

**Office of Natural Resources and Environmental Policy and Planning  
Regional Environmental Office 8  
Provincial Office of Natural Resources and Environment in REO8  
Ministry of Natural Resources and Environment  
The Kingdom of Thailand**

**The Project for Strengthening  
Environmental Management and Linkages  
among Central, Regional, Provincial and  
Local Levels in the Kingdom of Thailand**

**Completion Report**

**Volume 3: Pilot Project Report**

**February 2016**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

**ORIENTAL CONSULTANTS GLOBAL CO., LTD.**

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<b>16-013</b>

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## Abbreviations

EGAT	Electricity Generating Authority of Thailand
EM	Effective Micro-organism
CA	Capacity Assessment
CD	Capacity Development
CDI	Capacity Development Intervention
D/S	Disposal Site
DEQP	Department of Environmental Quality Promotion
DGR	Department of Ground Water Resources
DMR	Department of Mineral Resources
DNP	Department of National Parks, Wildlife and Plants Conservation
EQMP	Environmental Quality Management Plan
GIS	Geographic Information System
GPS	Global Positioning System
JCC	Joint Coordinating Committee
JET	JICA Expert Team
JICA	Japan International Cooperation Agency
LA	Local Administration
MNRE	Ministry of Natural Resources and Environment
N-EQMP	National Environmental Quality Management Plan
NIDA	National Institute of Development Administration
ONEP	Office of Natural Resources and Environmental Policy and Planning
OPS	Office of the Permanent Secretary
P/R	Progress Report
PAO	Provincial Administration Office
PCD	Pollution Control Department
PCM	Project Cycle Management
PDM	Project Design Matrix
P-EQMP	Provincial Environmental Quality Management Plan
PONRE	Provincial Office of Natural Resources and Environment
PP	Pilot Project
QGIS	Quantum Geographic Information System
R/D	Record of Discussion
REO8	Regional Environmental Office 8
R-EQMP	Regional Environmental Quality Management Plan

SDM	Sub-District Municipality
TAO	Tambon Administration Office
TFT	Task Force Team
WG	Working Group

## **Part A**

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### **Overview of the Pilot Project**

## **1. Introduction**

### **1.1 Rationale and Background**

The Regional-EQMP 2013-2016 for REO8 was prepared in partnership with ONEP, REO8 and JICA Expert Team (JET) as part of the joint activity of “The Project for Strengthening Environmental Management and Linkages among Central, Regional, Provincial and Local Levels in the Kingdom of Thailand”. In line with this, the implementation of Regional EQMP will also be supported as well as the implementation of two pilot projects.

As to pilot project implementation, the general idea is to develop a model and verify the feasibility and effectiveness of method/s and technology in responding to an urgent environmental issue or problem. It is expected that thru the implementation of the selected type of pilot projects, success rate of implementing them will increase across REO8 jurisdiction. It is also expected that thru the pilot project implementation, best practices and good case studies are developed and documented. Furthermore, the experiences and the lessons learned gained from the implementation can be replicated and duplicated to other areas in REO8 and whenever appropriate to other regions with similar environmental situations.

### **1.2 Objectives of Pilot Project**

Objectives of pilot project are:

- To develop a model to be replicated to other provinces or regions, and;
- To verify the feasibility and effectiveness of a method/s and/or technology in responding to an urgent environmental issue or problem.

### **1.3 Expected Outcomes**

The expected outcomes form implementation of pilot projects are:

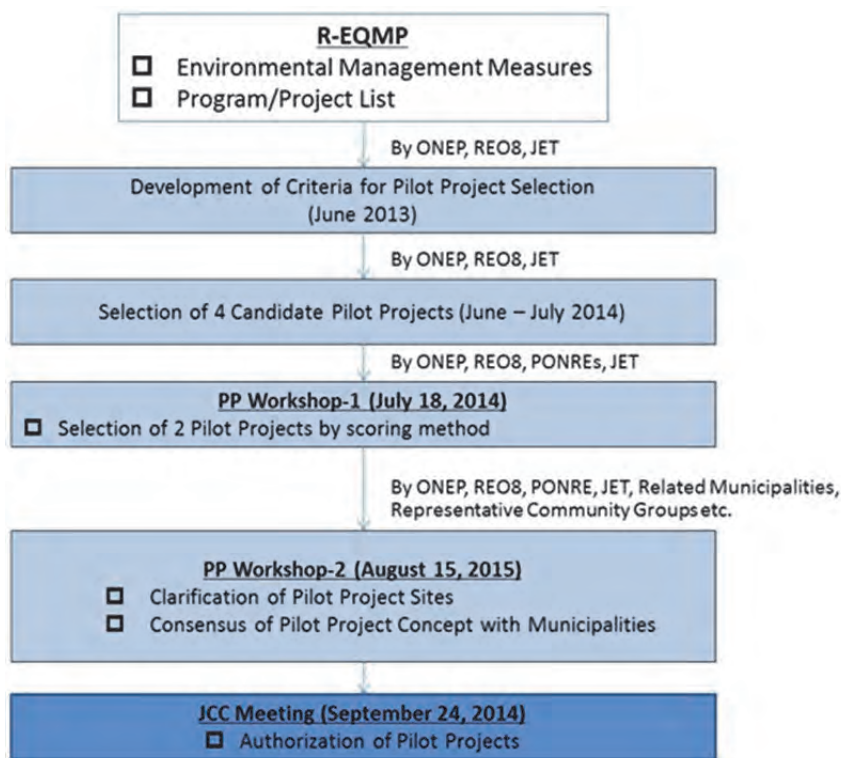
- Experiences during implementation of the selected type of pilot projects contribute to an increase success rate of the Project during full-blown project implementation.
- Thru the pilot project implementation, best practices and good case studies are developed, documented and replicated to other areas with similar environmental situations.



## 2. Pilot Project Selection

### 2.1 Determination of Pilot Projects

The selection of the type of pilot projects are designed base on the Management Unit Strategies and Environmental Management Measures stipulated in the Regional EQMP. Based on this, process and criteria were developed in a participatory manner with REO8 and ONEP. Process of pilot project selection is shown in Figure 2-1.



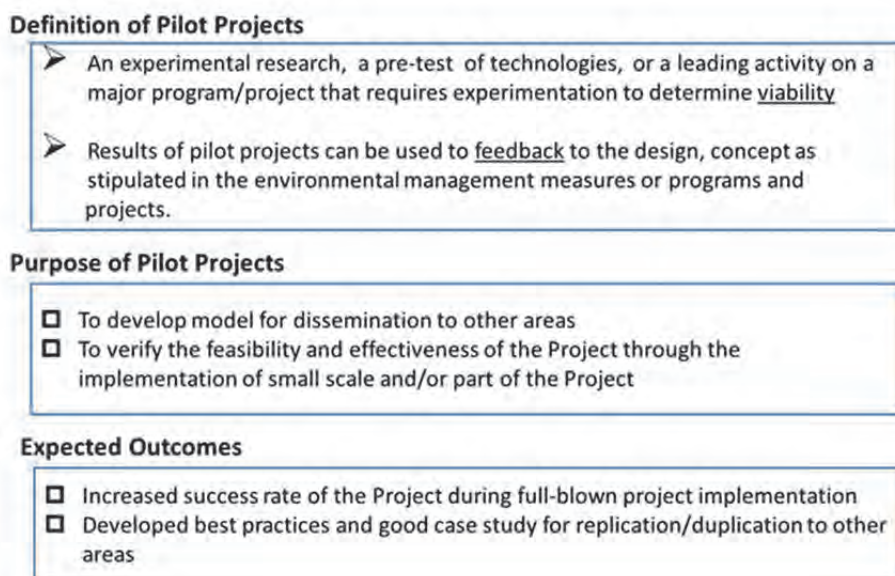
**Figure 2-1 Process of Pilot Project Selection**

The framework and mechanisms of the pilot project implementation were finalized on July 1, 2014 during the Meeting held with Deputy Secretary General at ONEP. It was further presented during the Pilot Project Workshop 1 held on July 18, 2014 in Ratchaburi attended by representatives from PONRE, REO8 and ONEP.

During the workshop, areas of concerns such as definition, purpose and expected outcomes of the pilot projects as well as the type of projects to qualify to be a pilot were clarified. Shown in Figure 2-2 and Table 2-1, respectively are the fundamentals in implementing pilot projects.



Workshop for Pilot Project Selection



**Figure 2-2 Definition, Purpose and Expected Outcome of Pilot Project Implementation**

**Table 2-1 Definition of Types of Project to Qualify as Pilot Project**

Type of Project	Definition
Model Development	<ul style="list-style-type: none"> <li>• New type of environmental management interventions not yet done by REO8 and PONREs</li> <li>• Easily replicable new technological model to other PONRE or other regions</li> </ul>
Development of Implementation Mechanism	<ul style="list-style-type: none"> <li>• Linkage between REO8 and PONRE</li> <li>• Linkage between PONREs</li> <li>• Linkage between PONREs and LA</li> <li>• Linkage between REO8, PONREs and LAs</li> </ul>
Verification of feasibility and effectiveness of concepts and technology	<ul style="list-style-type: none"> <li>• Test of soundness and effectiveness</li> <li>• Applicable and practicable methodology for easy duplication to other areas</li> </ul>

## 2.2 Criteria for Pilot Project Selection

The criteria used in the selection of pilot projects are shown in Table 2-2 below:

**Table 2-2 Criteria in the Selection of Pilot Project**

Criteria	Description
Policies in Regional-EQM (2013-2016)	e.g. water quality management, wetland management, coastal zone management, solid waste management, climate change
Responsibility of REO8 and PONRE on the issue	Whether the scope or responsibility and role to resolve are in context with PONRE and REO8
National special agenda on environmental management	As national environmental management agenda, waste management is designated for 2014, and water quality management for 2015.
Common or Cross border issues among REO8 and neighboring Provinces	Whether the pilot project(s) benefits to not only in one but several provinces in REO8

Contribution to strengthen environmental management system and relationship among regional and local levels	Whether different organizations are involved in the pilot project to address issues
Allocation of necessary staff	Whether PONRE/REO8 can provide necessary staff
Easy dissemination and application to other areas or regions	The pilot project(s) which can disseminate and apply not only to specific area or region but other are areas or regions as well. This is given a higher priority.
Acceptance of activities	The project activities and pilot project is accepted by related government agencies, people and NGOs in the target areas.
Security	Safety in the implementation of pilot project activities are ensured.

The based on the above process and criteria, the following pilot projects are selected:

**Pilot Project 1:** Improvement of the solid waste management system in Tha Yang Sub-District Municipality in Phetchaburi

**Pilot Project 2:** Community-based Environmental Management in Pak Tho Sub-District Municipality in Ratchaburi.

### **3. Overall Work Flow**

#### **3.1 Work Flow**

The pilot project implementation will be carried out based on the workflow considering the schedule of the JICA Project implementation. The following tentative activities are identified below and shown in Figure 3-1 is the schematic presentation of the work flow.

##### **1) Rapid survey and investigation on the selected pilot project and proposed sites**

Rapid survey and investigation of the selected pilot project and proposed sites were conducted in order to understand the feasibility of the pilot project implementation in the selected sites. The results of the rapid survey and investigation will provide and enhance understanding of the current condition as well as to determine viability of the chosen site.

##### **2) Preparation of project outline**

The pilot project outline will be prepared that describes the framework of the pilot project implementation, objectives and expected outcomes. The preparation of the outline will be done together with JICA Expert Team, REO8 and PONRE and will be presented to selected Sub-District Municipality in a workshop organize for this purpose.

##### **3) Explanation and consensus on pilot projects outline**

A workshop will be conducted in order to explain the pilot project outline and gain consensus as to its contents, objectives and expected outcomes. Consultations of the Mayors and relevant departments at Sub-District Municipality levels together with relevant PONREs will also be conducted. These activities are facilitated in order to enhance understanding of the overall framework of the pilot projects.

##### **4) Preparation of implementation plan**

The preparation of the implementation plan will be conducted in a participatory manner together with the concerned Sub-District Municipalities with relevant participation of the communities, where several communities are involved.

##### **5) Establishment of implementation mechanism**

Implementation mechanism will be established at the Sub-District Municipality levels which will guide the overall implementation of activities. The JICA Expert Team together with REO8 and relevant PONRE will provide technical support and guidance to the selected Sub-District Municipalities with technical support from JICA Expert Team.

## 6) Establishment of Advisory Team

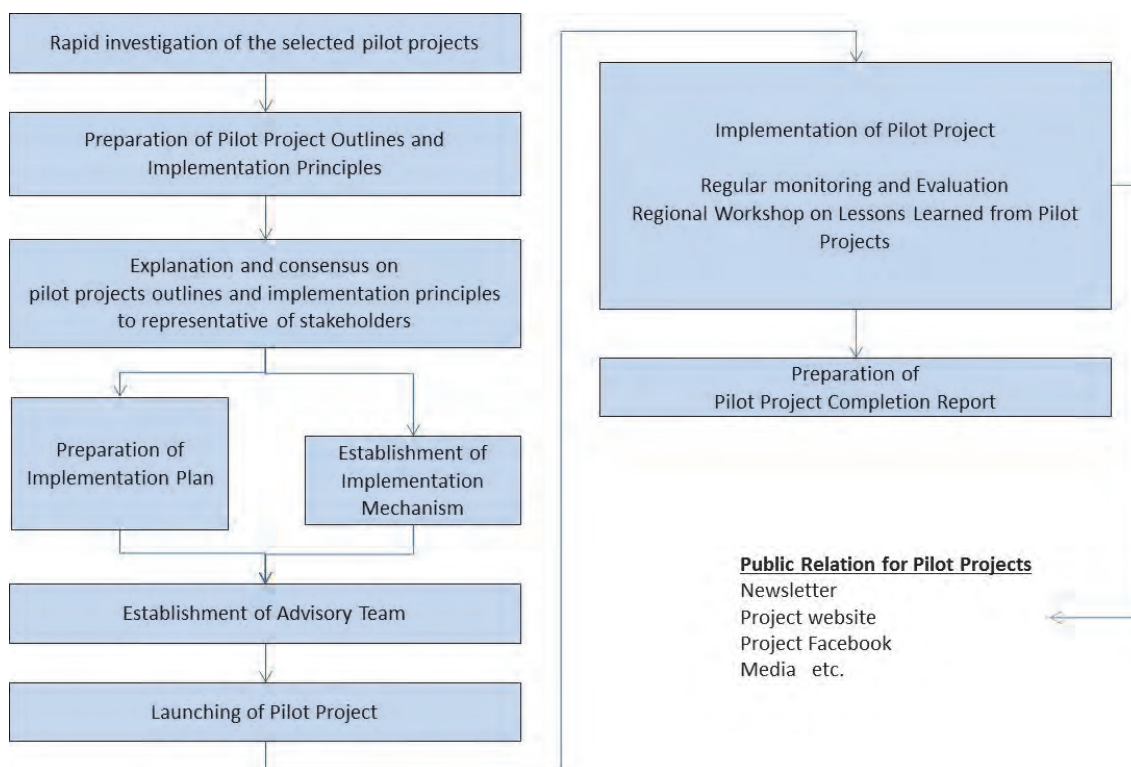


Figure 3-1 Overall Workflow

An Advisory Team was organized whose functions are to provide overall direction, monitor and evaluate the implementation of the pilot projects. The members of the Advisory Team consist of representatives from REO8, ONEP, 5 PONREs. Membership was expanded as the need arises (also refer to Item #5)

## 7) Launching of pilot project

A formal and informal launching of the pilot project implementation will be organized at the Sub-District Municipality levels which will be attended by various stakeholders.

## 8) Implementation, monitoring and evaluation

As part of the process, the JICA Expert Team together with Advisory Team will formulate a mechanism of monitoring and evaluation of the pilot project implementation. The frequency of the monitoring and period of evaluation will be decided by the Advisory Team and schedule will be determined, depending on the progress of the implementation.

**3.2 Implementation Schedule**

The time frame for the implementation of the pilot project selection is outline is shown in Table 3.1.

