

- 3) The organic waste to be digested may not be able to produce enough biogas not equal quantity as from animal manure digestion, to generate electricity at the planned capacity.

### **3.3 Sriracha Town Municipality**

#### **3.3.1 Technical System**

##### **3.3.1.1 Discharge and Storage**

Sriracha Town Municipality is one of the seaside urban communities of Cholburi Province, is about 116 kilometers away from Bangkok. Total municipal area of Sriracha Town Municipality covers 4.058 square kilometers of which only 2.153 square kilometers is for land area. The number of registered population and households (August 2003) was 27,580 and 6,180 respectively. Major sources of municipal solid waste generation in the community are households, various merchandized shops and business establishments totaling about 750, local government offices, fresh market and midnight food market, monasteries, schools, medical-care institutions, etc.

Based on field observation, waste collection and discharge practices in each generation source can be divided into 2 groups. The first group of small waste generators such as residences, various merchandized shops and businesses typically discharge solid waste into their own small plastic or steel collection bins. Any putrescible wastes will be kept and wrapped in plastic bag prior to throwing in collection bins. For the large waste generators like fresh markets, schools, and hospitals, large storage bins (200-250 liters) are normally placed at dedicated locations. Additionally, Sriracha Town Municipality also placed about 350 large plastic containers (170 liters) distributed in major public places of municipal area for waste collection.

In fact, the Sriracha Town Municipality has provided wet and dry garbage bins of different colors for the "Waste Separation at Sources Campaign" as we can see elsewhere in the municipality (See Picture 3-2). It's a pity that the municipality collectors still collect the separated waste in the same compartment of the truck as usual and upset the people so much that they gave no more cooperation after that. This is actually due to the lack of good cooperation among different divisions as while the Planning and Education Divisions tried to push out the separation bins project, the Public Health and Environment Division had no plan to train the waste collectors, nor provide collection equipment and set up collecting schedule to collect each type of waste.



*Dry and wet garbage bins in Sriracha Town Municipality. There are no waste separation by people because the waste collectors did not separate the waste into different containers.*

**Picture 3-2: Unsuccessful Case in Waste Separation**

### **3.3.1.2 Collection and Transportation**

Waste collection and hauling task to the disposal site is under responsibility of the Public Health and Environment Division. The service is routinely performed every day specifically in the municipal area using 4 collection trucks comprising two 10-cubic-yard side-loaders; one 15-cubic-yard side-loader and one 10-cubic-yard rear-end compactor. Current collection vehicles have service life of 6-8 years. Three collection crews are normally attended at each truck which starts daily working hour from 06.00 A.M., 09.30 A.M. and 03.30 P.M. for 2-3 trips a day. All collected waste is hauled to Sriracha Town Municipality's sanitary landfill disposal facility which is 15 kilometers far away from the municipal area. According to the daily waste load collected about 30 tons, the average collection efficiency is 90% of the total waste quantity generated. At present, waste collection fee imposed on household starts from 20 baht/household/month.

### **3.3.1.3 Road Sweeping and Drain Cleansing**

Responsibility of public road sweeping in the municipal area is also under the Public Health and Environment Division. Presently, the number of available road sweeping workers is about 30 which normally go on duty during 5 A.M., 9 A.M. and 1 P.M. of each day. Total length of sweeping roads is about 6 kilometers. In addition, SRTM also owns one dust power-suction truck which is in normal service during 6-12 A.M. particularly in Sukhumvit Road and unswept roads.

The task of drain cleansing of trunk roads in the urban area belongs to the Technical Sanitation Division which deploys 3-4 workers for each batch of service. Due to inadequate appointed staff and budget allocation, the drain cleansing task is normally performed in emergency case or on request.

### **3.3.1.4 Intermediate Treatment and Recycling**

According to the collected data of waste recycling practice at source from SRTM, it is found that about 60% of the two major waste sources (households and merchandized shops) voluntarily involved in the recycling program. The segregated recyclables typically consist of variety of papers, plastic containers, glass bottles, various metal products. In municipal area, recyclable materials are directly recovered by tricycle waste buyers (Saleng) and then to large recyclable buyers and recyclable processors as the end users. However, some discarded food waste is also utilized for animal feed.

In addition to source recycling, waste collection crew of SRTM also segregate recyclables from mixed waste during the waste pick-up interval. The segregated recyclables are by nature contaminated or dirty, hence the selling prices are lower than those of source recyclables. In the municipal area, it is found out

that there are only 6 tricycle buyers while the large-scaled recyclable buyers are not available.

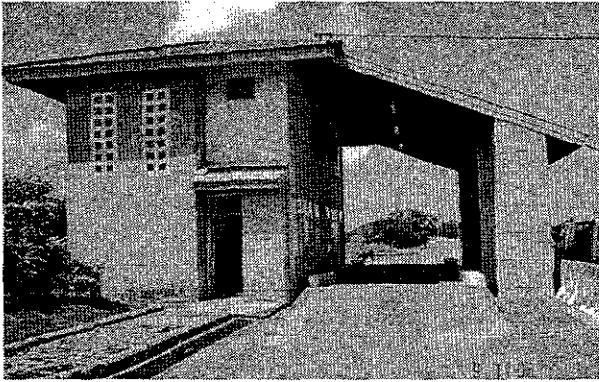
There are also some alert in terms of school recycle campaign, for example the Dara Samut School has started a project to collect all used paper and digest in slurry form to reproduce colored paper for reuse purpose within the school.

