TAO's budget in each area that are not big differ. The average budget per population ranges about 528-777 Baht/person/year.

It also should be noted that almost of TAOs in the study area do not put high priority to SWM. The answer to this question from many TAOs is quite simple because their areas do not have waste problem due to less population density and rural conditions. Therefore, TAOs spend quite less amount of budget for SWM. The average maximum SWM expenditure to number of population that TAO pay is only 20 Baht/persons/year while many TAOs have not spent at all.

## **4 Coordination in Waste Management**

### **4.1 Relationship among Local Administrations and Ministries Concerned**

#### **4.1.1 Relationship in Activity Management Aspects**

It is divided into 3 categories as follows:

##### **1) Central Government's Activities**

The central government's activities are further divided into 3 fields as follows;

###### **a. Administrative Activity**

It is administrative public services, such as, internal public order maintenance, national defense, justice facilitation, etc. They are activities as owned and provided by the central government.

###### **b. Economic Activity**

It is commercial and industrial public services, such as, transportation, railway, telegraph and post, electricity, waterworks, etc. They are activities as owned and provided by the central government through the government agency or state enterprise or private sector as assigned and supervised by the central government.

###### **c. Social Activity**

It is social public services, such as, education, public health, sport, culture, etc. They are activities as owned and provided by the central government through the government agency or state enterprise or private sector as assigned and supervised by the central government.

##### **2) Local Government's Activities**

Local administration's activities are incurred themselves from the features of community condition owing that the central government could not provide the said activities efficiently throughout the country and the features of the said activities are demanded by each community.

#### **4.1.2 Relationship in Supervisory Aspects**

Decentralization is one of important administrations. Decentralization without supervision may not maintain the nation. Supervision will be divided into 2 categories namely; direct and indirect supervisions.

##### **1) Direct Supervision**

The direct supervision is divided into 2 types as follows;

a. Person and Organization Supervision

Person and organization supervision is supervision to legal status of group of people or individual in form of group of people (such as municipal council, municipal executives or mayor). For instance, the provincial governor opines that the local administration does many illegal act or has bad behavior to cause damage to his position, the provincial governor has power to suggest the Interior Minister to instruct the local administrator remove out of his position.

b. Activity Supervision

Important doing of local administration is subject to the supervision of central government, viz, give opinion to local administration budget, order to revoke or suspend any act, etc.

2) Indirect Supervision

The indirect supervision is also divided into 2 categories as follows;

- Grant Transfer

Grant transfer is one of indirect measures. The central government will allocate grant transfer to the local administration every year.