**Table 3-1 Time Frame of the Pilot Project Implementation**

Activity	2014					2015												2016				
	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
PP Planning	←→																					
PP Implementation			←→																			
Monitoring and Evaluation							▲			▲				▲				▲				
Reporting, coordination and communication	←→																					
Pilot Project Completion/Reporting																				←→		

#### **4. Implementing Mechanism**

The REO8, in cooperation with the JICA Expert Team, organized the Pilot Project Advisory Team during a meeting held last January 27, 2015 at REO8 Conference Room in Ratchaburi. Attended by 26 participants, they discussed the composition of the Advisory Team, clarified its functions and expected roles and responsibilities in the implementation of pilot projects. As agreed, the main roles and functions of the Advisory Team were the following:

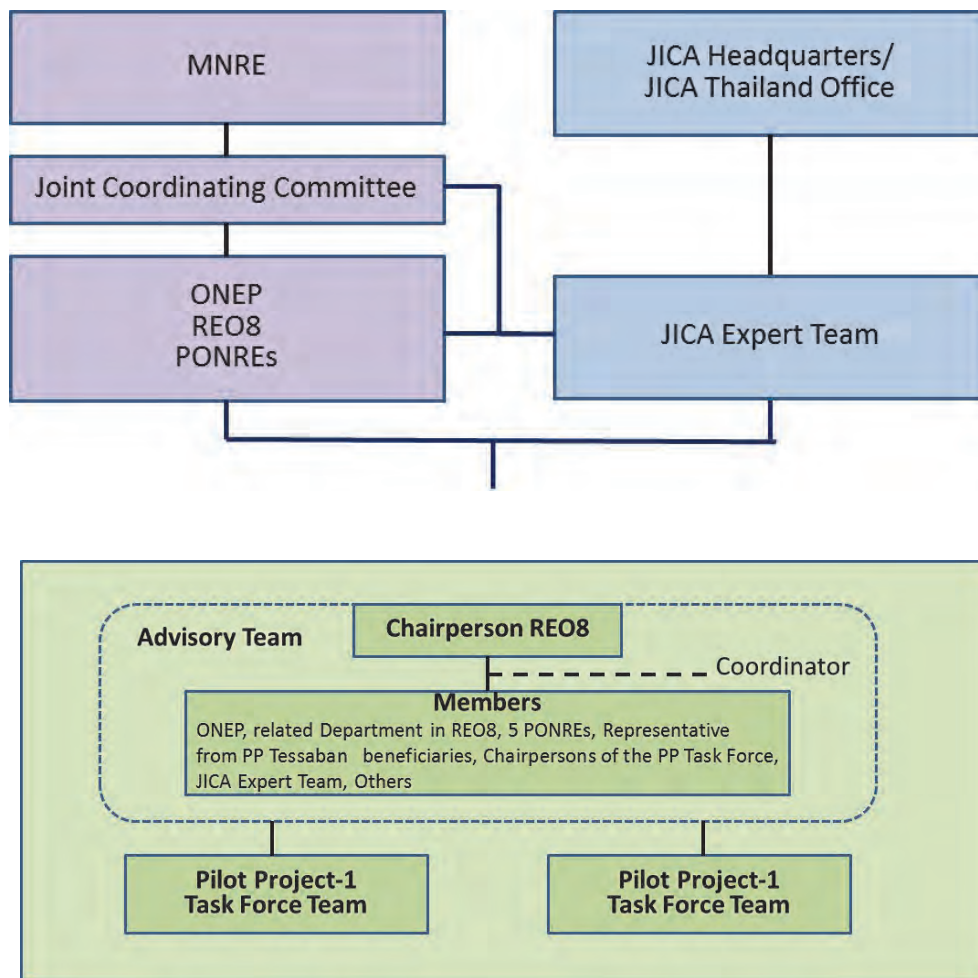
- Provide technical support to the Task Force Teams in implementing the activities and plans of pilot projects
- Facilitate in the coordination with the relevant agencies, groups and institutions at the national or regional levels on matters that are important to the implementation of the pilot projects and are deemed beneficial to the successful outcome of pilot project activities
- Conduct monitoring and evaluation of activities and ensure that the Implementation Plans are carried out

The duties and responsibilities of the team were also discussed and are to be composed of the following:

- Attendance at meetings and participate in activities
- Share data and information significant for the implementation of the pilot projects
- Assist in disseminating good practices, experiences and knowledge in the pilot areas
- Act as resource persons during special events organized by the Task Force Teams

The REO8 Director was designated as Chairperson of the Advisory Team and the members are composed of representatives from ONEP, PCD, DEQP, five PONREs in Ratchaburi, Samut Songkhram, Kanchanaburi, Phetchaburi and Prachuap Khiri Khan, Chairpersons of the Task Force Team from Tha Yang and Pak Tho, representatives from SDM Tha Yang and Pak Tho, Environmental Quality Promotion Division of REO8 and the JICA Expert Team. The project's counterpart staffs of REO8 act as the coordinator for the Advisory Team. Figure 4-1 shows the structure of the Pilot Project Advisory Team and its relationship to the overall structure of the project.





**Figure 4-1 Pilot Project Implementing Structure**

The meeting concluded with the understanding that the meetings shall be conducted once in every quarter for the duration of the pilot project implementation. The Chairperson may convene the Advisory Team Meeting with recommendation from JET, in addition to the quarterly schedule, when deemed necessary.





## **Part B**

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### **Pilot Project 1: Improvement of Solid Waste Management System**

## 5. Introduction of Pilot Project 1

### 5.1 Objectives of Pilot Project 1

Regional EQMP 2013-2016 mentioned that solid waste management is the common issue in the REO8 jurisdiction. According to Public Health Act 1992 and revision of this act Volume 2 , 2007, LAs are key players in solid waste management. Although the Government of Thailand allocated budget for solid waste management in almost 20 years, the most of landfill is still open dumping. The Pollution Control Department (PCD) mentioned that 80% of total number of disposal sites (2,490 sites in 7,782 LAs) is categorized as inappropriate dumping such as open dumping and open burning (PCD Document for the National Council for Peace and Order, June 2014).

Through the Pilot Projects, it is expected that success rate of implementing Regional EQMP will increase across REO8 jurisdiction, and also best practices and good case studies are developed and documented. A serious of meetings, workshops, etc. the following was selected as one of the pilot projects (so called “Pilot Project-1”):

Improvement of System for Solid Waste Management in Tha Yang Sub-district Municipality

The objectives of Pilot Project-1 are:

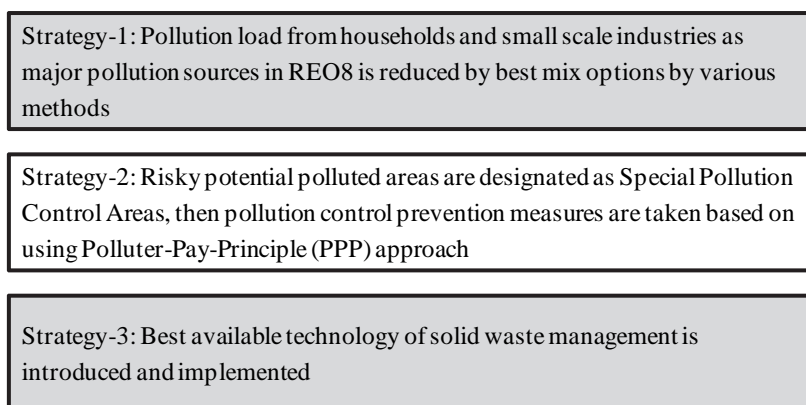
- To verify implementation mechanism for solid waste management system including planning, implementation and monitoring of the plan
- To accumulate know-how for solid waste management
- To disseminate results of Pilot Project-1 to other LA

### 5.2 Relationship between Pilot Project 1 and Regional EQMP 2013-2016

As mentioned, the Regional EQMP stipulates that solid waste management is the common issue in the REO8 jurisdiction. The existing solid waste management problems caused many related issues in the environment, including public health, water pollution, among others so that it becomes an urgent issue. In the Regional EQMP, the management issues for Pollution Control Management Unit Plan mentioned:

- Pollution load should be minimized effectively
- Preventive Pollution control should be introduced in risky pollution areas
- Clean cities should be achieved through practical solid waste management

The first and third management issues are related to solid waste management. Hence, the Unit Management strategies are formulated, and are shown in Figure 5-1. Strategy 1 and Strategy 3 of Regional EQMP are related to solid waste management, where waste reduction at generation source may be done by 3R. The best available technology will be used and tested during the implementation of Pilot Project-1.



**Figure 5-1 Strategies of Pollution Control Management Unit**

### **5.3 Expected Outcomes**

The following are expected outputs from Pilot Project-1:

- Sub-district Municipal Solid Waste Management Action Plan
- Increased capacity of Tha Yang Sub-district Municipality for solid waste management
- Dissemination of pilot project process and methodology to other PONREs and LAs.

## 6. Existing Solid Waste Management in Tha Yang Sub-district Municipality

### 6.1 Outlines of Tha Yang Sub-district Municipality

The Tha Yang Sub-district Municipality (SDM) is a part of Phetchaburi Province. The National Road Route No. 4 runs in this SDM. It has a total land area of 79 km<sup>2</sup> and approximate population of 28,446 as of September 2014. The basic information and location of Tha Yang SDM are shown in Tables 6-1, and Figure 6-1.

**Table 6-1 Basic Information of Tha Yang Municipality**

Size of area	79 km <sup>2</sup>
Population (September 2014)	28,446
No. of Household	10,307
No. of Village	20
No. of community	37

Source: Tha Yang SDM



**Figure 6-1 Location of Tha Yang Sub-district Municipality**

### 6.2 Duties of Sub-district Municipality in Solid Waste Management

The regulations related to the roles of organizations in solid waste management are the following:

- Determining Plans and Process of Decentralization to Local Government Organization Act, 1999

- Public Health Act, 1992
- The Act to Maintain Cleanliness and Good Order of the Country, 1992

According to the above regulations, the Tha Yang SDM has the responsibility for solid waste management and known to be the key player in its management. The following departments are related to solid waste management:

- Department of Public Health and Environment
- Department of Public Works

### 6.3 Waste Generation and Waste Flow

#### (1) Unit Waste Generation Rate

According to the results of the Waste Amount Survey conducted in February and March 2015, it revealed the following:

- Average Waste Generation Rate (wet base) is:

0.56 kg/capita/day (Household)

- Waste Generation Rate of other sources are shown in Table 6-2

**Table 6-2 Waste Generation Rate by Waste Source**

	Waste Sources		Waste Generation Rate	
Commercial Establishments	Restaurant	-	0.30	kg/customer/day
	Coffee shop	-	0.08	kg/day
	Shops	Convenience store (Seven Eleven etc.)	3.04	kg/day
		Local Convenience shop	0.81	kg/day
		Clothes shop	0.02	kg/customer/day
		Electrical shop	0.28	kg/day
		Meat shop	0.52	kg/customer/day
		Dessert shop	1.47	kg/day
		Souvenir shop	3.30	kg/day
		Glossary store	0.81	kg/day
		kiosk, Mobile store on the street	1.40	kg/day
		Tool shop	0.93	kg/day
Public Facilities	Market	Public	68.1	kg/day
		Private	36.39	kg/day
	School	Primary School	0.12	kg/student/day
		Secondary School	0.12	kg/student/day
	Temple	Temple	3.5	kg/day
		Monastery	3.5	kg/day
	Hospital/ Clinic	Hospital	11.37	kg/day
		Clinic	0.24	kg/day

Source: Waste Amount Survey, March 2015

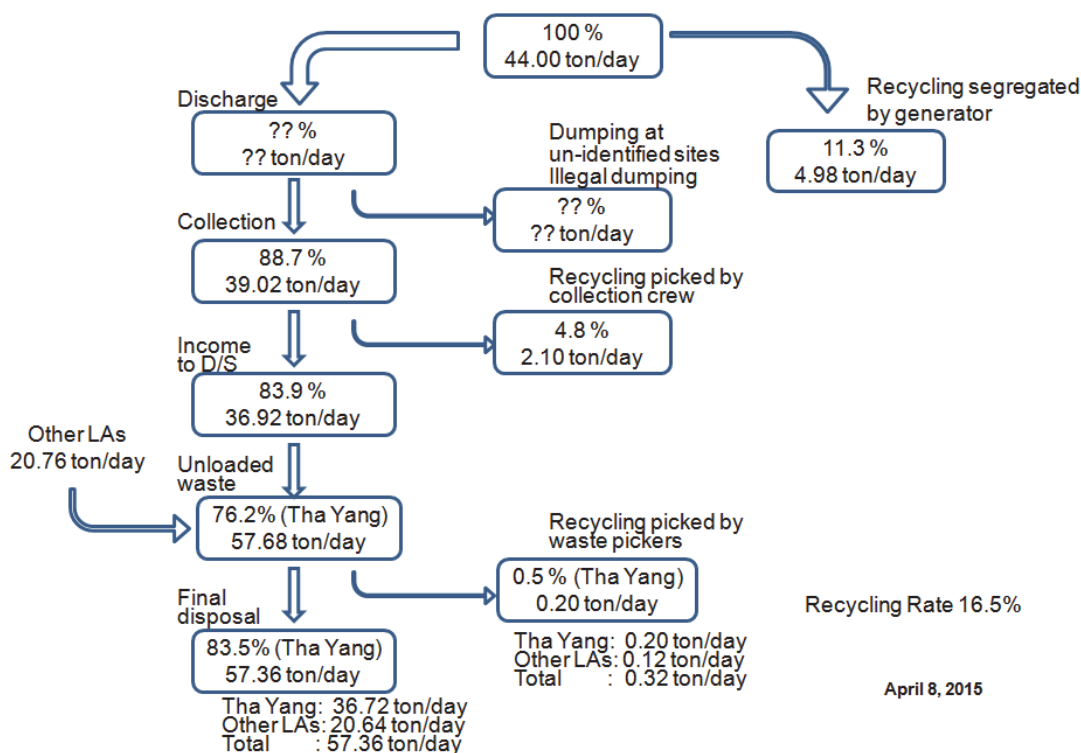
(2) Current Waste Flow

The current waste flow in Tha Yang SDM is shown in Figure 6-2. It is estimated that the solid waste generation at generation source is approximately 44.00 ton/day including households, commercial establishments and public facilities. From the 44.00 ton/day of generated waste in Tha Yang, 4.98 ton/day of waste or 11.3% of generation wastes are collected at generation sources for recycling. An amount of waste are thrown in road sides, vacant spaces and other places illegally. However, this amount of waste is cannot be estimated.

The waste collection vehicles of Tha Yang SDM collect 39.02 ton/day of waste and 2.10 tons/day are considered recyclable waste which can sold to junkshops. A total of 36.72 ton/day of waste unloaded by collection vehicles from Tha Yang at disposal site.

This disposal site accepts waste from other LAs including Orbotor Wang Krai and Orbotor Yang Yong so that an approximate 20.64 tons/day of wastes come from Orbotor Wang Krai and Orbotor Yang Yong. Total waste unloading at disposal site is 57.36 ton/day. Waste pickers collect 0.32 ton/day of recyclable waste from unloaded waste including 0.20 ton/day from Tha Yang. An approximate 57.36 tons/day of wastes are disposed including 36.72 tons/day from Tha Yang.

The recyclable rate in Tha Yang is estimated to be at 16.5% of generated waste or at least 7.28 tons/day.

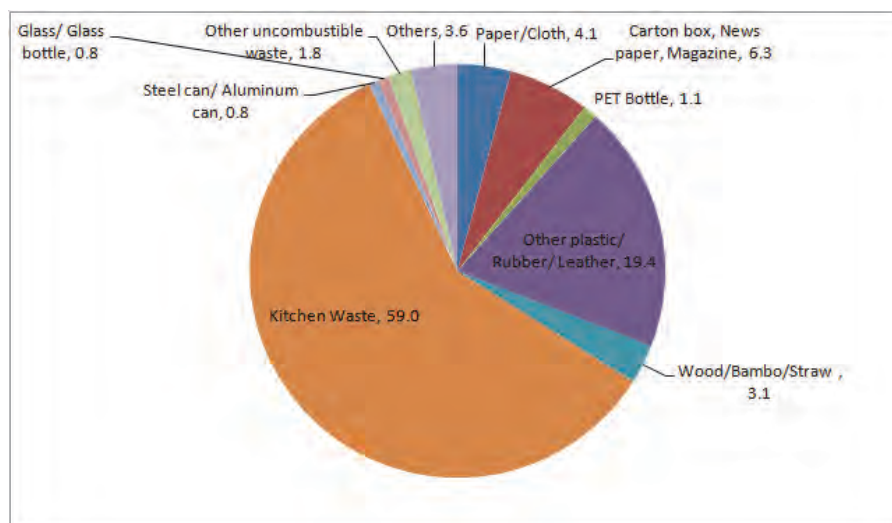


Source: Waste Amount Survey, Waste Incoming Survey at D/S, Waste Picker Survey February and March 2015

Figure 6--2 Current Waste Flow in Tha Yang Sub-district Municipality

### (3) Waste Composition

The results of the Waste Composition Survey conducted in February 2015 is shown in Figure 6-3. The total waste generation from households is 15.93 tons/day (0.56 kg/c/day x 28,446 persons). The kitchen waste accounts for an approximate 60% of total generation wastes at households on average or 9.4 tons/day.



Source: Waste Composition Survey, February 2015

**Figure 6-3 Waste Composition of Household**

## 6.4 Collection and Transportation

### 6.4.1 Waste Collection Services

#### (1) Overview

In Tha Yang SDM, waste collection system is done using waste bins and collected by waste collection vehicles. Tha Yang SDM distributes waste bins on the road side in front of houses. Residents bring their garbage and put into waste bins, then waste collection vehicles pick up the garbage and transport them to disposal site. The waste collection service covers not only for households but also public facilities including markets, schools, hospital and temples, and commercial establishments including restaurant, shops and shopping malls.

#### (2) Responsibility of Waste Collection and Transportation

The Department of Public Health and Environment of Tha Yang SDM has responsibility for solid waste management in Tha Yang which has several related departments working for solid waste management.