### **3.3.1.5 Final Disposal**

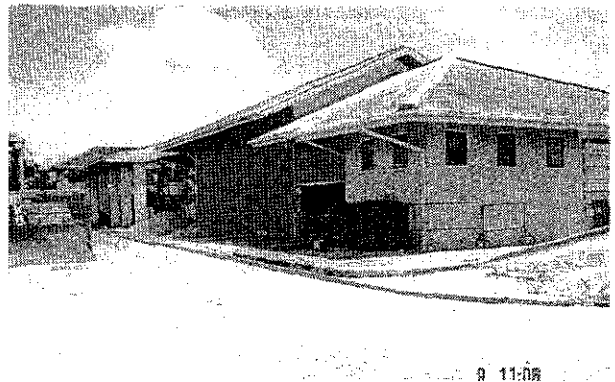
All collected waste in the service area of Sriracha Town Municipality is hauled for disposal to the Sriracha Town Municipality-owned sanitary landfill facility at Nong Kham Sub-district, Sriracha District which is 15 kilometers far away from the municipal area. This 116-rai landfill disposal facility was originally supported in the detail design and facility construction project by the government budget allocation through the Public Works Department's supervision, and has been operated since 1994. Current waste quantity accepted at the facility including waste outside municipal area (Kao Kiew Open Zoo) is about 40 tons a day. At present, approximately 70% of total landfill area is utilized for disposal. In the near future, Chao Phraya Surasak Sub-district Municipality which is in proximity of Sriracha Town Municipality, has requested Sriracha Town Municipality to accept its waste for final disposal prior to the commencement of the Cholburi Central Waste Disposal Facility's operation.

There are 10 operating staffs of Technical Sanitation Division stationed at the landfill facility. Available heavy equipment used in the landfill operation includes 2 bulldozers for waste moving and compaction. Major difficulty facing in the daily operation is the landfill operation could not be performed every day due to the inundated condition of the landfill trench.

Picture 3-3 shows the existing status of Sriracha Town Municipality landfill site. The landfill operation seemed not so complete as no daily covered soil, not enough compaction, operation as waste cell was not recognized. Scavengers are still allowed earning inside nowadays. The rusty condition of tractor and compactor indicates that the machines are not well maintained and lubricated. Moreover, the HDPE lining in the leachate treatment ponds swells up as a big balloon of air trap indicates problems in the non-standard lining since the construction phase.



*Weigh Bridge House with nice operation*



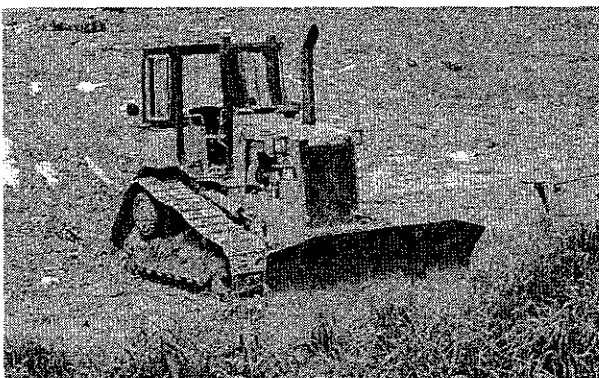
*Maintenance Building*



*Landfill without soil covering, it doesn't look like cell*



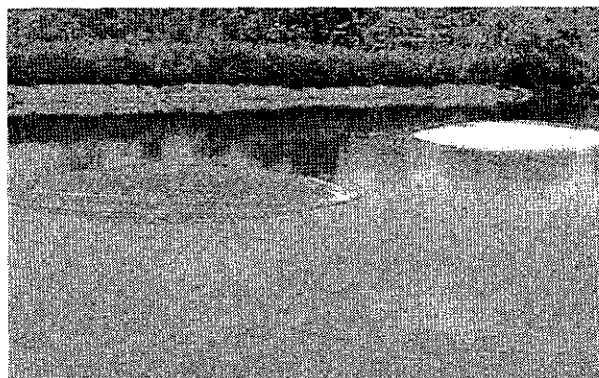
*Scavengers*



*Bulldozer in landfill*



*Landfill Compactor*



*Waste water treatment pond for leachate that HDPE lining swells up as a big balloon of air trap*



*Another view of leachate treatment pond*

**Picture 3-3: Sanitary Landfill of Sriracha Town Municipality**

### **3.3.1.6 Maintenance of Vehicles and Equipment**

For waste collection service maintenance activity mainly involves waste collection vehicles. Normally, light maintenance works are performed by waste collection staff. Any maintenance or repair works requiring skilled and experienced capability are usually handed over to private contractors. Regarding the annual allocated budget of vehicle maintenance activity, it is always insufficient to cope with. In the past year budget, the allocated amount was about 230,000 Baht.

Repair and maintenance work at the landfill disposal facility is typically concentrated on the two available bulldozers for which routine maintenance job is normally undertaken by existing bulldozer operators. For sophisticated repair work, it is always contracted out to the private skilled mechanics. Last year's maintenance budget of waste disposal service was allocated at about 120,000 Baht.

### **3.3.1.7 Medical Solid Waste Management**

Medical care and treatment service institutions in the municipal area consist of 3 large general hospitals (700 service beds in total), and 45 private clinics. In general, the solid wastes generated in hospitals are segregated for disposal as general solid waste and infectious waste in compliance with the Ministry of Public Health's regulation. All three serviced hospitals in Sriracha Town Municipality are currently equipped with small incinerators for waste disposal. For Somdet Na Sriracha Hospital, the largest government-owned hospital in Sriracha Town Municipality (300 service beds), the general solid waste of about 2 tons a day uses the hauling and disposal service of Sriracha Town Municipality.

Regarding the solid wastes generated at small private clinics, it is reported that no waste segregation for separated collection between general waste and infectious waste is implemented but mixed waste collection for final disposal by Sriracha Town Municipality.