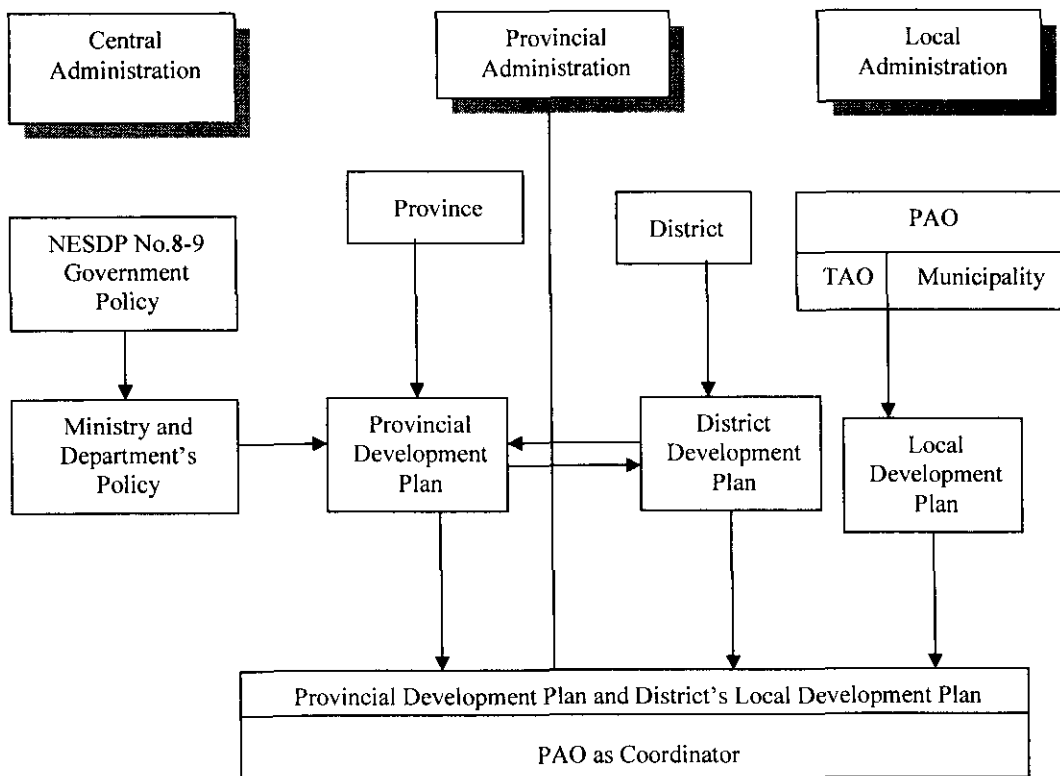


Figure 4-1: Coordination Structure of Provincial Development Plan



- Standard Form of Contract

To execute the contracts of local administration, the Interior Ministerial Regulation on Procurement of Local Administration provides that it must be complied with the standard form of contract as attached hereto. Any amendment to the contract will be done upon obtaining the approval of the Provincial Public Prosecutor.

## **4.2 Relationship Among Local Administrations**

### **4.2.1 PAO and Municipalities, TAO**

Co-ordination of doing the provincial development plan is its important works under its power and duties. Especially, it is required by the law to have power and duties to co-ordinate the issuance of the provincial development plan. Besides, joint support and co-operation among another local administration within the province (municipalities and TAOs) is one of PAO activities nowadays. As apart from having the same powers and duties as the municipality and TAO, PAO still has powers and duties like the central government (in the name of central administrations and regional administrations). Co-ordination of doing the provincial development plan is one of procedure to divide the activities among them.

The Decentralization to Local Administration Committee has provided the action plan for determining procedure of decentralization to local administrations and determining scope of responsibility for public services among local administrations. The Sub-committee as appointed by the said Committee has provided the plan with condition frame for doing the action plan in order to transfer the powers to the local administration as follows:

- Transfer as appropriate to local potential by dividing liability
- The people will receive quality services not less than former.
- Transfer must be covered with investment and resources.

After transfer of power to local administrations, it will comprise of 3 types as follows:

- 1) Local administrations operate the activities by themselves:
  - Each local administration operates by itself;
  - Joint co-operation among local administrations;
  - If the local administration does not operate, it may purchase service from the outsider or assign the private sector to operate.
- 2) Local administration and central government via central administrations or regional administrations have joint responsibility and operation.

- 3) It is the same activity as the central government operates except the local administration has ability to do it.

If PAO wants to do its duties to comply with the target, it is necessary for PAO to have paradigm shift as follows:

- Strengthen its capacity to co-ordinate in doing the provincial development plan.
- Strengthen the potential and capacity level of PAO, its administrators and council to be consistent with the decentralized activities to the local administration.

#### **4.2.2 Municipalities and TAO**

In principle, the municipality and TAO are separated legal juristic persons and local administrations. Each municipality or TAO has powers and duties to provide public services within its own boundary.

However, the Municipality Act B.E.2496 (1953) empowers the municipality to do activity outside its own boundary or may do activity jointly with other person by establishment of the limited company or holding shares in the limited company under the rule and condition as specified by the said law. The Tambol Council and Tambol Administrative Organization B.E.2537 (1994) also empowers TAO to do activity outside its own boundary or do activity jointly with the Tambol Council, TAO, PAO or another local administrations under the rule and condition as specified by the said Act.

Presently, there have no municipality or TAO doing activity outside its own boundary, or doing activity jointly with another people officially under the said laws. On the other hand, municipality and TAO unofficially help and co-operate each other for public services because of personal relationship of local administrators, such as, Koh Wai Sub-district Municipality assisted in the solid waste collection to TAO as located adjacent to its boundary, Prachantakham Sub-district Municipality allowed TAO around its boundary to drop solid waste in the disposal site without charge, or Nakhonnayok Town Municipality assist Koh Wai Sub-district Municipality to dispose its solid waste, etc.