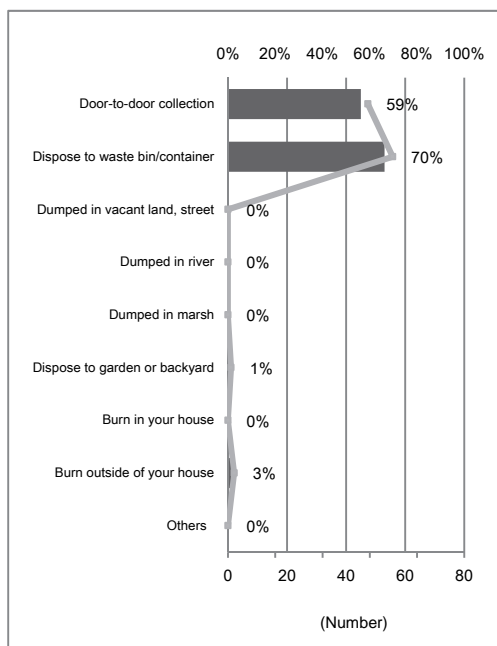
The Department of Public Health and Environment provided waste bins based on request from the residents and collect and transport waste to the designated disposal site. The

residents should bring their wastes to the wastes collection stations as designated by the SDM.

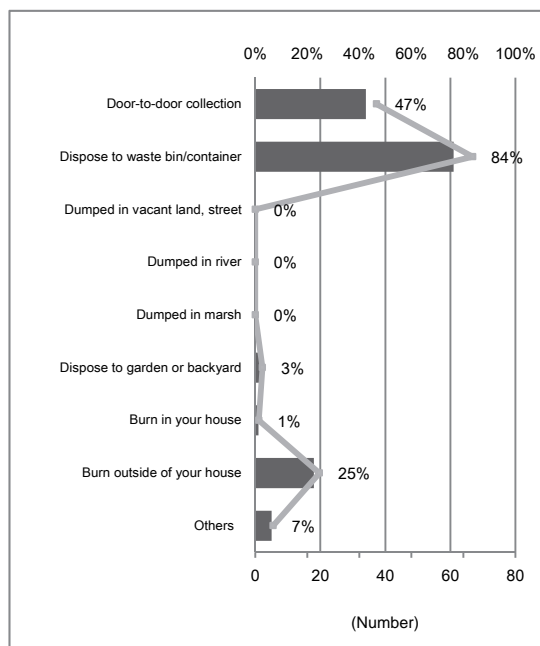
(3) Coverage Area and Frequency of Waste Collection

There are different waste collection services between populated areas and non-populated areas in the collection methods and collection frequency. The results of the Household Questionnaire Survey on waste collection methods is shown in Figure 6-4. Based on the results of this survey, 70% and 84% of respondents in populated area and non-populated area are covered by waste bins or container collection. Door-to-door collection is shared by 59% and 47% respectively. However, 25% of respondents in non-populated area also answered burn in their houses. For the waste collection frequency, 35% of respondents in populated area received more than 1day/week collection service, while 12% of the respondents in non-populated area is not covered by collection services.

Q4-2: Way of waste disposal (multiple answer)



(Populated area)



(non-Populated area)



Q4-3: Frequency of waste collection (single answer)

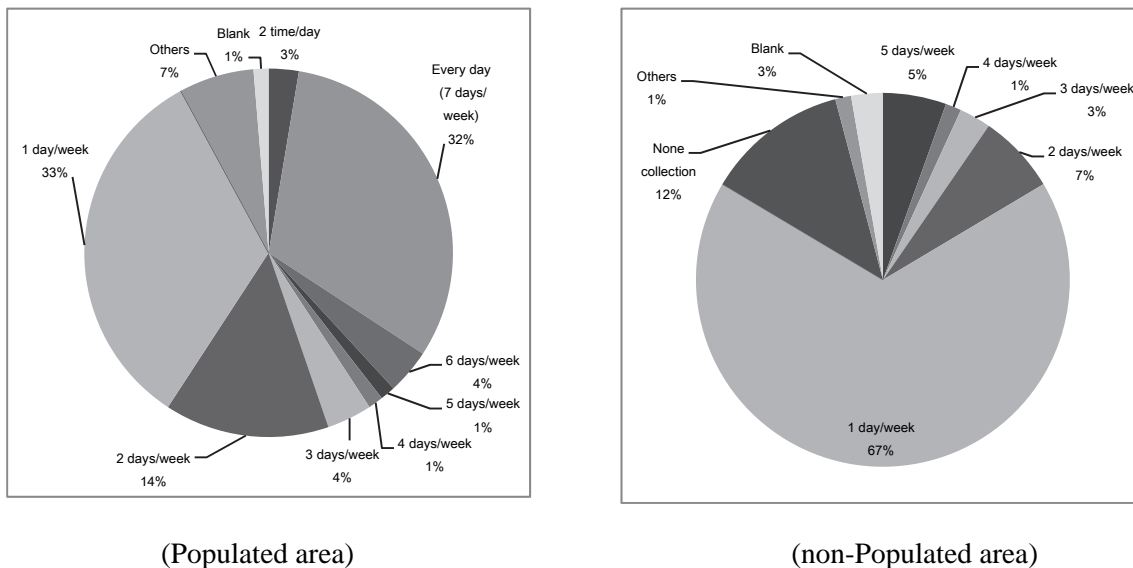


Figure 6-4 Result of Household Questionnaire Survey related to Waste Collection Service

(4) Waste Collection Stations

In principle, waste collection stations are located on the road sides. The Tha Yang SDM distributed plastic waste bins with cap. It is observed that bamboo waste bins are also used in some areas.

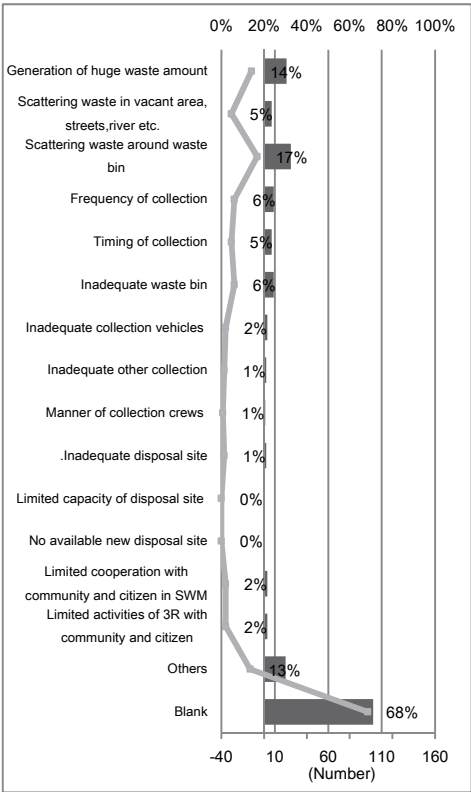


Figure 6-5 Type of Waste Bin

Problems of plastic waste bins have been observed as follows:

- can be broken easily
- generates odor
- leaked leachate

According to the results of the Household Questionnaire Survey conducted, 17% of the respondents mentioned that solid waste problems include; scattering waste around waste bins, 6% is inadequate waste bin including volume, shape and solidity (see Figure 6-7).



Source: Q2-2 Multi-answer , Household Questionnaire Survey, Multi-answer

**Figure 6-6 Solid Waste Management Problems in Tha Yang SDM**

**6.4.2 Waste Transportation**

(1) Waste Collection Vehicles and Crews

In Tha Yang SDM, there are 8 waste collection vehicles managed by the Department of Public Health and Environment. The lists and photos of waste collection vehicles owned by Tha Yang SDM are shown in Table 6-3 and Figure 6-7 respectively. Waste collection vehicles carried the collected wastes to disposal site which is located in Tha Leang. approximately 12 km from Tha Yang SDM. On the average, each collection vehicles has 1 to 2 trips /day so that one collection vehicles traveled 40 to 50 km/day. Usually, the three collection crews work for picking up waste and putting wastes collection vehicles.

**Table 6-3 List of Waste Collection Vehicle**

No.	License Plate Number	Types of Vehicle	Capacity (m3)	Age	Condition	Daily Running Distance (km)	Number of Trip (/day)	Type of Fuel
1	81 0570	Compaction	12	13	good/ usually repaired	50	2	diesel
2	81 3113	Compaction	6	14	good/ usually repaired	45	2	diesel
3	81 1016	Compaction	10	11	good/ often repaired	53	2	diesel
4	81 0500	Standard waste collection truck (Open Sideway Truck)	6	20	good	45	2	diesel
5	81 1364	Compaction	10	10	good/ usually repaired	55	2	diesel
6	81 1865	Compaction	12	8	good	50	2	diesel
7	81 1717	Standard waste collection truck (Open Sideway Truck)	5	9	good	70	3	diesel
8	81 6688	Container carrier	8	23	good	55	3	diesel

Source: Tha Yang SDM



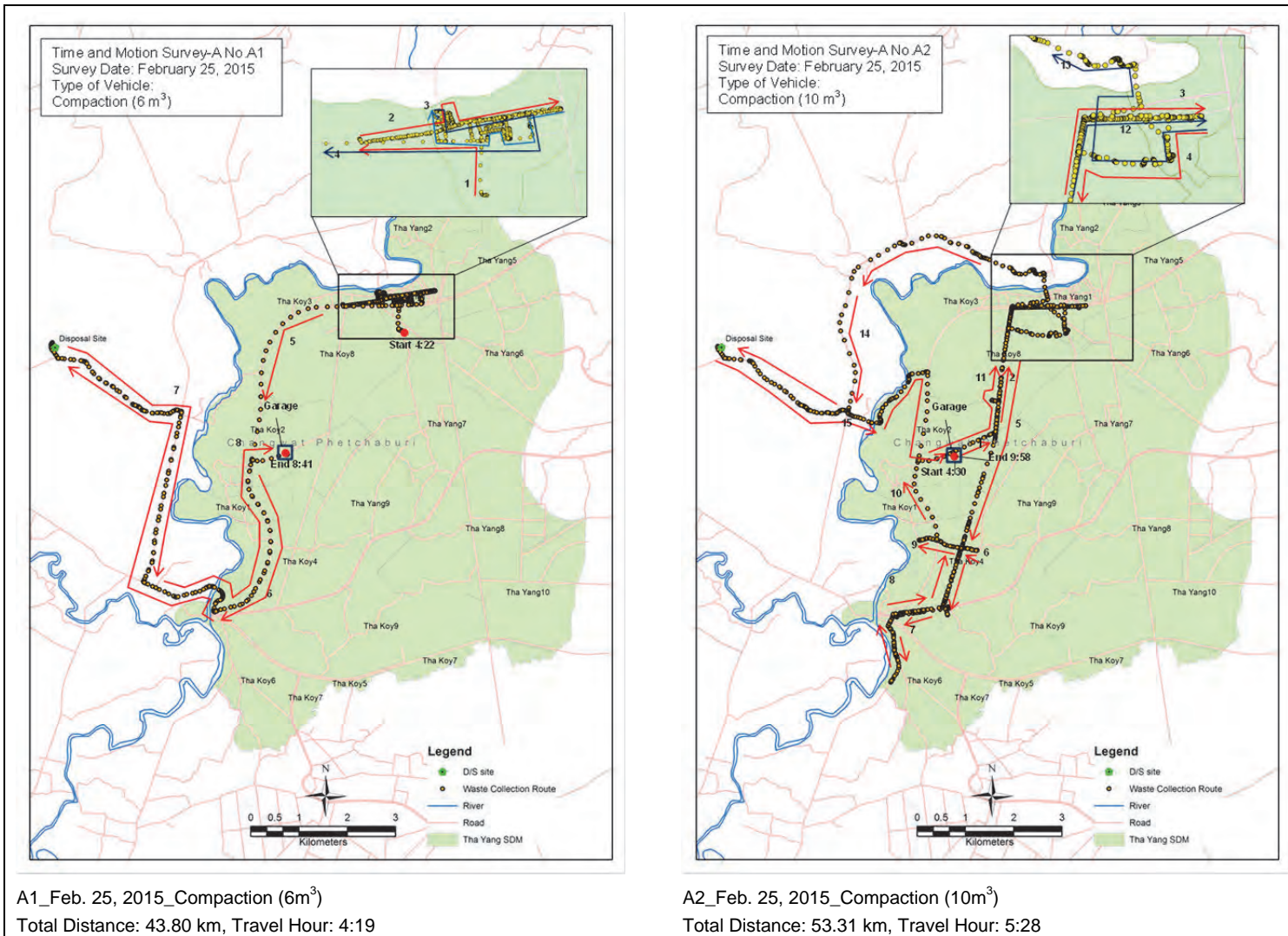
Figure 6-7 Waste Collection Vehicles owed by Tha Yang Sub-district Municipality

(2) Waste Collection and Transportation Distance and Time

The travel distance, travel time and average speed of traced waste collection vehicles by Time and Motion Survey-A and B. Wastes collection are conducted in the morning from 4:00 am to before 12:00 am. The travel distances are between 30 km to 70 km. However, the collection vehicle and container carrier traveled a distance of 110 km.

The travel distance of waste collection depends on capacity of the waste collection vehicles. It was observed that compaction type vehicles can travel long distance compared to an open sideways truck type.





**Figure 6-8 Examples for Result of Time and Motion Survey-A (1)**

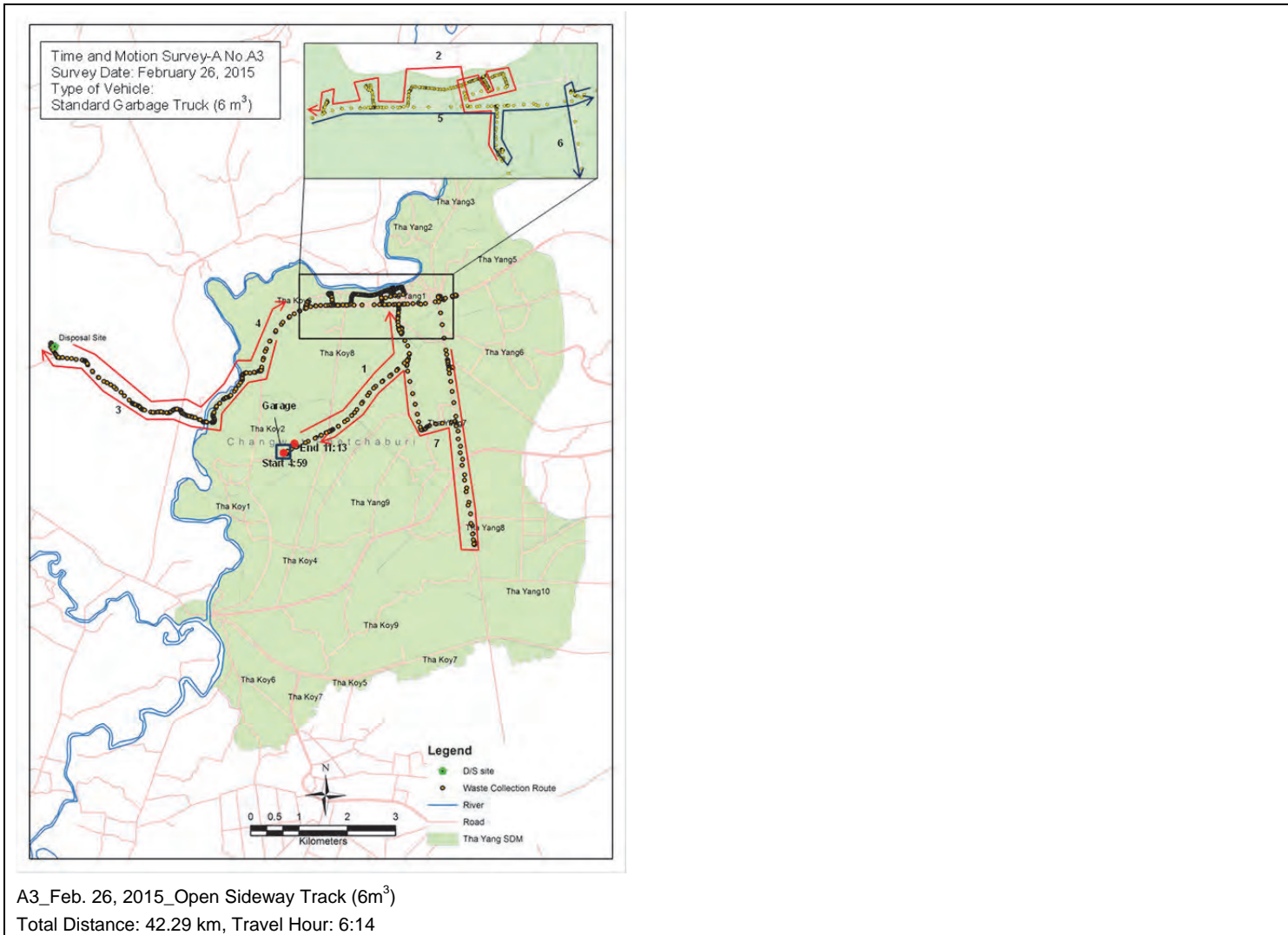


Figure 6-8 Examples for Result of Time and Motion Survey-A (2)

## 6.5 Waste Recycling Activities

### 6.5.1 Recyclable Waste

According to the results of the Household Questionnaire Survey and interviews conducted with the junkshops, the following wastes are collected and recycled in Tha Yang SDM:

- Newspaper, Magazine
- Cardboard
- Other paper
- Drinking Glass bottle
- Other glass
- Steel can
- Aluminum can
- Metals
- Kitchen waste
- Plastic

### 6.5.2 Stakeholders of Recycling Activities

#### (1) Overview

The recyclable waste is separated mainly in three places as follows (see Figure 6-9):

- waste generation by waste generator
- during waste collection and transportation by waste collection crews
- disposal site by waste pickers

The first one which is the waste generation by waste generator is done at the generation sources such as households, shops and others. People bring these to the junkshops by themselves or give it to the recyclable waste collectors, waste banks, and then bring them to the junkshops. The second one is that waste are segregated by waste collection crews. During waste collection and transportation, waste collection crews pick up the recyclable waste from wastes bins. They sell these recyclable wastes every two days or three days to the junkshops. The third one is that waste are separated at the disposal site by waste pickers at disposal site. They pick up recyclable wastes at disposal site.