## **3.3.2 Institutional System**

### **3.3.2.1 Administration and Organization**

Sriracha Town Municipality provided its structure and administration as follows:

- 1) Office of Under Secretary General. It has duties on general affairs not to be duty of any division, or other assigned work;
- 2) Technical and Planning. It has duty to control and be responsible to perform the works involving planning, legal and regulation, public relation and information distribution,

budgeting and budget analyzing, and general administration affairs;

- 3) Finance Division. It has duties on financial and accounting, procurement and asset, budgeting, benefit, and other relevant or assigned works;
- 4) Engineering Division. It has duties involving town planning and public works, public utility, and other relevant or assigned works;
- 5) Sanitary Engineering Division. It has duties on waste and refuse disposal, wastewater treatment, and other relevant or assigned works;
- 6) Public Health and Environment Division. It has duties involving public health and other relevant or assigned works;
- 7) Education Division. It has duties on educational and other relevant or assigned works;
- 8) Social Welfare Division. It has duties involving public welfare, community development, and other relevant or assigned works;
- 9) Internal Audit Unit. It has duties to audit and scrutinize, give comment and recommendation to the Under Secretary General involving finance of the municipality, and control and audit other aspects as assigned.

Organization structure and Administration of Sriracha Town Municipality is shown in Figure 3-4.

### **3.3.2.2 Human Resources**

Sriracha Town Municipality has 113 positions, 52 permanent employees and 167 temporary employees as follows:

- 1) Office of Under Secretary General 24 positions
- 2) Technical and Planning 5 positions
- 3) Finance Division 20 positions
- 4) Engineering Division 18 positions
- 5) Sanitary Engineering Division 8 positions
- 6) Public Health and Environment Division 17 positions
- 7) Education Division 18 positions
- 8) Social Welfare Division 2 positions
- 9) Internal Audit Unit 1 positions

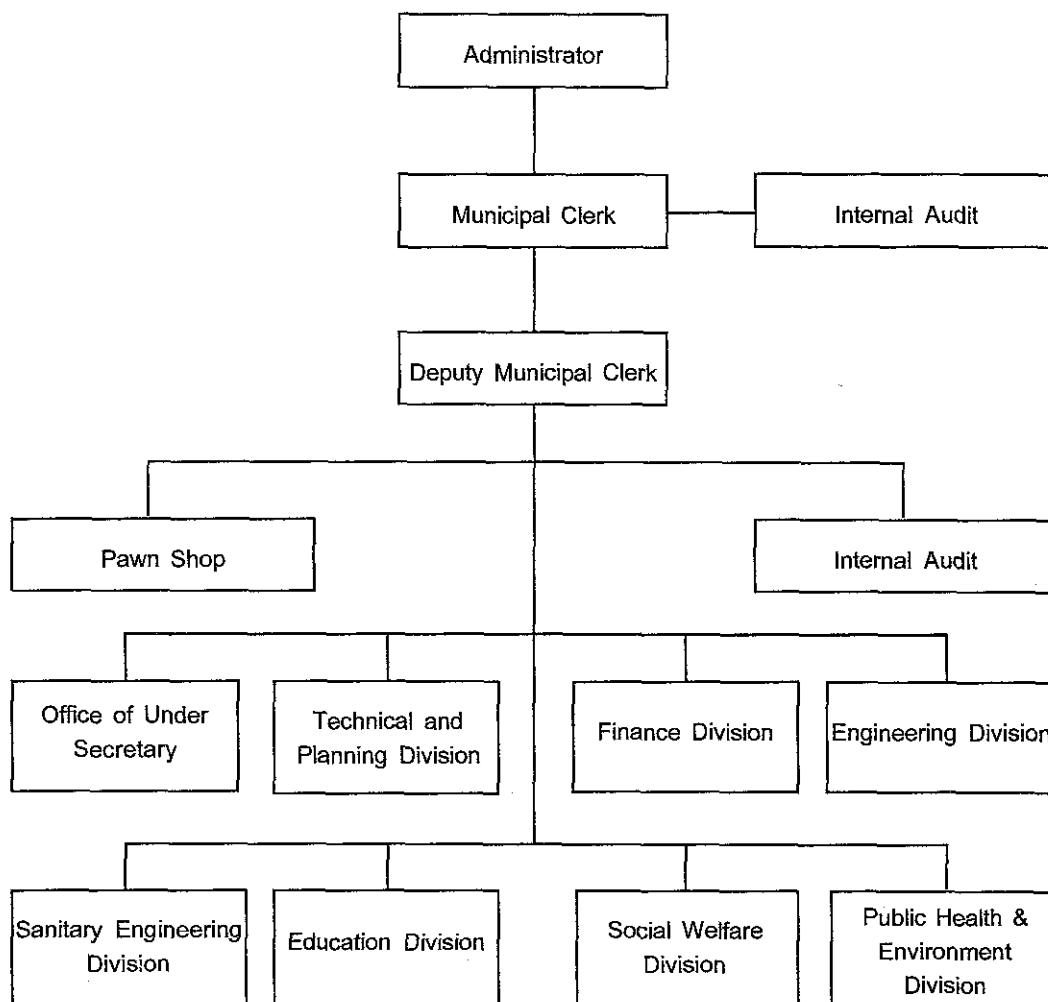


Figure 3-4: Organization Structure and Administration of Sriracha Town Municipality

### 3.3.2.3 Legislation and Enforcement

Sriracha Town Municipality issued many municipal regulations involving waste management in its own boundary, such as the Municipal Regulations on Waste and Refuse Disposal, and on Maintenance Cleanliness and Public Order. Others are the Municipal Regulations on Activities Dangerous to Health, on Trade Control of Food and Ice Cube, on Private Premises, on Public Market, on Private Market, on Control of Stall, and on Control of Vendor, etc.