### **4.3 Coordination in Waste Management Among Local Authorities**

Because of the problems with providing land for waste management, public complaints, unsanitary waste management, high investment and technology in the construction of waste disposal plants, budget and staff, income from waste management not being in balance with expenses, etc., the local administrations do not have the integrated capacity to systematically manage waste by themselves within their own boundaries. As a result, the government has a policy and plan to establish a central waste disposal center in each province and the local administrations within each province must coordinate efforts and cooperate with each other in using the said center.

Presently, the said center has been established in many provinces, and all provinces are expected to have a center by 1996.

However, many local administrations with abilities in waste management have tried to cooperate and coordinate with other nearby local administrations such as assist in collecting and /or disposing of waste, etc.

#### **4.3.1 Cholburi Provincial Administration Organization**

As Cholburi PAO does not have its own administrative boundary, it does activities that other local administrations cannot do or can do but have many obstacles and problems.

Under the state policy and plan, the government will assign each Provincial Administration Organization to be responsible for the central waste disposal center in each province because the municipality or TAO has many tasks to do and has to request other local administrations to cooperate in doing activities outside its own boundary. Therefore, PAO which has a few tasks in actuality should be suitable to handle the said center in its own province.

Cholburi PAO must coordinate efforts with the Cholburi Provincial Industrial Office, Industrial Estate Offices in Cholburi Province, the Tourism Authority of Thailand, non-government organizations, private organizations and any other relevant body to dispose of waste at the said center. This includes working together to raise public awareness and knowledge concerning waste reduction and correct waste management.

#### **4.3.2 Sriracha Town Municipality**

Sriracha Town Municipality has its own sanitary landfill for waste management located in Nongkham Sub-district, Sriracha District, Cholburi Province, about 15 km outside its boundary. It has an area of 116 rais. The Municipality has used the landfill since B.E.2537 and disposes of only the waste from within its boundary. So far it has used around 80 rais. No assistance or support has been given to other local administrations in waste management, but it is now considering allowing Chaopraya Surasakmontri Sub-district Municipality to use the said plant until the central waste disposal center can be operated. Sriracha Town Municipality also needs to use the said center because expenses for waste management are cheaper than management by itself (100 Baht/ton: 300 Baht/ton).

Sriracha Town Municipality has hardly any coordination with other local administrations and relevant bodies in waste management because there is no problem in waste management within its own boundary. However, it has projects and measures to reduce waste at the sources by coordinating with schools, hospitals and community groups within its boundary and other relevant bodies to create understanding in maintaining cleanliness.

### **4.3.3 Chachoengsao Town Municipality**

Chacheongsao Town Municipality completed the construction of a sanitary landfill waste disposal plant with budget support from the Ministry of Natural Resources and Environment in 2000 (B.E.2543). Presently, the said plant is located in TAO Koh Kanun but cannot be used to dispose of waste because there are problems with the entrance to the plant and with the protest of people in TAO Koh Kanun. Therefore, Chacheongsao Town Municipality will negotiate with TAO Koh Kanun to obtain permission to dispose of waste in the said plant by allowing the said TAO to use the said plant without charge because the same TAO currently burns and dumps waste into the canal. The Municipality should negotiate with the land owner at the entrance to the plant to allow the said land to be used as the entrance to the plant, as the state invested about Baht130 million for the said plant. The Municipality will also coordinate with people to deal with the negative impact of the waste imposed on them.

In the event that Chacheongsao Town Municipality is not able to enter into the said plant even after every effort is made to negotiate with them, the Municipality should change the said plant into the central waste disposal plant in Chacheongsao Province and assign PAO Chacheongsao to handle it. The Municipality can use the transfer sub-station to get the waste from Muang District, Banpho District, Bangpakong District and transport it to the said plant for disposal. The Municipality must coordinate with those concerned to negotiate on and discuss the expenses of waste transportation and disposal.

Furthermore, the Municipality still has projects and measures to reduce waste at the sources by coordinating with schools and community groups within its boundary, including coordinating with others to create understanding in maintaining cleanliness and separating waste.

### **4.3.4 Koh Wai Sub-District Municipality**

Because Koh Wai Sub-district Municipality does not have its own waste disposal plant, it will coordinate with other local administrations to bring the collected waste to the disposal plant of other local administrations such as Nakhonnayok Town Municipality (formerly) and Prachinburi Town Municipality (presently). The Municipality coordinates with other adjacent local administrations such as TAO Pak Phli, TAO Koh Poh, TAO Koh Wai, TAO Tharua, TAO Nongsang (TAO Kokmailai is under consideration) to assist them in collecting the waste because in Pakplee District only the Municipality has a truck to collect the waste. However, the Municipality does not have any projects or plans to cooperate with other local administrations in waste disposal.