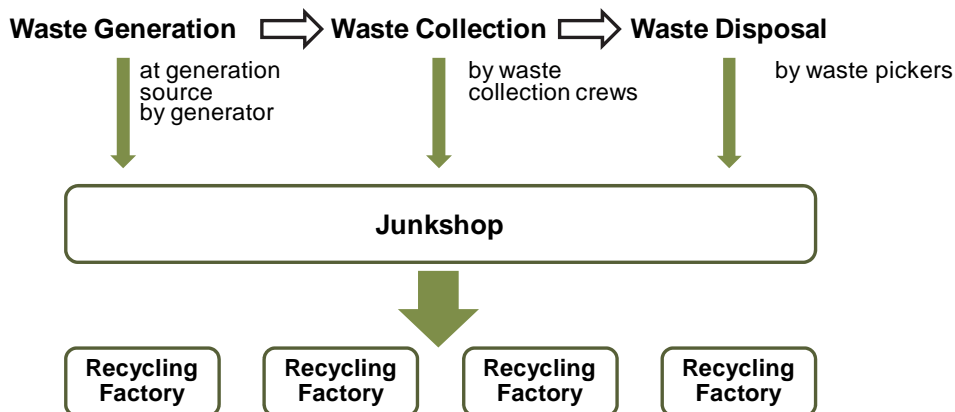


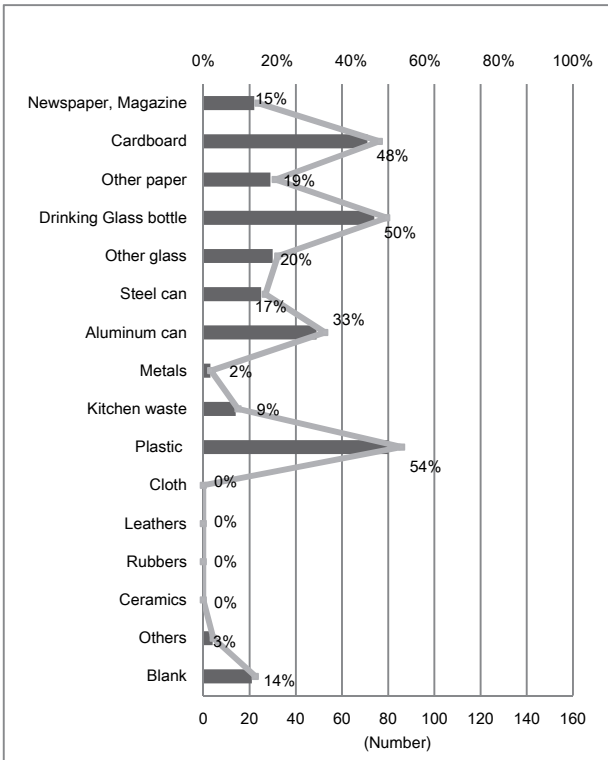
Figure 6-9 Major Recyclable Waste Separations



(2) Household and Other Waste Generators

At the waste generation sources, the recyclable wastes are segregated for waste recycling. The shops segregated the cardboard and wrapping the materials, restaurants collect glass bottles and PET bottles.

At the households, people also undertake segregation for recyclable wastes from other wastes. According to the results of the Household Questionnaire Survey (February 2015), it revealed that 83% of respondents segregate recyclable waste (total samples: 149). Figure 6-10 shows which wastes are segregated for recycling. As shown, the most popular recyclable wastes are plastics including PET bottles which accounts for 54% of the respondents. Cardboards, drinking glass bottles, aluminum cans are also among the major wastes segregated at households which accounts for more than 30%.



Total respondents: 149 samples  
 Source: Q4-13, Household Questionnaire Survey, February 2015

**Figure 6-10 Segregated Waste by Household**

(3) Recycling Industry

There are 13 registered junkshops in Tha Yang. At present, only 8 junkshops are operated, and buy different types of recyclable waste. In general, sellers including NGOs, citizens and companies bring recyclable waste to junkshops. Then they sell to the other junkshops or waste recycling factories within and outside of Tha Yang SDM.



**Figure 6-11 Junkshops in Tha Yang**

(4) Waste Picker

There are three waste pickers for recyclable wastes in the disposal site. This activity can result in waste reduction of disposed wastes at the disposal site. An interview was conducted with two waste pickers in March 2015. It is estimated that around 321 kg/day of recyclable wastes are picked up by these three waste pickers, of which data is shown in Table 6-12.

The waste pickers sell to the junk shops regularly, of which the selling price depends on market price.



Waste Picker

Waste Picker

Hat for Waste Picker

Waste Picker

**Figure 6-12 Waste Picker in Disposal Site**

**Table 6-4 Estimated Collected Recyclable Waste by Waste Pickers**

Items	Total (kg/month)	Total (kg/day)
Newspaper, Magazine	300	11.54
Cardboard	600	23.08
Other paper	-	-
Drinking Glass bottle	1,600	61.54
Other glass	800	30.77
Steel can	1,100	42.31
Aluminum can	44	1.69
Metals	460	17.69
Kitchen waste	200	7.69
Plastic	3,180	122.31
PET bottle	36	1.38
Cloth	-	-
Leathers	-	-
Rubbers	-	-
Ceramics	-	-
Others (Copper wires)	2	0.08
Stainless	6	0.23
<b>Total</b>	<b>8,364</b>	<b>321.69</b>

Source: Waste Picker Interview Survey, March 2015

## 6.6 Waste Disposal

### (1) Overview

The outlines of Tha Yang disposal site is shown in Table 6-5. Tha Yang has a total of 25,600 m<sup>2</sup> or 16 rai of waste disposal site located in Tha Laeng. It was established in 1995 and is located about 12 km from the town centre. The Pollution Control Department (PCD) categorized this disposal site as an open-dumping with covering soil employing a strict compliance of covering soil method.

The Tha Yang D/S receives waste not only from Tha Yang SDM but also from its neighboring TAO namely; Yang Yong TAO and Wang Krai TAO. Within the vicinity of disposal site is another disposal site owned and managed by a private company and on the other side was a closed solid disposal site.

**Table 6-5 Outlines of Tha Yang Waste Disposal Site**

Location	Orbortor Tha Laeng
Address	Ban Huai Taklae Moo 5, Tha Laeng Sub District Municipality, Tha Yang District, Phetchaburi Province
Size of Area	25,600 m <sup>2</sup> or 16 rai All area is reclaimed by waste

Land Use surrounding of D/S	Forest, Fruit trees Houses are located at around 3km from D/S
Operation Period	1995
Method of disposal	Covering soil method Height of disposed waste is 2 – 3 m
Facility and Equipment	Fence, access road Bulldozer (rent)
Waste Pickers	Three waste pickers There are hats in D/S for storage of collected recyclable waste

Figure 6-13 illustrates the existing conditions of the Tha Yang disposal site.

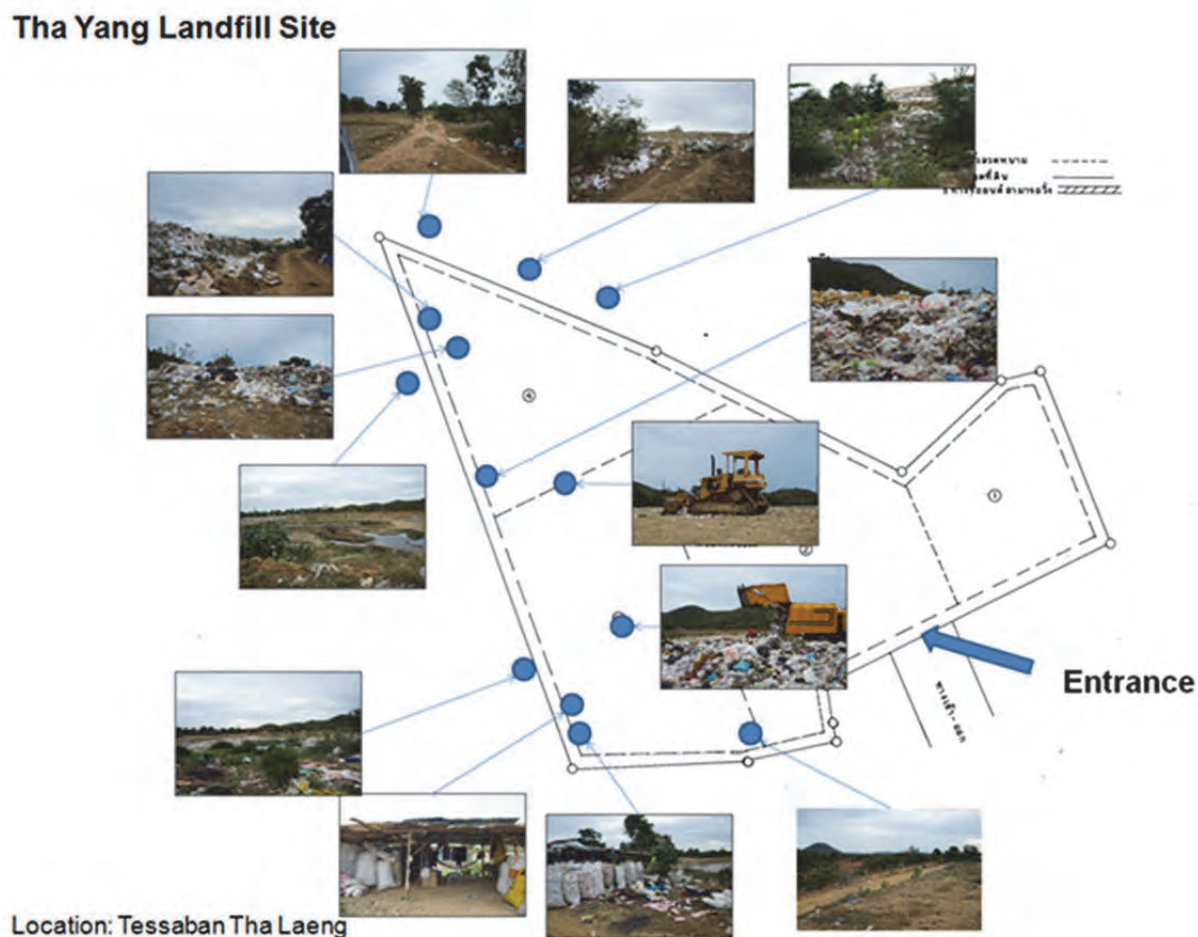


Figure 6-13 Conditions of Tha Yang Disposal Site

(2) Incoming Waste Amount at D/S

An incoming waste survey was conducted in March 2015. This survey covers the whole day and was carried out by counting the collection vehicles from Tha Yang SDM and other LAs such as Wang Krai and Yang Yong SDM. The results of survey are shown in Table 2.6.3. The total incoming waste at the disposal site is 57.36 tons/day, of which 64 % of waste comes from Tha Yang. On the other hand, incoming waste from other SDMs accounts for 36% or 20.64 tons/day (see Table 6-6).

**Table 6-6 Incoming Waste at Disposal Site from Tha Yang and other LAs**

Collected Area	Incoming Waste (ton/day)	%
Tha Yang	36.72	64.0
Other LAs	20.64	36.0
Total	57.36	100.0

(3) Capacity of Disposal Site

Since the start of the waste disposal at this disposal site in 1995, the wastes disposed in the site are estimated to be at 2 to 3 m thickness as flat pile in the whole area of disposal site. The SDM estimated to use this disposal site for 2 to 3 years more under the same conditions.

## **7. Framework for Pilot Project 1**

### **7.1 Pilot Project Site**

Pilot Project-1 site is the whole of Tha Yang Sub-district Municipality, Phetchaburi Province. The Tha Yang Sub-district Municipality has a waste disposal site in Tha Leang Sub-district Municipality so that Pilot Project site is the following site:

- Tha Yang SD Municipality
- Disposal site for Tha Yang Sub-district Municipality in Tha Leang Sub-district Municipality

### **7.2 Objectives and Target Solid Waste**

Objectives of Pilot Project-1 are:

- To verify implementation mechanism for solid waste management system including planning, implementation and monitoring of the plan
- To accumulate know-how for solid waste management
- To disseminate results of Pilot Project-1 to other LAs

Targets of solid waste are as the followings:

- Household waste
- Market waste
- School waste
- Temple waste

The examples of establishment are restaurant, souvenir shop, hotel, Tesco Lotus.

### **7.3 Pilot Project Period**

- Pilot Project period is 15 months as follows:
- October 2014 – December 2015

### **7.4 Pilot Project Structure and Components**

The structure of Pilot Project-1 is shown in Figure 7-1. Solid Waste Management consists of four components as follows:

- Generation
- Collection/Transportation
- Intermediate treatment
- Disposal



In the beginning of Pilot Project-1, solid waste management surveys were conducted in order to obtain scientific data for rational solid waste management planning. Based on survey data, Sub-district Municipal Solid Waste Management Action Plan in Tha Yang will be formulated. The Action Plan will be implemented in cooperation with Tha Yang Sub-district Municipality and Task Force Team established to guide and provide support to Tha Yang Sub-district Municipality. The Figure below shows the structure of Pilot Project-1.

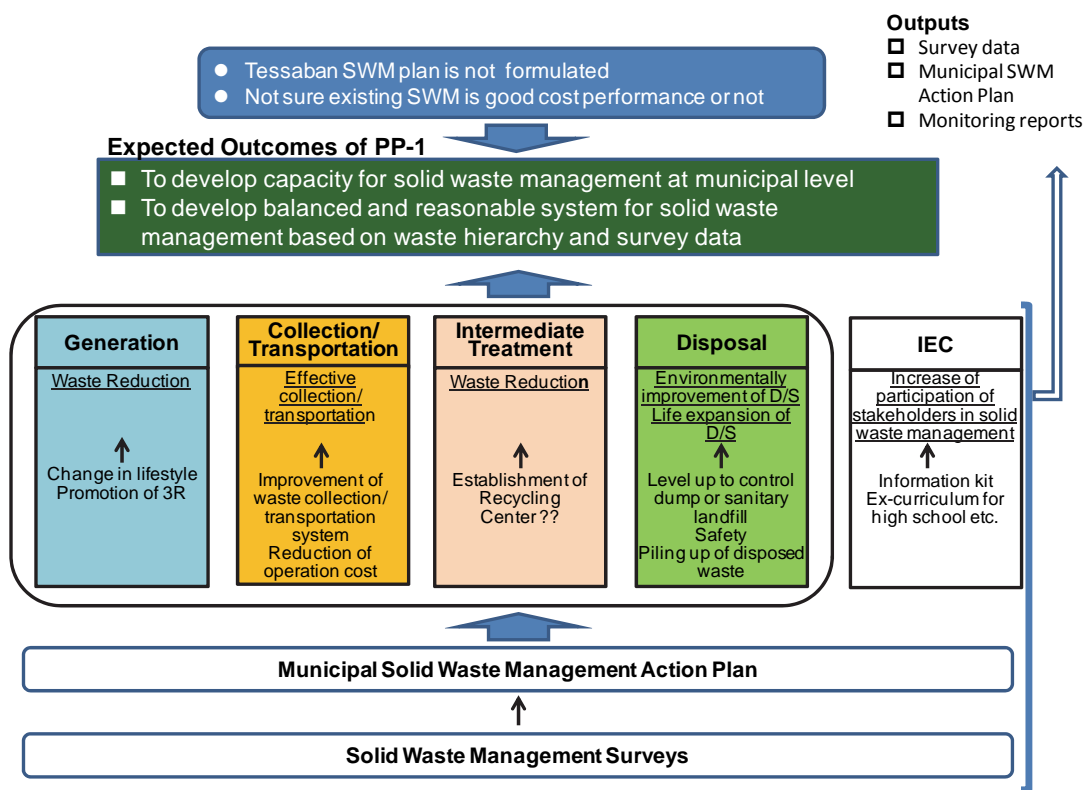


Figure 7-1 Pilot Project-1 Structure

### 7.5 Sub-district Municipality Solid Waste Management Action Plan

The framework of Tha Yang Sub-district Municipal Solid Waste Management Action Plan is as follows:

#### 1) Status of the Plan

Tha Yang Solid Waste Management Action Plan covers the whole Sub-district Municipality. It is expected that the Action Plan was considered as an official plan, which maybe authorized by the Major or City Council.

#### 2) Planning Area

In principle, planning area covers the whole Tha yang Sub-district municipality. However, for waste collection/transportation, populated areas are focused as intensive planning area.

Disposal site is located out of Tha Yang Sub-district Municipality so that disposal site of Tambon Tha Leang is included for planning area.

### 3) Implementation Period

Sub-district Municipal Solid Waste Management Action Plan was formulated during pilot project period. The Action Plan covers the following two fiscal years:

- 2015 and 2016 fiscal year plan: March 2015- December 2015

### 4) Domain of the Plan

In principle, the Action Plan has the following domains.