### 3.3.2.4 Financial Status and Refuse Collection Charge

In fiscal year 2001 Sriracha Town Municipality had income totally Baht 73,826,052.94 (included government support money of Baht 4,966,500,00 Baht and had expenses totally Baht 56,054,560.33.



In fiscal year 2001 Sriracha Town Municipality could collect fees for waste collection and transportation totally Baht 973,780 and its projection for fees collection in fiscal years of 2002 and 2003 would be Baht 850,000 and Baht 1,000,000 respectively.

### **3.3.2.5 Public Cooperation**

In the mid year 1998, Local Government Development Affairs Division in collaboration with the German Agency for Technical Cooperation (GTZ) had implemented "Urban Environmental Management Project (UEMP)". The overall project goal is "...to develop sustainable environmental planning and management in Thailand". The project purpose is to achieve a framework "...to enable relevant institutions to apply proven instruments for environmentally sound urban development".

For the study area, the project selected 5 municipalities as its target to conduct demonstration project. They are as follows;

- Sriracha Town Municipality
- Kanchanaburi Town Municipality
- Kaeng Khoi Sub-district Municipality
- Chumphon Town Municipality
- Lamphun Town Municipality

However, type and number of demonstration project in each model municipality are difference depending on appropriate and area condition. For Sriracha Town Municipality, the UEMP had implemented 4 demonstrations projects as follows;

- 1) Septic Tank Demonstration Project: The project constructed septic tank for 20 households at Rim Thalay Community as demonstration and encouraging community members to install septic tanks in their houses. Anyhow, after the project end, the municipality facing several problems especially about construction cost and maintenance of the septic tanks.
- 2) Master Plan for the Coastal Zone Development:
- 3) Campaign for Environmental Awareness for Students: Essay, slogan and painting contests on urban environmental matters were carried out in local schools.
- 4) Restoration of the Sea Shore in front of Sukhapab Park: This demonstration project is to clean up and separate collected garbage in front of Sukhapab Park. The project started implementation in November 1998. The weekly campaign for school children by garbage collection was organized. Volunteer students collected and separated garbage every Friday from 9-11 am. The restoration activity was shortly interrupted due to drainage works at Sukhapab Park, but was continued after drainage work completion.

However, after ending of the project the municipality has not continued these activities. According to explanation from Chief of Public Health and Environment Division of Sriracha Town Municipality, teachers and school administrators made complaint to the municipality. The complaint is these cleaning activities may bring negative impacts to the high school students because their study were very hard but they had to absent from their class half day a week for the project. If the municipality recruits primary student to do, it is also too hard to them. Furthermore, the completion of the project means no financial support more. The municipality put priority to other works. While for keeping the area clean, the municipality has assigned their employees nearly a hundred persons to do.

### **3.4 Chachoengsao Town Municipality**

#### **3.4.1 Technical System**

##### **3.4.1.1 Discharge and Storage**

Chachoengsao Town Municipality (CTM) encompasses an area of 12.76 square kilometers; registered population of 42,872 (December 2002) with non-registered figure of about 30,000; and 16,129 recorded households. Major sources of municipal solid waste comprise households, merchandized stores and business establishments totaling about 900, approximately 190 food shops, fresh markets, local government offices, schools, medical-care institutions, 90 small factories, and 12 tourist attractions and historical sites. Total generated waste quantity is about 60 tons per day.

Waste discharge and collection practice in the community is normally different depending on waste source and quantity. Household and merchandized store dwellers always discharge solid waste either directly to their own small collection bins or in wrapped plastic bags and put in the bins. For large waste generators like fresh markets, schools, hospitals, factories, and tourist attractions, 200-liter steel drums are placed for waste collection.

##### **3.4.1.2 Collection and Transportation**

The Public Health and Environment Division of CTM is the responsible agency for waste collection and transportation in the municipal area as well as other related public health services.

Presently, CTM owns 10 waste collection vehicles of which 9 vehicles are in daily service and the remaining vehicle is for reserve. The available collection vehicles consist of four 12-cubicyard side-loaders, two 8-cubicyard side-loaders, and four 8-cubicyard rear-end compactors, which perform daily task in 9 major routes in the municipal area. Waste collection and

hauling service normally starts early in the morning (4 A.M.) and in the afternoon shift (3 P.M.) with average waste pick-up of each truck of 2 trips per day. In addition, CTM also possesses three 4-wheeled and 6-wheeled trucks arranged for waste pick-up in small narrow roads, tree branch and twig collection in the municipal area. Total waste quantity collected in the service area is about 55 tons per day which is equivalent to 90% of total generated waste amount in the community. All collected waste is then hauled to the CTM's 30-rai transfer station located 7 kilometers away from CTM's office at Bang Kwan Sub-district, Muang District. At present, minimum waste collection fee imposed on households is 20 Baht/household/month.

#### **3.4.1.3 Road Sweeping and Drain Cleansing**

Public cleansing and road sweeping task is also one of the designated duties of the Public Health and Environment Division. There are totally 48 road sweeping workers performing daily work in 9 major roads in the municipal area during the morning shift starting from 4 A.M. and the afternoon shift starting from 1 P.M.

The duty of drain cleansing on trunk roads is under the Technical Division's responsibility. Nine workers are appointed to handle the task in major trunk roads totaling 40 kilometers in length. The weekly work schedule comprises 3 planned operating days whereas the remaining two days are for emergency task. Additionally, CTM also owns one power-suction truck for drain cleansing purpose.