Presently, the Municipality plans to have private land for waste disposal as detailed in the Municipality Development Plan 2004 (B.E.2547).

The Municipality still has projects and/or measures to reduce waste and a campaign to create public understanding of maintaining cleanliness and

separating waste by coordinating with schools, community groups and business operators within its boundary.

#### **4.3.5 Prachantakham Sub-district Municipality**

Prachantakham Sub-district Municipality has its own waste disposal plant with an area of 4 rais in Ban Thapho, about 2 km outside its boundary. The disposal system is not sanitary because it leaves the waste in the field and burns it. The Municipality temporarily permitted TAO Koh Loy and TAO Pho Ngam located nearby to use the said plant without charge for one month in a transitional period to solve their own problems. The temples outside the boundary also requested to use the waste collection service of the Municipality from time to time and the District hospitals outside the boundary requested the Municipality to collect their general waste.

However, the Municipality has good coordination and cooperation with local people and the people cooperate in discharging their waste at the time fixed by the Municipality. There are projects and measures to reduce waste and create understanding in maintaining cleanliness and separating waste among people, community groups, schools, and business operators within its boundary. Local people participate in almost all projects at the first stage.

#### **4.3.6 Ratchaburi Town Municipality**

As Ratchaburi Town Municipality does not have a waste disposal plant, it stores the waste collected at a transfer area in the wastewater treatment plant of the Municipality, and employs a private company to dispose of it at a temporary private disposal plant at Baht 1,700/truck.

In the procurement of land outside its boundary to be used for the waste disposal plant, the Municipality will negotiate with the local administration in charge of the land in order to get permission for the establishment of the disposal plant. (The bidding document specifies that getting permission from the said local administration is the burden of bidder; however, that should not be the burden of the bidder because the bidder does not have state power.) The Municipality may agree to pay compensation to the said local administration for waste disposal in its boundary or allow it to use the said plant without charge in order to obtain permission from it.

Presently, the Municipality should coordinate with other local administrations to dispose of its waste in order to reduce the cost and expense of private employment.

However, the Municipality still has projects and measures to reduce waste and to create public understanding of maintaining cleanliness and public order, and environmental volunteers. The Municipality must coordinate with schools, communities, hospitals, business operators and relevant bodies for efficiency.

### **4.3.7 Evaluation of Coordination in Waste Management**

Overall, the coordination in waste management of local administrations is summarized as follows:

- The local administrations have coordination in waste management with the central administration such as the Ministry of Interior, the Ministry of Natural Resources and Environment, the Ministry of Industry, the Ministry of Public Health, etc; with the regional administrations such as the representatives of the central administrations related to waste management in each province; and among themselves.
- Coordination in waste management is important and unavoidable because it is now very hard for a local administration to have its own disposal plant within its boundary. Therefore, working in coordination to assist other local administrations in collecting or disposing of waste is vital and appropriate in the present situation.
- The state policy and plan to establish a central waste disposal center in each province will greatly reduce the burden and problems in waste management, as PAO will be in charge of operating the center in its own province in lieu of other local administrations.
- It is important for local administrations to coordinate efforts to solve problems in waste management as soon as possible; otherwise, other problems will come about especially problems incurred on the people in the said areas;
- The local administration should often implement projects and measures on waste reduction, such as projects to create public understanding in maintaining cleanliness and public order, projects to separate waste, projects of environmental volunteers, etc., in order to encourage schools, community groups, business operators and other relevant bodies to take an interest in the said matters and cooperate in the said projects.