- Waste Reduction/Recycling Plan
- Waste Collection/Transportation
- Intermediate Treatment Plan
- Final Disposal Plan
- Information, Education and Communication (IEC) Plan

## 7.6 Pilot Project Phasing

The implementation of Pilot Project-1 consists of 3 phases as follows:

- Phase 1: Preparation of Pilot Project-1
- Phase 2: Formulation of Municipal SWM Action Plan
- Phase 3: Implementation of Municipal SWM Action Plan

Time frame of Pilot Project-1 and project process are shown in Table 7-1 and Figure 7-2.

**Table 7-1 Project Phasing**

Phase	2015 Fiscal Year											2016 Fiscal Year					
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.
Phase 1: Preparation of Pilot Project-1	█																
Phase 2: Formulation of Municipal SWM Action Plan		█	█	█	█	█	█	█									
Phase 3: Implementation of Municipal SWM Action Plan									█	█	█	█	█	█			
Phase 4: Formulation of Next Municipal SWM Action Plan									█	█							
Phase 5: Implementation of Next Municipal SWM Action Plan													█	█	█	█	█



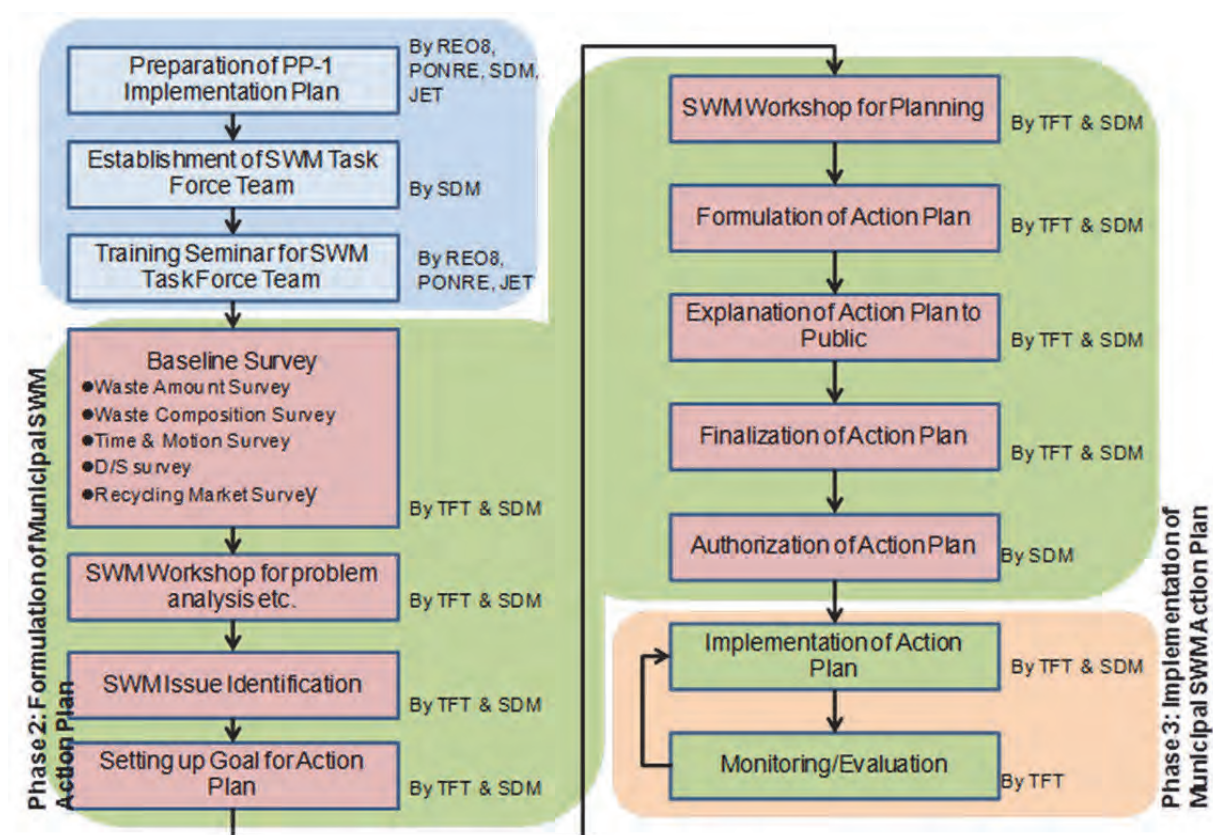


Figure 7-2 Process of Pilot Project-1

## 8. Implementation Mechanism for Pilot Project 1

### 8.1 Implementing Structure of Pilot Project-1

Implementing structure for Pilot Project is shown in Figure 4-1. A Pilot Project Advisory Team was established by Thai and JICA sides. The Pilot Project Advisory Team guides right of direction and suggest technical aspect during implementation.

Under the Advisory Team, Pilot Project-1 Task Force Team was established. There are various stakeholders in solid waste management including governments, private sector, academic, volunteers and NGOs, and community and citizens. Necessary stakeholders should be identified and involved in Pilot Project-1.

### 8.2 Roles of Key Related Organizations

Roles of key organization of Pilot Project-1 are shown in Table 8-1. Tha Yang Sub-district Municipality has a responsibility of solid waste management in Tha Yang that is their official duties. Task Force Team works together closely with Sub-district Municipality for solid waste management during Pilot Project period.

REO8 and PONRE Phetchaburi provide technical support and coordinate the smooth implementation of the pilot project. Communities and citizens are also involved and participate in waste generation and collection/transportation components. Communities and citizens have an important roles in these components. Private recycling companies were also be involved in intermediate treatment component being partners in solid waste management. Since the disposal site, is located in Tha Leang Sub-District Municipality, it is necessary to involve Tha Leang Sub-District Municipality in the process of improvement. In this case, coordination with PAO is important.

**Table 8-1 Key Organizations for Pilot Projects-s**

REO8	PONRE	Task Force Team (TFT)	Municipality	Community Private Sector, others	JET
<ul style="list-style-type: none"> <li>● Provide technical support</li> <li>● Share implementation of Action Plan with Tha Yang SDM</li> </ul>	<ul style="list-style-type: none"> <li>● Provide technical support</li> <li>● Provide financial support</li> <li>● Share implementation of Action Plan with SDM</li> </ul>	<ul style="list-style-type: none"> <li>● Conduct Baseline Survey</li> <li>● Organize Workshop</li> <li>● Formulate Action Plan</li> <li>● Implement Action Plan</li> </ul>	<ul style="list-style-type: none"> <li>● Establish TFT</li> <li>● Support TFT and others in SWM</li> <li>● Authorize Action Plan</li> </ul>	<ul style="list-style-type: none"> <li>● Participate activities for SWM</li> <li>● Cooperate with Municipality and TFT</li> </ul>	<ul style="list-style-type: none"> <li>● Provide technical support</li> <li>● Share implementation of Action Plan</li> </ul>

### 1) Pilot Project-1 Task Force Team

In order to enhance participation and create ownership of the pilot projects, Task Force Team was organized in each pilot project site. Each Task Force Team's function is to coordinate the implementation of the pilot project; assist in its implementation and report the progress to the Pilot Project Advisory Team. Chaired by PONRE Directors, the Task Force Team for Pilot Project 1 is composed of (12) twelve members. Table 8-2 shows the detailed composition of the pilot project's task force team in each pilot project site.

**Table 8-2 Composition of Task Force Team in Pilot Project 1**

Chair Person	Director Pipop Phatcharaphansakul, PONRE Phetchaburi
<b>Members</b>	
REO8	Ms. Kullada Eakboonchu
PONRE Phetchaburi	Mr. Nippon Chaisalee Ms. Chantana Bualom
SDM	Mr.Thawatchai Kunthithong, Chief Administrative Mrs.Suni Kunthiamsin, Director, Public Health and Environment Mr. Rueangsin Hasakun, Director, Public Works Section Ms. Chanthra Mahabenchawong, Head, Public Health Administrator Mr. Supphawit Sochaemchit, Head of Sanitary Works Ms. Waraphon Thawisi, Registered Nurse
Community Group	Mrs.Janthimar Pinhiran, Environmental Volunteer

### 2) Tha Yang Sub-district Municipality

Tha Yang Sub-district Municipality has two departments related to solid waste management, namely Department of Public Health and Environment and Department of Public Works. The staffs in these departments were actively involved in Pilot Project-1 implementation. It is expected that after the implementation of the pilot project, these departments were continued to play significant role in the overall solid waste management works.

## **9. Tasks and Schedule of Pilot Project 1**

Schedule of tasks is shown in Task in Figure 9-1.

### **1) Phase 1: Preparation of Pilot Project-1**

#### Task 1-1: Preparation of Implementation Plan

The Implementation Plan was prepared by PONRE Phetchaburi, Tha Yang Sub-district Municipality, REO8 and JET. The Implementation Plan laid down the details of the pilot project as well its overall implementation mechanisms.

#### Task 1-2: Establishment of Implementation Mechanism

The stakeholders that involved in the implementation of the project were identified and participation mechanisms were laid down for smooth implementation of the Pilot Project-1.

#### Task 1-3: Establishment of Task Force Team

Task Force Team was established as well as their roles and functions were identified as shown in Table 8-2.

#### Task 1-4: Training for Task Force Team

Training seminars were conducted for the Task Force Team and Tha Yang Sub-district Municipality will be organized by REO8, PONRE and JET. These seminars were expected to impart knowledge on solid waste management relevant in the implementation of pilot project activities.

### **2) Phase 2: Formulation of Municipal SWM Action Plan**

#### Task 2-1: SWM Surveys

The following solid waste management surveys were conducted in order to obtain scientific data:

- Waste amount survey
- Waste composition survey
- Time and Motion survey
- Disposal site survey
- Recycling market survey

These surveys were conducted in coordination with the Task Force Team and Tha Yang Sub-district Municipality. Waste amount and composition surveys will cover the whole pilot project site, while Time and Motion survey covers mainly those populated areas. A disposal site survey will also be conducted at the existing site.

### Task 2-2: Design of Planning Workshop

Design for the series of Planning Workshop was prepared and conducted in order to formulate Solid Waste Management Action Plan for Tha Yang. Participatory method should be adopted for management of these workshops.

### Task 2-3: Series of Planning Workshop

Series of planning workshops were organized by PONRE, and Tha Yang Municipality initiated by Task Force Team. Process for Planning Workshops is shown in Figure 9-1. Mainly participants of Planning Workshop were Task Force Team and Tha Yang Sub-district Municipality. If necessary, other stakeholders can be invited such as recycling companies, academe and others.



**Figure 9-1 Process of Planning Workshop**

### Task 2-4: Formulation of Draft Action Plan

Based on Planning Workshop (Task 2-3), Draft Tha Yang Sub-district Solid Waste Management Action Plan was formulated by the Task Force Team, Tha Yang Sub-district Municipality and JET.

### Task 2-5: Explanation of Draft Solid Waste Management Action Plan to Public

Draft Solid Waste Management Action Plan was explained in order to exchange opinion and obtain comments. This task also aimed to disseminate information and awareness about the Pilot Project-1.

### Task 2-6: Finalization of Solid Waste Management Action Plan

Tha Yang Sub-district Solid Waste Management Action Plan was finalized by Task Force Team, Tha Yang Sub-district Municipality and JET based on Task 2-7.

Task2-7: Authorization of Action Plan

Final Solid Waste Management Action Plan was authorized by Sub-district Municipality as Sub-district municipal plan. Methodology for authorization was discussed later.

**3) Phase 3: Implementation of Municipal SWM Action Plan**

Task 3-1: Implementation of Solid Waste Management Action Plan

Solid Waste Management Action Plan was implemented.

Task 3-2: Monitoring/Evaluation of Activities

Implementation of Action Plan was monitored by Task Force Team regularly. The Task Force Team reports monitoring results to Pilot Project Advisory Team. The Advisory Team was also monitor the progress of the implementation thru site visits, etc.

**Table 9-1 Scheduled of Pilot project-1**

Activities	2015 Fisical Year												2016 Fiscal Year			
	2014						2015						2016			
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Phase 1: Preparation of PP1</b>																
Preparation of Implementation Plan	■	■														
Establsihment of Implementation Mechanism	■	■														
Establsihment of Task Force Team			■													
Training for Task Forcce Team				■				■								
<b>Phase 2: Formulation of Municipal SWM Plan</b>																
SWM Surveys				■	■	■	■	■								
Design of Planning Workshop			■	■	■	■	■									
Series of Planning Workshop				■	■	■	■									
Formulation of Draft Action Plan					■	■	■	■								
Explanation of Draft Acton Plan to Public									■							
Finalization of Action Plan										■	■					
Authorization of Action Plan											■	■				
<b>Phase 3: Implementation of Action Plan</b>																
Implementation of Action Plan													■	■	■	■
Monitoring/Evalotion of Activities													■	■	■	■

## 10. Major Pilot Project Activities and Outputs

During the period covered, a series of meetings and consultations were conducted with Tha Yang SDM facilitated by PONRE Phetchaburi and supported by the JICA Expert Team. In each meeting and consultation, pilot project implementation mechanisms were clarified and the roles and functions of various stakeholders were understood. In each meeting the schedules and plan of activities were also discussed. PONRE Phetchaburi was actively engaged in the overall coordination of the Task Force Team and facilitated smooth communication with the Mayor of Tha Yang SDM.

Major activities of Pilot Project-1 are shown in Table 10-1.

**Table 10-1 Major Activities of Pilot Project-1**

Month	Day	Activity
<b>2014</b>		
September	15	<input type="checkbox"/> Meeting on Implementation Plan and Task Force Team with PONRE Phetchaburi, JET (at PONRE Phetchaburi Office)
October	08	<input type="checkbox"/> Meeting on Implementation Plan with REO8, PONRE Phetchaburi, Tha Yang SDM, Tha Leang SDM, JET (Tha Yang SDM Hall)
	29	<input type="checkbox"/> Meeting on PP boundary with Tha Yang SDM
	31	<input type="checkbox"/> Meeting on Pilot Project Sites and Solid Waste Management Action Planning Site with PONRE Phetchaburi, Tha Yang SDM, JET (Tha Yang SDM Hall)
November	14	<input type="checkbox"/> Submitting and explanation of Implementation Plan to Tha Yang SDM <input type="checkbox"/> Submitting and explanation of Implementation Plan to REO8 <input type="checkbox"/> Sending of Implementation Plan to PONRE Phetchaburi through e-mail
	28	<input type="checkbox"/> Receiving of Notification Letter by Tha Yang SDM
December	15	<input type="checkbox"/> Sending of Accepted Letter from Tha Yang SDM to ONEP
<b>2015</b>		
January	mid to end	<input type="checkbox"/> Series of preparation meetings for "Training Seminar on Solid Waste Management for PP1 Task Force Team and Tha Yang SDM" <input type="checkbox"/> Series of preparation meetings for SWM surveys
February	9, 10	<input type="checkbox"/> Training Seminar on Solid Waste Management for PP1 Task Force Team and Tha Yang SDM at Tha Yang Hall
	10	<input type="checkbox"/> Meeting for SWM surveys at Tha Yang Hall with ONEP, REO8, PONRE Phetchaburi, Surveyors and JET
	14	<input type="checkbox"/> Preparatory Meeting for Solid Waste Management Surveys
	16, 17	<input type="checkbox"/> Solid Waste Management Survey - Household Questionnaire Survey -
	20	<input type="checkbox"/> Solid Waste Management Action Planning Workshop - 1 - Problem Analysis, Stakeholder Analysis
	23 - 26	<input type="checkbox"/> Solid Waste Management Survey - Waste Amount and Composition Survey
	25, 26	<input type="checkbox"/> Solid Waste Management Survey - Time and Motion Survey-A
26	<input type="checkbox"/> Solid Waste Management Survey - Time and Motion Survey-B	

March	2	<input type="checkbox"/> Solid Waste Management Survey - Time and Motion Survey-B <input type="checkbox"/> Solid Waste Management Survey - Incoming Waste Survey at D/S
	3	<input type="checkbox"/> Solid Waste Management Action Planning Workshop - 2 - Vision Matrix
	9	<input type="checkbox"/> Solid Waste Management Action Planning Workshop - 3 - Objectives Analysis/Identification of Solutions
	16	<input type="checkbox"/> Solid Waste Management Action Planning Workshop - 4 - Planning Matrix
	24	<input type="checkbox"/> Interview to Junkshops
	25	<input type="checkbox"/> Solid Waste Management Action Planning Workshop - 5 - Planning Matrix
	27 - 31	<input type="checkbox"/> Preparation of SWM Action Plan
April	1	<input type="checkbox"/> Explanation of SWM Action Plan to Tessaban Tha Yang and PONRE Phetchaburi
	2 - 9	<input type="checkbox"/> Revision of SWM Action Plan
	21	<input type="checkbox"/> PPI Task Force Team Meeting at Tha Yang SDM Hall
	27	<input type="checkbox"/> Advisory Team Meeting at REO8
May	26	<input type="checkbox"/> Training Seminar on Solid Waste Management for PPI Task Force Team and Tha Yang SDM (Waste disposal)
June	4	<input type="checkbox"/> Meeting in Explanation of Up-grading and Lifespan Extension Plan at Tha Yang SDM including Field Visit (38 participants)
	5	<input type="checkbox"/> Seminar on Tha Yang SWM Action Plan (Public Hearing) including Waste Segregation (140 participants)
July	14	<input type="checkbox"/> PPI Task Force Team Meeting at Tha Yang SDM Hall
	14	<input type="checkbox"/> 1 <sup>st</sup> Community Meeting for PPI Sub-Pilot Project (Explanation of Sub-Pilot Project by Tessaban)
	21	<input type="checkbox"/> Pilot community meeting and hand over waste bins for hazardous waste and recycle waste
August	4	<input type="checkbox"/> Discussion with Tessaban about school activities
	13	<input type="checkbox"/> Environmental Education (Waste separation) at Ban Tha Yang School
September	2	<input type="checkbox"/> Pilot community meeting and hand over waste bins for hazardous waste and recycle waste
	3-4	<input type="checkbox"/> Environmental Education (Waste management) at Tha Yangwittaya School and study trip <input type="checkbox"/> Environmental Education (Waste separation) at Wat Tha Koi School
	10	<input type="checkbox"/> Explanation draft safety manual for waste collection and transportation to Tessaban officer <input type="checkbox"/> Shooting VDO for SWM survey
	11	<input type="checkbox"/> Environmental Education (public awareness in 3R) at Ban Tha Yang School <input type="checkbox"/> Selection Meeting of Winners for Logo & Mascot Contest
	29	<input type="checkbox"/> Inspection Survey for Grass-roots Fund by Embassy of Japan
	30	<input type="checkbox"/> Award Ceremony for Logo & Mascot Contest
	30	<input type="checkbox"/> Technical Seminar on Safety Waste Collection and Transportation Services for Divers and Waste Collection Crews
October	9	<input type="checkbox"/> Task Force Team Meeting on PP-1 Evaluation
November to December	-	<input type="checkbox"/> Production of Solid Waste Management Survey Manual Video
December	8	<input type="checkbox"/> Advisory Team visited to PPI site
	9	<input type="checkbox"/> Advisory Team Meeting

Outlined below are the major activities conducted in cooperation with the Task Force Team, REO8 and PONRE Phetchaburi and the JICA Expert Team:



## 10.1 Preparation of Pilot Project-1

### 1) Preparation of Implementation Plan

From September 2014, we discussed scope of Pilot Project-1 with REO8, PONRE Phetchaburi, Tha Yang SDM and JICA Exert Team (JET). Implementation Plan of Pilot Project-1 was prepared based on discussion. At the same time, Pilot Project-1 Task Force Team was established. Detail of Task Force Team is described in Chapter 8. Implementation Plan is attached with Appendix A.