#### **3.4.1.4 Intermediate Treatment and Recycling**

In general, generated waste from households and merchandized stores are recycled at sources prior to discharging for disposal. Major recyclables include paper products, various plastic containers, glass bottles, and metal products. It is found that there are more than 100 tricycle buyers of recyclables and 8 large recyclable buyers in the municipal area. The abundance of food shops in the urban area also takes some portion of food waste to be utilized as animal feeds.

Waste separation for recyclable materials of collection crew during waste pick-up is a common practice. The segregated recyclables are mainly plastic and glass bottles, and aluminum cans. It is reported that total recovered materials in a day sum up to about 800 kilograms.

In 2002 CTM cooperated with the Department of Environmental Quality Promotion to launch a campaign on waste reduction in households and schools by setting up a community recycling center and school bank for recyclables in order to buy back the segregated materials prior to discharging.

### **3.4.1.5 Final Disposal**

Through the budget allocation from the Ministry of Science, Technology and Environment for the detail design and construction project of sanitary landfill disposal system, CTM completed the construction project in 2000. Unfortunately the completed sanitary landfill facility could not be operated as a result of local residents' opposition. Although CTM has requested to use the site from Koh Khanun Tambol Council, the local authority by the time the site was constructed, and has already got the permission. After the construction of this huge landfill site was finished last 4 years, the Koh Khanun TAO, a new established local authority in that area, ignored the last agreement and did not allow CTM to use the site ever since. Moreover, there were objections from the nearby community leader with a weak reason that the surface water may be contaminated by leachate. According to our survey surface there is only a small shallow reservoir near the site and nobody lives near the site, nor uses that water resource. This is actually a big pity felt by anybody visiting this landfill site.

Major components of the constructed sanitary landfill disposal system are as follows:

#### **a. Transfer Station (Picture 3-4)**

It is located at Bang Kwan Sub-district, Muang District, consisting of 2 main parts:

- Waste transfer operation comprises transfer building, weighbridge, truck parking shelter, maintenance shop, staff housing units, truck washing area, guard house, etc.
- Temporary waste disposal operation comprises 6 landfill trenches, 3 leachate treatment ponds and 30 night soil digestion tanks.

Heavy equipment and vehicles utilized in the transfer station include backhoe, 2 bulldozers, dump truck, water tanker, tractor and trailer. There are six operating staffs stationed at the transfer station.

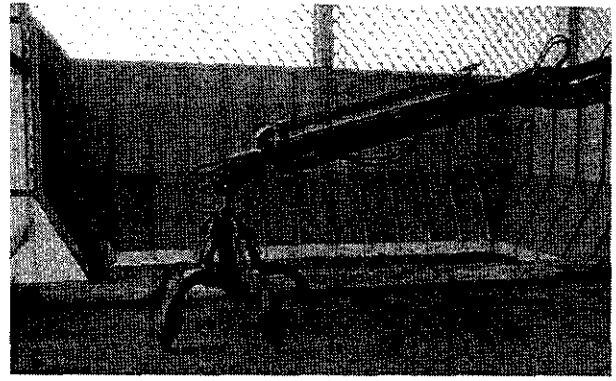
Unfortunately, this transfer station cannot be used as purposes. All the buildings, facilities and equipment are still kept in the station. This is because the CTM landfill site in Koh Khanun TAO is not allowed to use.

#### **b. Sanitary Landfill Facility (Picture 3-5)**

It is located at Koh Khanun Sub-district, Panom Sarakam District consisting of 2 main parts:



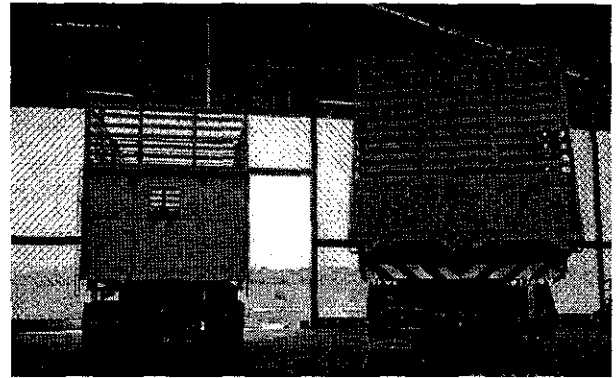
*This transfer station has never been operated*