## 5 Recommendations

### 1. Current Issues/Problems and Improvement Measures

This part is prepared focusing on mainly action to be taken by the central government, especially those on the institutional improvement, in order to solve common issues and problems of SWM in local administration in the country

Table 5-1: Current Issues/Problems of Institutional System on SWM and Improvement Measures

Current Issues/Problems	Proposed Improvement Measures
<p><b>1. General Administration</b></p> <ul style="list-style-type: none"> <li>• Insufficient decentralization and high dependence of Local authorities on the Central Government</li> <li>• Very weak financial basis of LAs</li> <li>• Extremely difficult to site urban sanitation facilities like landfills</li> </ul>	<p><b>1. General Administration</b></p> <ul style="list-style-type: none"> <li>• Execution of further decentralization program especially financial aspects</li> <li>• Enhancement of tax collection capability of local administrations</li> <li>• Establishment of a principle to dispose of municipal SW within the juridical area of each LA</li> <li>• Requirement that the location and plan of urban sanitation facilities be included in the urban development plan of each LA</li> </ul>
<p><b>2. SWM in General</b></p> <ul style="list-style-type: none"> <li>• Structural and institutional weakness of SWM system in LAs (lower states, etc.)</li> <li>• Lack of SWM planning</li> <li>• Lack of inter-sectoral, inter-institutional and inter-municipal coordination</li> <li>• Insufficient enforcement</li> <li>• Insufficient or improperly trained human resources in terms of technical and managerial aspects</li> <li>• Weak financial basis of responsible authorities, especially LAs.</li> <li>• Negligence or lack of cost management especially O&amp;M</li> </ul>	<p><b>2. SWM in General</b></p> <ul style="list-style-type: none"> <li>• Establishment of transparent and public involved policy making</li> <li>• Establishment of a responsible division on SWM in LAs having more than 40,000 people and a responsible section in LAs having more than 20,000</li> <li>• Establishment of a body in a PAO for supporting SWM in LAs</li> <li>• Establishment of a National Supporting Centre for the improvement of SWM</li> <li>• Establishment of a qualification system for SWM officers</li> <li>• Establishment of independent accounting code system for SWM works in LAs</li> <li>• Introduction of SWM fees, i.e. tipping fee for landfill and treatment plants, collection fee for large dischargers</li> </ul>

<p><b>3. Municipal SWM</b></p> <ul style="list-style-type: none"> <li>• Negligence and lack of awareness of people to MSW problems</li> <li>• Insufficient public education and limited public participation</li> </ul>	<p><b>3. Municipal SWM</b></p> <ul style="list-style-type: none"> <li>• Implementation of public education and campaign for proper MSWM</li> </ul>
<p><b>4. Infectious Waste Management</b></p> <ul style="list-style-type: none"> <li>• Lack of enforcement</li> <li>• Lack of coordination among medical institutions</li> </ul>	<p><b>4. Infectious Waste Management</b></p> <ul style="list-style-type: none"> <li>• Elimination of infectious waste at municipal solid waste landfills</li> <li>• Enforcement of the regulation</li> </ul>

## **2. Action to be taken by the Central Government for the Improvement of SWM in LAs**

The study found that most of the current problems are caused by institutional issues for which improvement requires strong leadership of the Central Government. The actions to be taken by the Central Government, PAOs and LAs are presented in the table below, focusing on the following 7 issues in order to improve the current SWM of LAs.

- 1) Strengthening of the administrative capability of LAs;
- 2) Strengthening of the organization responsible for MSWM;
- 3) Establishment of a principle to dispose of MSW within the juridical areas of LAs;
- 4) Promotion of cooperation among LAs;
- 5) Development of a proper technical system for MSWM;
- 6) Strengthening of the financial capability of LAs on MSWM;
- 7) Improvement of infectious waste management

Though it is not mentioned above, the first action to be taken by the Central Government is to recognize the current problems and make all stakeholders (the government, LAs (PAOs, municipalities, TAOs), related authorities, NGOs, general public, etc.) aware of the problems.



Table 5-2: Actions to be taken by the Central Government, PAOs and municipalities for the Improvement of SWM in LAs