### 2) Training Seminar on Solid Waste Management for Task Force Team and Tha Yang SDM

A Training Seminar for the Task Force Team and Tha Yang Sub-district Municipality was held at Tha Yang Sub-district Municipality from February 9 to 10, 2015. The objectives of the training seminar were to share understanding of solid waste management systems and to enhance knowledge of the overall system of solid waste management. Attended by 20 participants from SDM Tha Yang, REO8 and ONEP, the major topics during the training seminar consisted of the solid waste management flow, namely: waste collection and transportation; intermediate treatment and final disposal. Table 10.2 contains the Program of Training Seminar on Solid Waste Management for Task Force Team and Tha Yang SDM.





**Training Semnar on Solid Waste Management**

**Table 10-2 Training Program for Task Force Team on Solid Waste Management**

<b>Day 1</b>	<b>February 9, 2015</b>	
9:30 - 10:00	Registration	
10:00 - 10:10	Welcome Speech by Mayor of Tha Yang SDM	
10:10 - 10:20	Opening Speech by Director of REO8	
10:20 - 10:40	Introduction of Participants	
10:40 - 11:00	Course Briefing by PONRE Phetchaburi	
11:00 - 11:30	Regional EQMP and Pilot Project-1 by JET	<ul style="list-style-type: none"> <li>• SWM problems in REO8</li> <li>• Strategies of Regional EQMP and Pilot Project-1</li> </ul>
11:30 - 12:00	Existing Situation of SWM in Tha Yang SD Municipality by Tha Yang SDM	
12:00 - 13:00	Lunch Break	
13:00 - 13:30	PCD SWM Road Map by REO8	
13:30 - 14:00	Video Program on "Experiences of Tokyo Metropolitan Government in Solid Waste Management" by JET	
14:00 - 14:30	Basic Knowledge of SWM-1: Overview of SWM by JET	
14:30 - 15:00	Basic Knowledge of SWM-2: Experiences for 3R Movement by REO8	
15:00 - 15:30	Basic Knowledge of SWM-3: Collection/Transportation	
<b>Day 2</b>	<b>February 10, 2015</b>	
10:00 - 10:30	Basic Knowledge of SWM-4: Intermediate Treatment	
10:30 - 11:00	Basic Knowledge of SWM-5: Final Disposal	
11:00 - 11:30	Basic Knowledge of SWM-6: Community Involvement in SWM	
11:30 - 12:00	Basic Knowledge of SWM-7: Introduction of SWM Surveys	
12:00 - 13:00	Lunch Break	
13:00 - 13:30	Video Program on "Experimental Study on Ex-curriculum of High School Students for Solid Waste Management in the Philippines" by JET	
13:30 - 14:00	Tasks and Schedule of Pilot Project-1 by PONRE Phetchaburi	
14:00 - 14:30	Explanation of Planning Workshop and SWM Action Plan by JET	
14:30 - 14:50	Conferment of Training Certificate to Participants	
14:50 - 15:00	Closing Speech by Tha Yang SDM or REO8	
15:00 - 15:10	Closing Remarks by PONRE Phetchaburi	

## 10.2 Formulation of Tha Yang Solid Waste Management Action Plan

### 1) Solid Waste Management Surveys

Solid waste management surveys were carried out in order to generate baseline information about the solid waste situation in Tha Yang. Table 10-3 shows the outline of the solid waste management surveys to be undertaken while Table 10-4 indicates the schedule of the surveys.

**Table 10-3 Outline of Solid Waste Management Surveys**

Survey	Objectives	Methods	Utilization of Data
Household Questionnaire Survey	<ul style="list-style-type: none"> <li>● To understand the situations of solid waste management</li> <li>● To understand people's satisfaction with the existing solid waste management</li> </ul>	1) Interview	<input type="checkbox"/> To assess the existing solid waste management from the viewpoint of the people.
Waste Amount Survey	<ul style="list-style-type: none"> <li>● To estimate amount of generated waste from households</li> </ul>	1) Take samples from households or waste collection vehicles by classified generation sources 2) Measures weight of waste	<input type="checkbox"/> To estimate amount of generated waste and waste generation rate <input type="checkbox"/> To prepare waste flow
Waste Composition Survey	<ul style="list-style-type: none"> <li>● To measure waste composition</li> </ul>	1) To take samples from households or waste collection vehicles by classified generation sources 2) Classify waste into several categories such as paper, cloth, plastic, wood, kitchen waste, metal etc. 3) Measure weight of each category	<input type="checkbox"/> To assess methods for waste treatment and disposal <input type="checkbox"/> To assess possibility of recycling
Time & Motion Survey	<ul style="list-style-type: none"> <li>● To assess effectiveness of waste collection and transportation</li> <li>● To observe waste discharging actions of the citizens and actions of collection crews</li> </ul>	1) To follow collection vehicles from garage collection stations to D/S 2) To measure and record time spent for each activity for collection and transportation of waste	<input type="checkbox"/> To utilize for improvement of collection and transportation methods
Incoming Waste Survey at D/S	<ul style="list-style-type: none"> <li>● To assess the existing D/S</li> <li>● To estimate amount of waste coming into D/S</li> </ul>	1) To observe conditions of disposed waste including location, contents of waste, scattering of waste 2) To observe operation of un-loading waste and disposal of waste by collection vehicles and heavy equipment	<input type="checkbox"/> To estimate amount of disposed waste at D/S <input type="checkbox"/> To provide insights regarding how to increase capacity for disposal of the waste

Source: JICA Expert Team

**Table 10-4 Schedule of Solid Waste Management Survey**

Task	February														March								
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	6	7
	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Preparation of surveys		■																					
Household Questionnaire Survey				■	■	■	■	■															
Waste Amount Survey											■	■	■	■	■								
Waste Composition Survey											■	■	■	■	■								
Time and Motion Survey A													■	■	■								
Time and Motion Survey B													■	■	■				■	■	■	■	■
Incoming Waste Survey																			■	■	■	■	■

Survey
  Analysis
  Data Entry

Source: JICA Expert Team

The mentioned surveys were conducted by a group of surveyors composed of representatives from PONRE, Environmental Volunteers, JICA Expert Team and student volunteers.

The results and analysis of the above mentioned surveys were compiled as Solid Waste Management Survey Data Book (see perspective below and Appendix B) by PONRE Phetchaburi, in cooperation with the Task Force Team and JICA Expert Team in March 2015 and was one of the bases for the formulation of the SWM Action Plan.

Household Questionnaire Survey

The household questionnaire survey was conducted from February 16-17, 2015 to understand the situation of solid waste management at the household level as well as to learn the perceptions of the households about solid waste and the system of solid waste management in Tha Yang SDM from the view point of the household level.



**Figure 10-1 Questionnaire Survey in Tha Yang on February 16, 2015**



Based on population ratio of villages and income levels, a total of 149 samples were generated from two high density populated areas in Tambon Tha Yang and Tambon Thakoy.

Waste Amount Survey

The waste amount survey was conducted on February 23-25 and March 23, 2015 in order to estimate the amount of generated waste from seven selected waste generators namely households, restaurants, shops, schools, temple and hospitals/clinics. A total of 78 samples were generated by the waste generators with the following sample distribution:

**Table 10-5 Distribution of Samples in Waste Amount Survey**

Waste Generators	No. of Samples
1) Households	
Densely populated Muban	31
Low/moderate/non-populated Muban	14
2) Restaurants	5
3) Shops	20
4) Market	2
5) Schools	2
6) Temple	2
7) Hospitals/Clinics	2
<b>Total</b>	<b>78</b>



**Figure 10-2 Waste Amount Survey in Tha Yang**

Waste Composition Survey

The waste composition survey was conducted on February 23-26 in order to measure types of waste generation amount from homes. A total of 11 samples were collected from the pre-selected zones which are densely populated and less populated areas. The samples were classified into 10 types. Figure 10-3 shows some of the pictures taken during the conduct of the waste composition survey.

Time and Motion Survey

Time and Motion Survey consists of A and B.

Time and Motion Survey A was conducted on February 26-27, 2015 in order to understand and assess the effectiveness of the waste collection systems of Tha Yang SDM. An observation of waste discharging actions and system were also conducted. The surveyors observed three (3) collection vehicles (from 03:30 am to 11:00am). Aided by a GPS, the surveyors followed the movement of the waste collection vehicles. Figure 10-4 shows some of the pictures taken during the survey.

Time and Motion Survey B was conducted on February 25, 26, and March 2, 2015. Collection routes of total 11 collection vehicles were traced by GPS.



Figure 10-3 Waste Composition Survey





Figure 10-4 Time and Motion Survey, February 25-26, 2015, Tha Yang

## 2) Planning Workshop on Tha Yang Solid Waste Management Action Plan

Planning Workshops on Tha Yang Solid Waste Management Action Plan were held on February 20, March 3, 9, 16 and 25, 2015 in Tha Yang SDM. Attended by total 123 persons from Task Force Teams, waste collection vehicle crews, community leaders and environmental volunteers, the participants shared their knowledge and experiences about the solid waste management in Tha Yang. Facilitated by PONRE Phetchaburi and JET, the participants conducted a problem analysis, stakeholder analysis and planning.

**Table 10-6 Outlines of the Series of Planning Workshop on Tha Yang Solid Waste Management Action Plan**

Days	Title	Objectives	Actions	Participants
Day 1 Feb. 20	Problems Analysis	<input type="checkbox"/> to identify and analyze problems regarding SWM	<ul style="list-style-type: none"> <li>● to identify problems</li> <li>● to structure problem trees</li> </ul>	20
	Stakeholder Analysis	<input type="checkbox"/> to identify stakeholders regarding SWM	<ul style="list-style-type: none"> <li>● to identify stakeholders in SWM</li> <li>● to clarify roles of stakeholders in SWM</li> </ul>	
Day 2 March 3	Visioning Matrix Preparation	<input type="checkbox"/> to image future vision of environmental and living environment regarding SWM (after 3 years or 5 years)	<ul style="list-style-type: none"> <li>● to clarify concrete image of Tessaban environment</li> <li>● to set up goals and target period</li> </ul>	19
Day 3 March 9	Objective Analysis	<input type="checkbox"/> to fill up gap between future vision and problems	● to analyze what are needed in order to fill up gap	61
	Identifying Solution	<input type="checkbox"/> to find how to achieve objectives	● to identify necessary actions within 1 year in order to achieve the future vision	
Day 4 March 16 Day 5 March 25	Planning Matrix Preparation	<input type="checkbox"/> to clarify planning parameters	● to prepare project descriptions including reasons, necessary actions, implementing organizations, project cost and schedule	17 6



**Figure 10-5 Planning Workshops on Tha Yang Solid Waste Management Action Plan**

**3) Seminar on Solid Waste Disposal Management Action Plan**

As part of building the capacity of the TFT on solid waste management, the JET in cooperation with REO8 and PONRE Phetchaburi conducted a training seminar on waste disposal management held on May 26, 2015 at Tha Yang SDM. The seminar was attended by 26 delegations coming from Tha Yang SDM, ONEP, REO8, PONRE Ratchaburi, Samut Songkhram, Prachuap Khiri Khan and selected LAs from Prachuap Khiri Khan Province.



*Participants during the seminar*

*Participants during session*

**Figure 10-6 Seminar on Solid Waste Management Action Plan on May 26, 2015**



#### 4) Finalization and Authorization of SWM Action Plan

With the completion of the SWM Action Plan, the TFT led by the Mayor of Tha Yang SDM held a public hearing on June 5, 2015 to present the details of the SWM Action Plan. This was attended by 140 delegations from the members of Tassaban Council, Section and Departments Heads of Tha Yang SDM, representatives from the different communities in the Tassaban. During this ceremonial celebration, the Mayor of Tha Yang SDM expressed commitment and support for the implementation of Action Plan and asked the representatives of the communities to support the future implementation. The Mayor expressed support to provide and allocate budget for the Solid Waste Management Action Plan implementation.



**Figure 10-7 Participants during the SWM Action Plan Public Hearing held on June 5, 2015 in Tha Yang**

### 10.3 Support in the Implementation of SWM Action Plan

In order to support the implementation of SWM Action Plan, activities were initiated by JET in coordination with PP-1 TFT and PONRE Phetchaburi namely: 1) Preparation of Upgrading and Lifespan Extension Plan for Tha Yang Disposal Site; 2) Preparation of Safety Manual for Waste Collection Crews; 3) Supporting for Fund Accessing for Track Scale Installation and Development of Recyclable Waste Collection Carts to Embassy of Japan; 4) Sub-Pilot Project on Waste Segregation Project with the community, and 4) Mascot and Logo Contest in schools. Details of these are as follows:

#### 1) Seminar on Solid Waste Disposal Management

As part of building the capacity of the TFT on solid waste management, the JET in cooperation with REO8 and PONRE Phetchaburi conducted a training seminar on waste disposal management held on May 26, 2015 at Tha Yang SDM. The seminar was attended by 26 delegations coming from Tha Yang SDM, ONEP, REO8, PONRE Ratchaburi, Samut Songkhram, Prachuap Khiri Khan and selected LAs from Prachuap Khiri Khan Province.



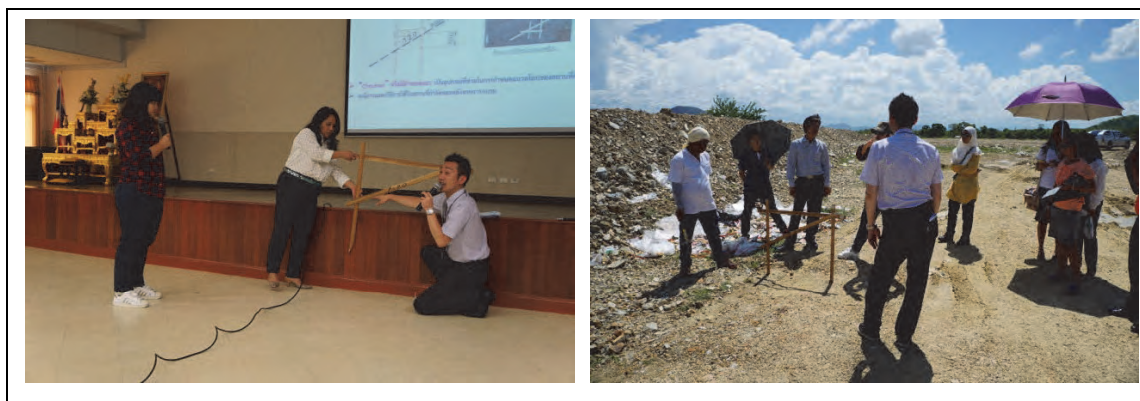
**Figure 10-8 Seminar on Solid Waste Disposal Management**

**2) Preparation of Upgrading and Lifespan Extension Plan for Tha Yang Disposal Site**

During the period covered, technical collaboration was facilitated with Tha Yang Public Works in preparing the plan to upgrade and extend the lifespan of Tha Yang disposal site. The plan was presented to Tha Yang SDM Public Works in the presence of ONEP, REO8, 5 PONREs and LAs in Prachuap Khiri Khan on June 04, 2015 held at Tha Yang SDM. This activity was facilitated to clarify the contents of the plan and to generate feedback and comments.