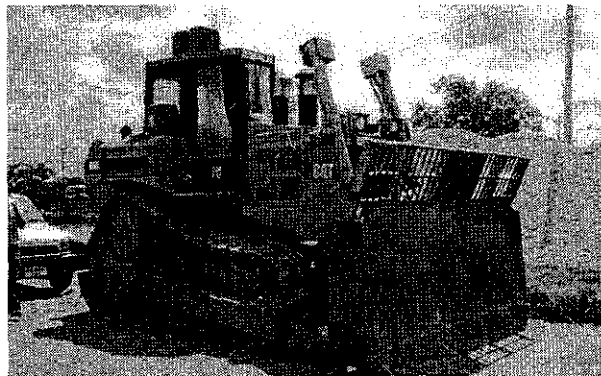
*Waste pit in the building*



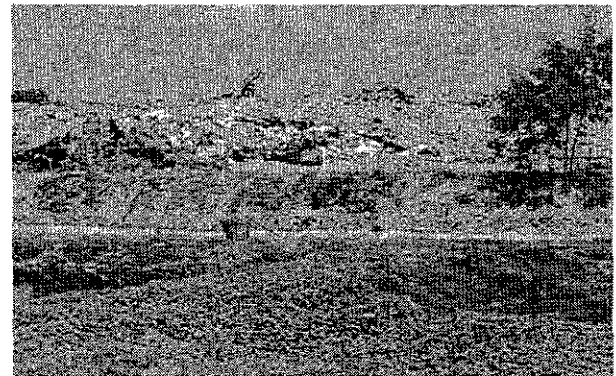
*Hauling Truck*



*They have never been used*



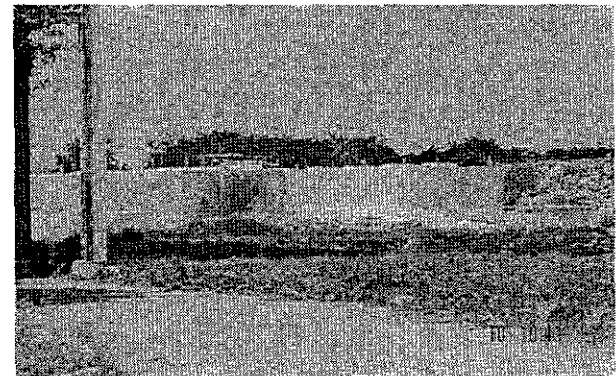
*Bulldozer*



*Using a part of transfer station as temporary landfill*

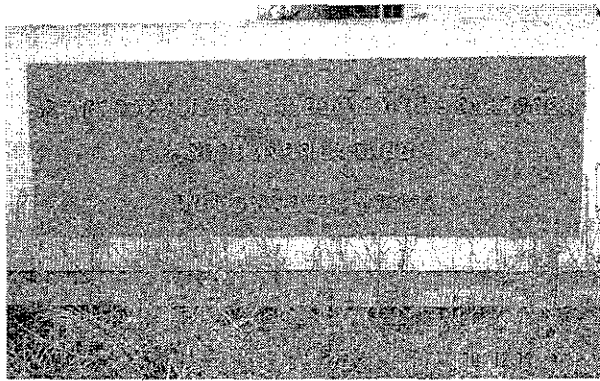


*Leachate pond*

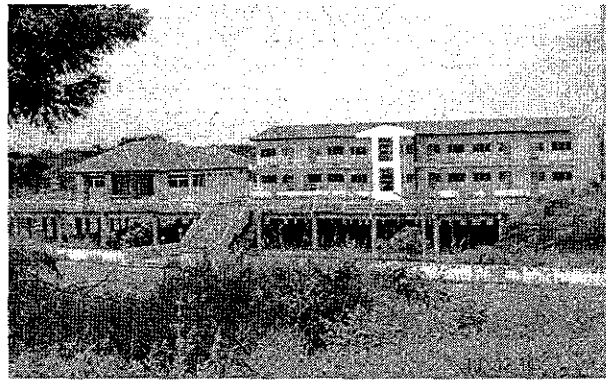


*Septic Tank*

**Picture 3-4: Transfer Station of Chachoengsao Town Municipality that could not be used**



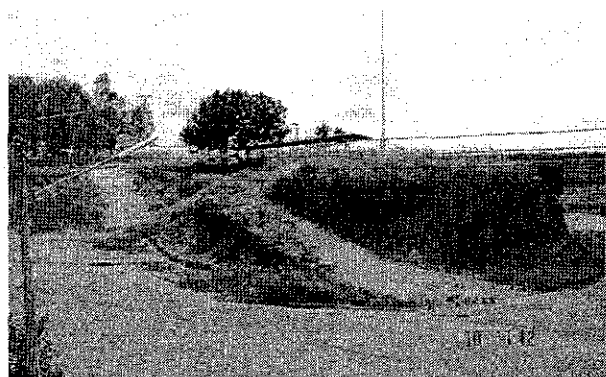
*Board at main entrance*



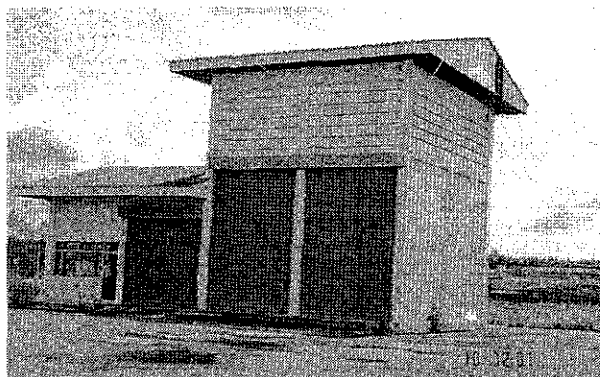
*Office and dormitory for employee*



*Multipurpose area*



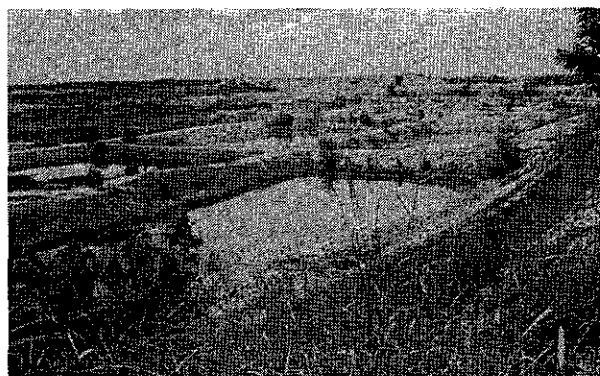
*Way for collection truck to bring waste for landfilling*



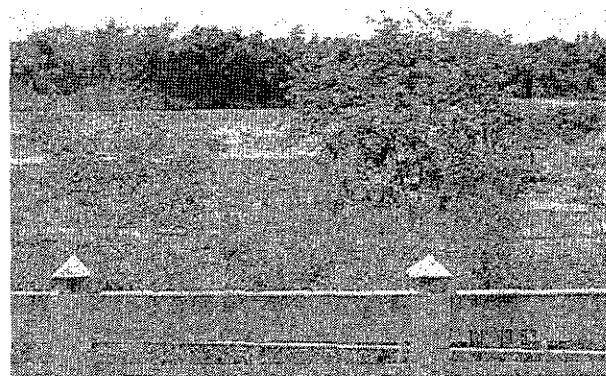
*Weigh bridge house that always closed*



*Landfill is quite well designed and constructed*



*Soil in this area is low permeability*



*Water source without water that people worry about contamination*

**Picture 3-5: New Landfill of Chachoengsao Town Municipality that could not be used**

- Administration and control operation comprises office building, truck parking shelter, maintenance shop, staff housing units, parking lot, guard house, water distribution tower, completed electrical system etc.
- Landfill operation comprises the dedicated area for landfill operation, and leachate treatment ponds.