Improvement Issues	Central Government	PAO	Municipality
<b>1. Strengthening of the administrative capability of LAs</b>	<ul style="list-style-type: none"> <li>• Execution of program for further decentralization especially financial aspects</li> <li>• Strengthening of cooperation among ministries concerned to enhance the administrative capability of LAs</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthening of tax collection capability</li> <li>• Support in the enhancement of the administrative capability of LAs</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthening of tax collection capability</li> <li>• Enhancement of administrative capability</li> </ul>
<b>2. Strengthening of the organization responsible for MSWM</b>	<ul style="list-style-type: none"> <li>• Establishment of a National Supporting Centre for the Improvement of SWM in LAs</li> <li>• Establishment of qualification system for SWM experts</li> <li>• Provision of seminars, training programs and education tools on MSWM</li> <li>• Promotion of accounting code for SWM works in LAs</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of a body for supporting SWM in municipality such as waste management coordinating committee in the province</li> <li>• Participation in seminars and training programs on MSWM</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of a division independently responsible for SWM in town municipality</li> <li>• Allocation of an appropriate number of officers responsible for SWM</li> <li>• Participation in seminars and training programs on MSWM</li> </ul>
<b>3. Establishment of a principle to dispose of MSW within the juridical areas of LAs</b>	<ul style="list-style-type: none"> <li>• Requiring that the location and plan of urban sanitation facilities be included in the urban development plan of LAs</li> </ul>	<ul style="list-style-type: none"> <li>• Formulation of a provincial development plan including the location and plan of urban sanitation facilities</li> <li>• Promotion and support in the establishment of inter-municipal treatment/disposal of MSW</li> </ul>	<ul style="list-style-type: none"> <li>• Coordination with PAO for formulation of an urban development plan including the location and plan of urban sanitation facilities</li> <li>• Establishment of inter-municipal treatment/disposal of MSW in cooperation with PAO and other LAs</li> </ul>
<b>4. Promotion of cooperation among LAs</b>	<ul style="list-style-type: none"> <li>• Assign PAO as an initiator for promotion inter-LG cooperation</li> <li>• Provide an incentive and enforcement system to support cooperation among LAs</li> <li>• Strong enforcement to eliminate open dumping operation</li> </ul>	<ul style="list-style-type: none"> <li>• Take initiative and coordinate local administrations for siting the location of inter-municipal SWM facilities</li> <li>• Provide some compensation to LAs or their community for</li> </ul>	<ul style="list-style-type: none"> <li>• Support PAO for siting inter-municipal SWM facilities</li> <li>• Conduct sanitary landfill operation to the extent possible</li> </ul>

		<p>siting inter-SW disposal facility</p> <ul style="list-style-type: none"> <li>• Establishment of transparent and stakeholder-involved for site selection and planning</li> </ul>	
<p><b>5. Development of a proper technical system for MSWM</b></p>	<ul style="list-style-type: none"> <li>• Promotion of sanitary landfill</li> <li>• Strengthening enforcement of regulation on final disposal</li> <li>• Defining of responsibility and obligation of each stakeholder on MSWM</li> <li>• Support in the establishment of transparent and public involved policy making for MSWM plan</li> </ul>	<ul style="list-style-type: none"> <li>• Support in central waste disposal facility construction and operation by PAO</li> <li>• Support recycling that contributes to reduce the final disposal amount by sanitary landfill</li> <li>• Support in the establishment of transparent and public involved policy making for MSWM plan</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of rules for proper MSWM to change the cultural attitude of the people</li> <li>• Implementation of public education and campaign for proper MSWM</li> <li>• Execution of sanitary landfill</li> <li>• Promotion of recycling that contributes to reduce the final disposal amount by sanitary landfill</li> <li>• Establishment of transparent and public involved policy making for MSWM plan</li> </ul>
<p><b>6. Strengthening of the financial capability of LAs on MSWM</b></p>	<ul style="list-style-type: none"> <li>• Provision of a manual for MSWM cost management</li> <li>• Dissemination of the manual to LAs</li> </ul>	<ul style="list-style-type: none"> <li>• Support for the dissemination of a manual for MSWM cost management to LAs</li> </ul>	<ul style="list-style-type: none"> <li>• Development of clear, separate accounting system for MSWM</li> <li>• Strict management of MSWM cost</li> <li>• Introduction of SWM fees, i.e. tipping fee for landfill and treatment plants, collection fee for large dischargers</li> </ul>
<p><b>7. Improvement of infectious waste management</b></p>	<ul style="list-style-type: none"> <li>• Enforcement of infectious waste disposal at municipal SW landfills</li> <li>• Enforcement of the regulation</li> <li>• Establishment of PPP (Polluter Pay Principle)</li> <li>• Assign the medical institution that have infectious waste</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthening enforcement of the regulation</li> <li>• Strengthening enforcement of PPP</li> </ul>	<ul style="list-style-type: none"> <li>• Elimination of infectious waste at municipal waste landfills</li> <li>• Implementation of prevention measure of illegal dumping</li> </ul>