The proposed upgrading is estimated to cost around 8.5 Million Baht to be constructed within a period of 1-2 years. With the implementation of this plan, the lifespan of the disposal site in Tha Yang can be extended up to 5 years. This plan is now under study by the Heads of Public Works and discussions are underway as to the feasibility and securing budget for its implementation.





**Figure 10-9 Seminar on Upgrading and Lifespan Extension Plan for Tha Yang Disposal Site**

### **3) Preparation of Safety Manual for Waste Collection Crews**

Drivers of waste collection vehicles and waste collection crews are in front of residents. They handle solid waste from household to disposal site. Drivers and collection crews have very important rules in solid waste management. However, drivers and collection crews are always faced with dangerous situations, because solid waste contains hazardous substances inducing glass, electric tube, agricultural chemicals, flammable waste and others. Collection crews are injured sometime. It is one of solid waste management problems.

On the other hand, it is possible to occur accidents during driving waste collection vehicles and waste collection and unloading waste at disposal site.

Safety Manual for Waste Collection and Transportation presents how to ensure safety for drivers and waste collection crews as minimum requirement.

Purpose of this manual is:

- to minimize accident for people, drivers of waste collection vehicles and waste collection crews

Tha Yang SDM and JET organized Seminar for Safety Waste Collection on September 30, 2015 for drivers of waste collection vehicles and waste collection crews based on Safety Manual.





Safety Manual in Thai and English Version

Participants of Safety Manual Seminar

Figure 10-10 Seminar on Safety for Waste Collection Crews

4) **Supporting for Fund Accessing for Track Scale Installation and Development of Recyclable Waste Collection Carts to Embassy of Japan**

In support of the overall SWM Action Plan, JET provided technical support to Tha Yang SDM in the preparation of a project proposal for the installation of track scale as well as the development of 5 units of recyclable waste collection carts amounting to approximately 2 Million Baht. This project proposal was submitted to the Embassy of Japan by Tha Yang SDM on July 24, 2015.



Figure 10-11 Recyclable Waste Collection Cart

### 5) Sub-Pilot Project on Waste Segregation Project with the Community

The Kra Jab community was selected to be the pilot community to undertake the waste segregation project with Tessaban. A community workshop will be conducted on September 02, 2015 to further clarify the objective and activities of the sub-project. The PCD has given JET with specialized containers for hazardous waste and these will be turn over to Kra Jab community. Waste collection carts as well as the establishment of waste station are planned to be implemented in September 2015.



**Figure 10-12 Sub-Pilot Project in Kra Jab Community for Waste Segregation**

### 6) Mascot and Logo Contest in School Students

The mascot and logo contest was participated by three schools namely: Ban Tha Koy School (Primary School Grade 1-6), Ban Tha Yang School (Primary School Grade 5-6), and Tha Yang Wittaya School (High School Grade 5). There were a total of 63 entries received, of which 59 entries are from primary school and 4 entries are coming from secondary school.

By the middle of Sept 2015, these entries will be judged according to the criteria set by the TFT namely: originality, appropriateness of the design to solid waste management, color coordination, and message. The winner/s of the contest will received plaque of appreciation from JET and non-winners will all received complimentary gifts. The Mayor of Tha Yang and the Public Works Department have also confirmed that the winning entry/ies or best logo and mascot designs will be used to as materials for the succeeding public campaign of the SDM, logo for reports and collection cars and carts, etc.





Selection of Winners



Winners



Mascot  
Elementary School

Logo  
Elementary School

Mascot  
Secondary School

## 7) Production of Manual DVD for Solid Waste Management Surveys

During Pilot Project-1, solid waste management surveys were conducted for planning of rational solid waste management action plan. However, it is difficult to conduct solid waste management surveys continuously, so that PONRE Phetchaburi and JET produced manual DVD for solid waste management surveys in cooperation with Tha Yang SDM.

The contents of DVD are as follow which are important surveys:

- Waste Amount Survey
- Waste Composition Survey
- Time and Motion Survey



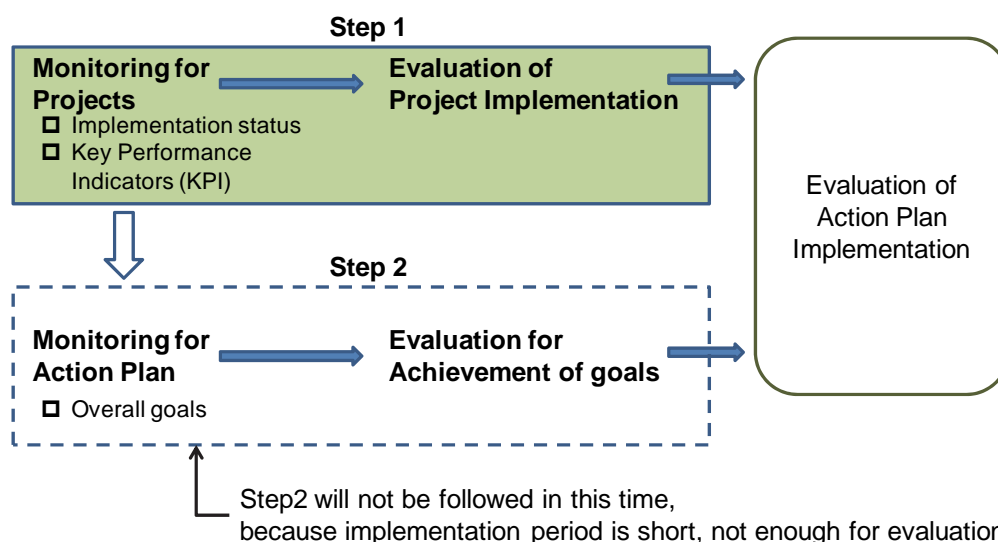
Figure 10-13 Manual DVD for Solid Waste Management Surveys

## 11. Monitoring and Evaluation and Lesson Learned from Pilot Project-1

### 11.1 Mechanism for Monitoring and Evaluation of Pilot Project-1

- For Pilot Project-1, the following were monitored and evaluated regularly:
- Tha Yang Solid Waste Management Action Plan
- Activities of Pilot Project-1

Monitoring and evaluation of Solid Waste Management Action Plan have two steps (see Figure 11-1). Step1 is to monitor and evaluate recommended programs and projects, and other one, Step 2, is for achievement of goals. During pilot project, it is short period for implementation so that Step 2 was not monitored and evaluated in this time.



**Figure 11-1 Mechanism of Monitoring and Evaluation for Tha Yang Solid Waste Management Action Plan**

Other target is for activities of Pilot Project 1. Activities of Pilot Project 1 was monitored and evaluated. If problems and issues for implementation of Pilot Project 1 are found, direction and inputs are improved.

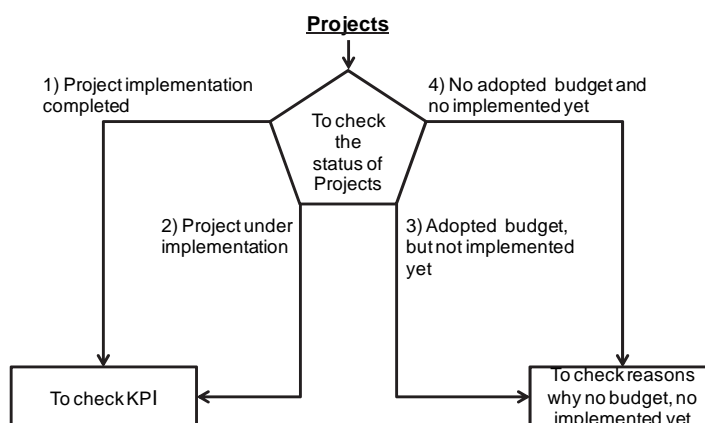
Both monitoring and Evaluation were conducted during Pilot Project 1 Task Force Team Meeting.

### 11.2 Monitoring and Evaluation for Tha Yang Solid Waste Management Action Plan

Tha Yang Solid Waste Management Action Plan was formulated in June 2013.

Total 11 programs/projects are recommended during 2015 fiscal year. Recommended 11 programs/projects were checked and evaluated based on the following four criteria (see Figure 11-2).

- Implementation completed
- Under implementation
- Adopted budget but no yet implementation
- No adopted budget and no implementation



**Figure 11-2 Criteria for Achievement of Recommended Programs/Projects**

Pilot Project 1 Task Force Team evaluated recommended 2015 fiscal year programs/projects on October 9, 2016. From 11 programs/projects, 9 programs/projects were already completed, and 2 programs/projects were under implementation.

**Table 11-1 Result of Evaluation for Recommended Programs/Projects**

Criteria for Implementation of Recommended Programs/Projects	No. of Programs/Projects
1) Project implementation completed	9
2) Under implementation	2
3) Adopted budget, but not implemented yet	0
4) No budget, no implemented yet	0
<b>Total No. of Project in FY 2015</b>	<b>11</b>

### 11.3 Monitoring and Evaluation for Pilot Project 1 Implementation

Performance of Pilot Projects 1 was monitored and evaluated regularly from viewpoint of project inputs, participatory level and task achievement by Task Force Team based on Implementation Plan. Results of evaluation are shown in Table 11-2, 11-3 and 11-4.

**Table 11-2 Evaluation of Pilot Project Inputs**

Evaluated Date and Period	Human Resources	Materials	Finance
April 27 January to June	<ul style="list-style-type: none"> <li>Related human resource has a very good cooperation</li> <li>Number of human resource is appropriate</li> </ul>	<ul style="list-style-type: none"> <li>At the beginning of surveying, documents did not translate from English to Thai. So, surveyor cannot understand it well.</li> <li>Material and Documents for meeting/workshop are sufficient.</li> </ul>	<ul style="list-style-type: none"> <li>So far, related agencies have enough budgets to attend PP1 activities</li> </ul>
July 21 from May to July	<ul style="list-style-type: none"> <li>Human resource has the potential and good cooperation in pilot project involvement</li> <li>TFT member have to allocate their time for other tasks</li> <li>In some presentation JET should speak slowly in order to complete perfect translation.</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate</li> </ul>	--
October 9 from July to September	<ul style="list-style-type: none"> <li>All staff was busy during ending period of fiscal year, so, participation in some activities has some limitation.</li> </ul>	<ul style="list-style-type: none"> <li>Good</li> </ul>	<ul style="list-style-type: none"> <li>Good</li> </ul>

**Table 11.3 Participated Level for Pilot Project Implementation**

Evaluated Date and Period	Evaluation
April 27 January to June	Phase 1 Preparation of PP1: Expected participants joined activities well Phase 2 Formulation of SWM Action Plan: Expected participants joined activities well
July 21 from May to July	---
October 9 from July to September	Phase 2: Formulation of Municipal SWM action plan: Good cooperation from stockholder Phase 3: Implementation of Municipal SWM action plan: Good cooperation from stockholder

**Table 11-4 Evaluation of Pilot Project by Task**

	Phase	Task	Activities	Score - 2 - + 2	Comments
April 21	<b>Phase 1 Preparation of Pilot Project-1</b>				
		Task 1-1	Preparation of Implementation Plan	+2	
		Task 1-2	Establishment of Implementation Mechanism	+2	
		Task 1-3	Establishment of Task Force Team	+2	◆ No officer from Tha Lange SDM join TFT meeting
		Task 1-4	Training for Task Force Team	+1	◆ Some TFT member could not attend all section/class.
April 21	<b>Phase 2 Formulation of Municipal SWM Action Plan</b>				
		Task 2-0	Preparation of Survey	-1	◆ Daily target and daily operation of survey did not plan well.
		Task 2-1	SWM Surveys	+1	<ul style="list-style-type: none"> <li>◆ Vehicle used during survey is not appropriate for SWM survey.</li> <li>◆ There is no announcement to Tha Yang people in advance about SWM survey. So, sometime people did not understand and not provide good cooperation.</li> <li>◆ Timing and Equipment management during survey is not appropriate</li> <li>◆ There is a small problem regarding communication between surveyor and expert</li> </ul>
		Task 2-2	Design of Planning Workshop	+2	
		Task 2-3	Series of Planning Workshop	0	<ul style="list-style-type: none"> <li>◆ It is better to invite more participants from community ex.community leader.</li> <li>◆ Some participants did not attend all series of workshop. Therefore, the continuity is not so well.</li> </ul>
		Task 2-4	Formulation of Draft Action Plan	+2	<ul style="list-style-type: none"> <li>◆ Time management during meeting should be more appropriate</li> <li>◆ Draft action plan should delivery to TFT in advance.</li> </ul>
July 21	<b>Phase 2 Formulation of Municipal SWM Action Plan</b>				
		Task 2-5	Explanation of Action Plan	+2	<ul style="list-style-type: none"> <li>◆ Other channel to should be used for promote the action plan such as Tessaban website</li> <li>◆ The presentation of action plan on June 5<sup>th</sup> did not cover all details of action plan content because of time limitation.</li> <li>◆ On public hearing on June 5th, private sector which is one of target group in action plan was not invited.</li> </ul>
		Task 2-6	Finalization of Action Plan		
		Task 2-7	Authorization of Action Plan	-	◆ The action plan will be incorporated in Tessaban development plan. Therefore, it is not necessary to authorize action plan.



	Phase	Task	Activities	Score - 2 - + 2	Comments
July 21	Phase	<b>3</b>	<b>Implementation of Action Plan</b>		
		Task 3-1	Implementation of Action Plan	0	<ul style="list-style-type: none"> <li>◆ At this moment, the implementation of action plan is under preparation stage.</li> <li>◆ As of now, the preparation of action plan implementation are 1) D/S improvement and life span expansion plan 2) selection of pilot community and pilot school.</li> <li>◆ TFT should discuss and analyses the potential and needs of pilot school and community in order to create appropriate activities.</li> </ul>
		Task 3-2	Monitoring and Evaluation	0	<ul style="list-style-type: none"> <li>◆ In order to evaluate the achievement of pilot project, the schedule of each activities should be set up and then pattern and date of evaluation will be specified.</li> <li>◆ Action plan activities should be evaluated every 3 months.</li> </ul>
October 9	Phase	<b>3</b>	<b>Implementation of Action Plan</b>		
		Task 3-1	Implementation of Action Plan	+2	<ul style="list-style-type: none"> <li>◆ Many projects completed during 2015 fiscal year</li> </ul>
		Task 3-1	Monitoring and Evaluation	+2	<ul style="list-style-type: none"> <li>◆ Timing, process, documents and place is appropriate.</li> </ul>

## **Part C**

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### **Pilot Project 2: Community-based Environmental Management**



## **12. Introduction of Pilot Project 2**

### **12.1 Objectives of Pilot Project 2**

The Regional EQMP 2013-2016 for REO8 was prepared in partnership with ONEP, REO8 and JICA Expert Team as part of the joint activity of “The Project for Strengthening Environmental Management and Linkages among Central, Regional, Provincial and Local Levels in the Kingdom of Thailand”. Through the pilot projects, it is expected that success rate of implementing them will increase across REO8 jurisdiction, and also best practices and good case studies are developed and documented.

As described in the PART A: two types of pilot projects were selected through a series of meetings, workshops, etc.

The pilot project 2 aimed at “Community-based Environmental Management in Pak Tho Sub-District Municipality (Tessaban Pak Tho) in Ratchaburi”.

The purposes of Pilot Project-2 are:

- To develop model for community environmental management system
- To develop and enhance linkages between and among community, the Tessabaan/PONRE, REO8 and other related organizations in supporting community environmental management efforts

### **12.2 Relationship between Pilot Project 2 and Regional EQMP**

R-EQMP indicates the following management issues for urban environmental management unit plan:

- Environmental quality in the living environment should be maintained and improved in terms of amenity and safety
- Community participation in urban environmental management should be promoted in the REO8 jurisdiction

Also management unit strategies for urban environment establish the following strategies:

Strategy 1: Green network in urban area should be established in order to enhance urban amenity and urban ecosystem

Strategy 2: Community participation in urban environmental management should be promoted in order to maintain and improve the living environment as a bottom up approach

Strategy 3: Clean and safety city should be achieved through beautification

Strategy 4: Communication with stakeholders in urban environments should be enhanced for the promotion of a green city movement based on local knowledge and wisdom

- Therefore It is justified that Pilot Project-2 can focus to develop model for dissemination to other areas, and to verify the feasibility and effectiveness of R-EQMP.

### 12.3 Expected Outcomes

Through Pilot Project 2, it is expected to:

- To empower and raise environmental awareness of community people through pilot project activities and processes
- To improve the communities' living environment by community people
- To develop workable community participatory environmental management system

### 12.4 Pilot Project

The Pilot Project 2 aimed to encourage communities on improvement environmental conditions, therefore communities themselves should be key players.

It was planned to formulate community environmental working group as direct implementers under the Task Force Team who performed on guidance and coordination. Detailed organization is explained in the Chapter 15 "Implementation Mechanism for Pilot Project 2".

### 12.5 Pilot Project Site

Pak Tho SDM consists of five communities which are relatively small with a population of around 300-500 people, except for Talad Pak Tho community which has over 1,000 people. The following table summarizes community demographic condition, and Figure 12-1 shows location of each community.