At present the completely constructed sanitary landfill facility still could not be operated. Therefore CTM has utilized the available small area in the existing transfer station as temporary dumping ground. However this solution requires CTM to contract out a private operator to move out the full dumped waste from the station every year. Annual allocated budget for this task is about 2 million Baht.

#### **3.4.1.6 Waste Management Proposal from Private Company**

A jointed private company called Jarung and Son Co., Ltd. & MD Power Engineering owning a business of selling electricity generator deriving biogas as fuel. This group of company has proposed the CTM a project named "Electricity Generation from Biogas Project" in order to manage the municipality garbage for free of charge. The reason behind that was claimed that they knew the burden of the city to hire private sector in hauling the municipal waste to private dumping site and also the existing of municipal plan of privatizing the night soil treatment to private sector while the Jarung group wants to demonstrate the use of electricity generator as a complete process.

The company asked CTM to provide land of around 10 Rai in order to set up the plant and also feed the plant with about 100 Tons/day garbage. The processes in the proposed plant include separation, anaerobic digestion to produce biogas, electricity generation and liquid fertilizer as by production.

The CTM is quite interested in the proposal. Therefore, the status by now is the drafting of contract to let them use the site at the existing Bang Kwan Transfer Station. The contract is expected to be signed by the beginning of 2004. The step after that will be the site preparation and construction for 6 months before real implementation as the following work plans:

##### **Month 1**

- Site Preparation
- Make agreement to sell electricity to Provincial Electricity Authority (PEA)
- Ask permission to set up the 1,000 KW. Transformer
- Start excavation of 2 anaerobic ponds (for biogas production) and one holding pond
- Construction of generator house and working office
- Import 1,000 KW. Electricity Generation

### **Month 2**

- Affix the generator transformer and other electrical compliances
- Build up cement ring around the mouth of anaerobic pond
- Construction of staff houses and fence
- Affix water supply and lighting systems

### **Month 3**

- Affix wastewater treatment equipment
- Affix power equipment and Control Boxes

### **Month 4**

- Affix Polyethylene dome on the anaerobic ponds
- Testing of electrical compliances and water pumps

### **Month 5**

- Link the generator with the system
- Final check up

### **Month 6**

- Test Run by feeding wet garbage as raw materials
- Generator test run
- Transmit electricity to PEA when ready

Operating step of the proposed waste management system is described as follows;

- 1) Collection trucks deliver the garbage to the garbage pit
- 2) Screw conveyor conveys the garbage for sorting
- 3) Sorting staffs separate the garbage as plastic, paper, glass, iron, etc.
- 4) Cleaning the recyclables for sale
- 5) Mix and agitate all wet garbage in the holding pond
- 6) Pump mix garbage into anaerobic digester\
- 7) Drain residual from anaerobic digester into Holding Tank
- 8) Dewatering by belt press to separate sludge for the composting unit Wastewater will be treated before discharged out to natural receiving water
- 9) Utilize Biogas from anaerobic digester as fuel to generate electricity



### **Comments from JICA Study Team to the Project**

The project principle is very good as it can manage the solid waste starting from separation, recycle, digestion, composting and electricity generation. However, the aimed results may not be well achieved due to the following factors.

- 1) Estimation based on too high waste generation: The private company's proposal is based on too high waste quantity estimation as 1 kg/capita/day, which is equal to that of BMA estimation. While the existing waste that CTM collects is only 60 ton/day, is it possible to make it 100 ton/day? The solution on this point may be solved by CTM acquiring waste from neighboring local authorities. However, the additional waste may come to the new burden of CTM when the project could not be operated successfully.
- 2) Unqualified Mixed Waste as Input: The waste input entering the plant is mixed garbage as the waste separation at source was unsuccessful. The mixed waste that reached the CWDF will be contaminated and will already be sorted by the prior process of each local authority's waste collector staff. It is quite difficult to sort for qualified recycle and reuse wastes.
- 3) Low Quality Recyclable: The final recyclable sorted from CWDF may be of too low economic value and the organic waste to be digested may not be able to produce enough biogas not equal quantity as from animal Manure digestion, to generate electricity at the planned capacity.

#### **3.4.1.7 Maintenance of Vehicles and Equipment**

Light maintenance work of waste collection vehicles is normally performed by the waste collection staff, while sophisticated and complicated repair job are always handled by private contractors. Since some collection trucks have long service life of 10-14 years, consequently high maintenance expense is unavoidable. Estimated maintenance and repair expense in 2003 for the Public Health and Environment Division is about 900,000 Baht.

For maintenance and repair task of the waste disposal operation relating to heavy equipment and trucks, it is mostly contracted out to private service operators. Estimated maintenance and repair expense in 2003 is about 150,000 Baht.

#### **3.4.1.8 Medical Solid Waste Management**

Medical care and treatment institutions in the municipal area comprise a state general hospital (503 service beds), private general hospital (100 beds), public health service center, and 63 private clinics.

At present, CTM provide collection and disposal service of only general solid waste for the state hospital with monthly service fee

of 1,000 Baht. The hospital's incinerator for infectious waste disposal was damaged and out of service two years ago, and it was never put into normal service since then as the fixing and operating costs are considerably high. Presently the hospital's infectious waste is serviced by private operators by incineration disposal. For the private hospital, it is installed a small incinerator (50 kilograms per hour) for burning its own wastes as well as disposal service to some private clinics in the municipal area.

### 3.4.2 Institutional System

#### 3.4.2.1 Administration and Organization

Chachoengsao Town Municipality provided its structure and administration as same as Sriracha Town Municipality (Figure 3-5).

#### 3.4.2.2 Human Resources

There are 6 officers working at the transfer sub-station as follows;

- weighting officer;
- 1 heavy-machine driver;
- truck drivers;
- general officers.

There are 74 officers having duties for waste collection as follows:

- 48 sweeping officers;
- 46 waste collection officers.

#### 3.4.2.3 Legislation and Enforcement

Chachoengsao Town Municipality had the similar municipal regulations as Sriracha Town Municipality.

#### 3.4.2.4 Financial Status and Refuse Collection Charge

Chachoengsao Town Municipality had the similar municipal regulations as Sriracha Town Municipality.

1) The estimate expenses for waste collection:

Salary or wages		450,000 Baht/month
Petroleum		100,000 Baht/month
Total	=	550,000 Baht/month/1,800 ton
		300 Baht/month/ton

The estimate expenses for waste disposal:

	150 Baht/ton
=	270,000 Baht/month

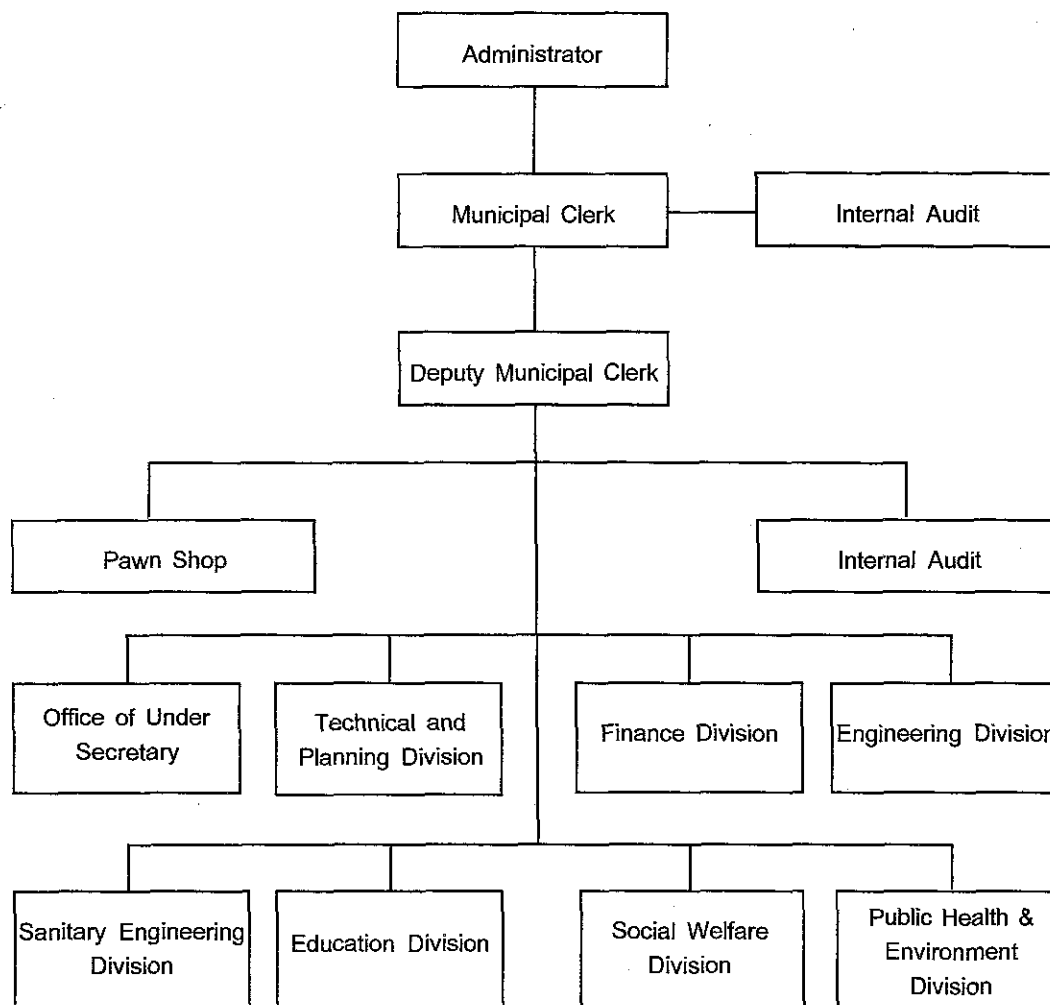


Figure 3-5: Organization Structure and Administration of Chachoengsao Town Municipality

2) The estimate expenses for waste disposal:

Total expenses for waste collection and disposal:

$$= 820,000 \text{ Baht/month}$$

The rate of collection and transportation fees are Baht 20/month/house (new rate). There were 5,000 houses that could be collected the said fees equivalent to approximately Baht 100,000 per month.

### 3.4.2.5 Privatization and Contracting System

In every year the Chachoengsao Town Municipality must employ the private person to carry the waste from the pond in the transfer station at Bangkwan Sub-district, Muang District, Chachoengsao Province in order to have space for its wastes until the sanitary landfill waste disposal plant at Koh Kanun