**Table 12-1 Socio-demographic Data in Tessaban Pak Tho**

Village No.	Name of Community	Area (sq. km)	Population/ Households	Basic Profile
1	Talad Pak Tho	0.27	1,434/705	- Facing Pak Tho, Noc Noi and Wan Dao Canal - Facing railway - Highest population density in northern part, less population in southern part - Three markets are operated
3	Rim Klong	0.08	330/106	- Facing Pak Tho Canal - Smallest community but high population density
5	Dao Loy	0.16	329/110	- Facing Wan Dao Canal - Facing railway - Lower population density, less commercial zone
7	Nok Noi	0.42	390/172	- Facing Pak Tho, Noc Noi and Wan Dao Canal - Highest population density in northern part - No resident, and rice field and wetland in southern part - There are Tessaban Office and community center
8	Don Muang	0.24	509/109	- Facing Pak Tho Canal - Facing railway - Lower population density, less commercial zone

Source: Tessaban Pak bTho



Source: Tessaban Pak Tho

**Figure 12-1 Location Map of the Pak Tho SDM**

A series of community meetings, listed as below, were held in order to select pilot communities for target on the pilot project 2.

**Table 12-2 Description of Community meetings**

Name of Community.	Date	Location Venue	Number of Participants
Talad Pak Tho	Oct. 14, 2014	Community Shrine	12
Rim Klong	Oct. 14, 2014	On the road	22
Dao Loy	Oct. 13, 2014	On the road	30
Nok Noi	Oct. 14, 2014	Non-formal education center	8
Don Muang	Oct. 13, 2014	Community leader's house	19



**Figure 12-2 Pictures of Community Meetings**

The pilot communities were selected based on the following criteria:

- Environmental situations, problem in communities (What environmental issues are recognized, how serious those issues affect to their living environment, and how easy or difficult are those issues to be solved by community based activity?)
- Spill over effect to other areas (How much can the pilot project results be expanded to other areas? There are the common issues or not?)
- Community Willingness (How much is community motivated to improve their living environment?) Existed Community Group (Do they have community groups/ organizations which can work for the pilot project?)
- Volunteer Spirit (Do they really voluntary allocate their time for the project, and do they initiate the work?)

Through evaluation for selection of communities based on above criteria, and discussion among REO8, PONRE Ratchaburi, Tassaban Pak Tho and JET, the following three communities were selected, Talad Pak Tho (Village 1), Rim Klong (Village 3) and Nok Noi (Village 7).

**Table 12-3 Evaluation Matrix for the Results of the Selection of Target Communities, Pak Tho**

<b>Evaluation Criteria</b>	<b>Dao Loy (Village 5)</b>	<b>Don Muang (Village 8)</b>	<b>Talad Pak Tho (Village 1)</b>	<b>Nok Noi (Village7)</b>	<b>Rim Klong (Village3)</b>
Characteristics of the community and location	<ul style="list-style-type: none"> <li>• Facing Wan Dao Canal</li> <li>• Facing the railway</li> <li>• Lower population density, smaller commercial zone</li> </ul>	<ul style="list-style-type: none"> <li>• Facing Pak Tho Canal</li> <li>• Facing the railway</li> <li>• Lower population density, smaller commercial zone</li> </ul>	<ul style="list-style-type: none"> <li>• Facing Pak Tho, Noc Noi and Wan Dao Canal</li> <li>• Facing the railway</li> <li>• Highest population density in northern part, less population in southern part</li> <li>• Two big markets are operated</li> </ul>	<ul style="list-style-type: none"> <li>• Facing Pak Tho, Noc Noi and Wan Dao Canal</li> <li>• Highest population density in northern part</li> <li>• No residents, but rice fields and wetlands in southern part</li> <li>• Near Tessaban Office and community center</li> </ul>	<ul style="list-style-type: none"> <li>• Facing with Pak Tho Canal</li> <li>• Smallest community but high population density</li> </ul>
Community Environmental issues and suitability as community based management model  A: suitable B: moderate C: not suitable	<ul style="list-style-type: none"> <li>• Drainage problems (blocked and disconnected from canals) -&gt; C</li> <li>• Scattered livestock waste outside of farm during rainy season -&gt; B</li> <li>• Improper collection of waste from school and temple, e.g. -&gt; A</li> </ul>	<ul style="list-style-type: none"> <li>• Flooding by heavy rain -&gt; C</li> <li>• Odor/noise from livestock farm -&gt; B</li> <li>• Damage and blocked drainage pipe -C</li> <li>• Scattered livestock waste outside of farm -&gt; B</li> <li>• Improper collection of waste, e.g. -&gt; A</li> </ul>	<ul style="list-style-type: none"> <li>• Odors due to improper wastewater treatment in Nok Noi Canal -&gt; B</li> <li>• Bird scat -&gt; B</li> <li>• Odors from garbage bins -&gt; A</li> <li>• Waste in Noc Noi Canal and Hattaya Market -&gt; B</li> <li>• Improper waste collection -&gt; A</li> <li>• Market clean up -&gt; A</li> <li>• Odors from Pak Tho Canal -B</li> <li>• Leakage of odorous water from garbage collection vehicles -&gt; C</li> </ul>	<ul style="list-style-type: none"> <li>• Odors due to blockage of drainage pipe -&gt; B</li> <li>• Improper waste collection -&gt; A</li> <li>• Wastewater and solid waste in Nok Noi Canal -&gt; B</li> <li>• Wastewater and solid waste in Pak Thoi Canal -&gt; B</li> </ul>	<ul style="list-style-type: none"> <li>• Wastewater in Sawang Chan Canal from rice field (out of Tessaban) -&gt; B</li> <li>• Mosquito breeding in vacant private land -&gt; C</li> <li>• Disturb beautification by non-used TEL line -&gt;C</li> <li>• Dropping bird scat -&gt; B</li> </ul>
Spill-over effect of problems onto other areas	<ul style="list-style-type: none"> <li>• Those issues may be common in Pak Tho as well as other areas except for the issues related to livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Those issues may be common in Pak Tho as well as other areas except for the issues related to livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Those issues may be common in Pak Tho.</li> </ul>	<ul style="list-style-type: none"> <li>• Those issues may be common in Pak Tho.</li> </ul>	<ul style="list-style-type: none"> <li>• Those issues may be common in Pak Tho.</li> </ul>

Evaluation Criteria	Dao Loy (Village 5)	Don Muang (Village 8)	Talad Pak Tho (Village 1)	Nok Noi (Village7)	Rim Klong (Village3)
Community Willingness (Volunteer Sprit)	<ul style="list-style-type: none"> <li>Participants in the meeting expressed willingness.</li> </ul>	<ul style="list-style-type: none"> <li>Participants in the meeting expressed willingness.</li> </ul>	<ul style="list-style-type: none"> <li>Participants in the meeting expressed willingness. Also they pay close attention to actual works/processes. They willingly participated in the meeting.</li> </ul>	<ul style="list-style-type: none"> <li>Participants in the meeting expressed willingness. Also they pay close attention to actual works/processes. They willingly participated in the meeting.</li> </ul>	<ul style="list-style-type: none"> <li>Participants in the meeting expressed willingness.</li> </ul>
Presence of existing community group	<ul style="list-style-type: none"> <li>Environmental volunteer and housewife group</li> </ul>	<ul style="list-style-type: none"> <li>Community welfare fund, environmental volunteer, elderly group, public health volunteer group</li> </ul>	<ul style="list-style-type: none"> <li>Environmental volunteer, housewife group, cultural group, labor volunteer, Muban funding group, joint environmental group with Talad Pak Tho and Rim Khlong community</li> </ul>	<ul style="list-style-type: none"> <li>Environmental volunteer, housewife group, public health volunteer, joint environmental group with Talad Pak Tho and Rim Khlong community</li> </ul>	<ul style="list-style-type: none"> <li>Environmental volunteer, housewife group, public health volunteer, joint environmental group with Talad Pak Tho and Rim Khlong community</li> </ul>
Overall Evaluation	+	+	+++	+++	++

Legend:

- +++ : high advantage
- ++ : medium advantage
- + : low advantage

### **13. Existing Environmental Issues in the Pilot Project Site**

#### **13.1 Community Profile**

Community profile of each selected communities is summarized as below:

##### Talad Pak Tho Community

Talad Pak Tho community has been built around 100 years ago, which is one of the oldest community in Tessaban Pak Tho. Population is 1,434 peoples and 705 families as of 2013. Average family number per household accounts for 2 persons or less than 4 persons, is relatively small.

The area of land accounts for around 0.27 km<sup>2</sup>. The community land faces three canals, namely Pak Tho Canal on Northern border, Nok Noi Canal on Eastern border and Wan Dow Canal on Southern border. The community land is divided two areas by national road. Northern part shows high population density area, while southern part is low density, covered with forest and farmland.

Community character can be said typical and common in Thailand, that to say, natives, origin and culture, are mixture, some community member have come from various areas in Thailand. Most of people are dedicated and familiar with Chinese, Buddhist tradition. They are well communicating and cooperating for community activities, ceremony etc.

Economic character shows typical structure, majorly consisting of general commercial, employee, government, e.g. Talad Pak Tho has three markets (Wat Pak Tho Market, Hattaya Market and Seer Kae Market).

##### Rim Klong Community

Rim Klong community is a new community group, built 12 years ago. Population is 330 peoples and 106 families registered as of 2013. Average family number per household is account for 2 persons or less than 4 persons. These conditions are similar to other communities in Pak Tho.

The area of land accounts for around 0.08 km<sup>2</sup>, which the smallest in Pak Tho. The community land faces Pak Tho Canal on Southern border.

Community character can be said typical and common in Thailand same as Talad Pak Tho Community

Economic character shows typical structure, majorly consisting of general commercial, employee, government, e.g. Some small grocery shops are found, but there are no factories, market. Community people are mostly shopping in the markets located in Talad Pak Tho Community.

### Nok Noi Community

Nok Noi community is a new community group; they have been separated from Talad Pak Tho since 15 years ago. Population is 390 peoples and 172 families registered as of 2013. Average family number per household is accounts for 3.4 persons or less than 4 persons. These conditions are similar to other communities in Pak Tho.

The area of land accounts for around 0.42 km<sup>2</sup>. The community land faces three canals, namely Pak Tho Canal on Northern border, Nok Noi Canal on Western boarder and Wan Dow Canal on Southern border. The community land is divided two areas by national road. Northern part shows high population density area, while there is less residential area in southern part, only wetland and farmland are spread aside from a stadium.

Community character is also similar to other communities, and common in Thailand. Economic character shows typical structure, majorly consisting of general commercial, employee, government, e.g. Tessaban office is placed in their community.

Some small grocery shops are found, but there are no factories, market. Community people are mostly shopping in the markets located in Talad Pak Tho Community.

## **13.2 Environmental Issues**

A field reconnaissance and interview with Tessaban Pak Tho were conducted by JET in order to grasp environmental profile in Tessaban Pak Tho. In addition, series of community meetings was given environmental issues which were raised by communities. The followings are summaries of environmental issues in each selected community.

### Talad Pak Tho Community

#### **1) Offensive odor from canals**

The odor is mostly caused by water degradation. Canal water is polluted by discharge water from household, market, etc. and improper wastewater treatment. This water degradation seems to be more serious in Nok Noi Canal. Nok Noi Canal is not connected effectively with Pak Tho Canal. Also the canal is blocked by bridges, road and drainage pipe crossing canal. In addition to water, garbage dumping is also source of odor.

#### **2) Offensive odor and leachate by garbage collection**

Odor from garbage bins, polluted water leached from garbage collection trucks, etc. are key community's concerns.

#### **3) Waste generated in market**

It is concerned that garbage form market is not timely collected because the collection trucks is not properly scheduled to collect garbage.

#### **4) Bird dropping, noise**

This issue especially occurs in late noon time.



### **Rim Klong Community**

**1) Water discharged from rice field**

According to the community leader, discharged water flows through Sawang Chan Canal from rice field where located out of Tessaban Pak Tho. Water contains polluted materials agricultural waste, ash by burning straw, etc. Also ash burning causes odor.

**2) Mosquito Breeding**

Especially mosquito breeding in vacant private land is more serious according to the community leader.

**3) Non-neatly wired telephone line**

TEL lines are not neatly wired which cause disturbing beautification according to the community.

**4) Bird dropping, noise**

This issue especially occurs in late noon time.

### **Nok Noi Community**

**1) Offensive odor from blocked drainage pipes**

Household wastewater is blocked by damaged pipes, and then it causes odor. Also improper wastewater treatment is reason of odor problem.

**2) Wastewater and solid waste in Nok Noi Canal**

This issue also lead problem to water degradation. Nok Noi Canal faces both Nok Noi Community and Talat Pak Tho Community, that it to say, the canal is not connected effectively with Pak Tho Canal. Also the canal is blocked by bridges, road and drainage pipe crossing canal. In addition to water, garbage dumping is also source of odor.

**3) Wastewater and solid waste in Pak Tho Canal**

The water condition of Pak Tho Canal is relatively better than Nok Noi Canal; however, water degradation and solid waste are major source of pollution. In addition, mosquito bleeding in the canal is also significant according to the community, because water gate opens for irrigation during dry season, it may lead source of mosquito bleeding.

From those assessment on environmental issues, and also further developing a community-based environmental management plan have led that the followings are main issues in Tessaban Pak Tho.

- Water pollution issues
- Solid waste management issue

## 14. Framework for Pilot Project 2

### 14.1 Pilot Project Site

The following three communities are selected and agreed to be involved by PONRE Ratchaburi, Tessaban Pak Tho for the Pilot project 2.

- Nok Noi
- Talad Pak Tho
- Rim Klong

Pilot project site is shown in Figure 14-1.

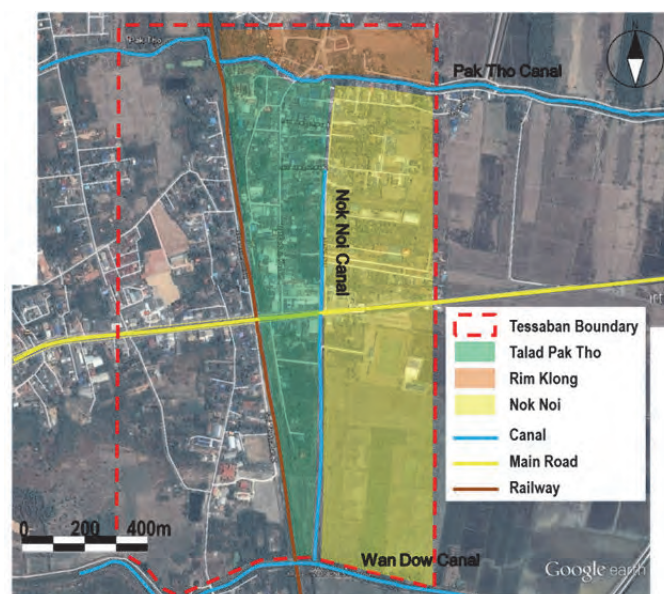


Figure 14-1 Location of Pilot Project Site

### 14.2 Objectives and Target on Community-based Environmental Management

Previously the community people understood that environmental management should be under responsible for Thai National / Local Government. However it is limited to sufficiently solve the environmental problems. Therefore R-EQMP of Region 8 (Regional Environmental Quality management Plan) has indicated: Community participation in urban environmental management should be promoted in the REO8 jurisdiction.

Communities, while, have noticed that some of environmental problems can be caused by their activities, and the community have a chance, responsibility to tackle to environmental issues in cooperation with government.



**Figure 14-2 Concept of Cooperation between Government and Community under the community-based Environmental Management**

Firstly participatory planning for establishing a CEM rose in the Pilot Project 2 under The Project. The objectives of the pilot project 2 are:

- To empower and raise environmental awareness of community people through pilot project activities and processes
- To improve the communities' living environment by community people
- To develop workable community participatory environmental management system

### **14.3 Pilot Project Periods**

The Pilot Project 2 was implemented from October 2014 up to December 2015. Project phasing was divided into the following three Phases;

- Preparation phase;
- Planning phase, and
- Implementation phase.

Preparation phase focused on selection of pilot communities, formulation of pilot project organization. Planning phase consisted of training, formulation of community-based environmental management plan through participatory planning.

Implementation phase was to conduct pilot activities based on the action plan, and then monitoring and evaluation was conducted.

Major tasks in each phase and actual schedule are described in Table 14-1.

Pilot Project 2, though, was completed in December 2015, Implementation of activities have been continued toward 2016 based on the plan established.

**Table 14-1 Project Phasing and Actual Schedule**

Tasks	2014			2015												2016	
	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2
<b><u>Preparation Phase</u></b>																	
Preliminary Evaluation, Site Survey	■																
Holding community meetings	■																
Selection of Pilot Community	■																
Development of Implementing Mechanism		■	■														
Explanation to people of Pilot Community		■	■														
Agreement of Pilot Project with Pilot Communities		■	■														
Appointment of Community Environmental Management Team			■	■													
<b><u>Planning Phase</u></b>																	
Training for Community Environmental Management Team				■	■												
Baseline Survey				■	■												
Workshop for Formulation of Community Environmental management Plan				■	■	■											
Formulation of Community Environmental Management Plan				■	■	■											
<b><u>Implementation Phase</u></b>																	
Implementation of Community Environmental Plan									■	■	■	■	■	■	■	■	■
Monitoring/Evaluation				■	■	■	■	■	■	■	■	■	■	■	■		

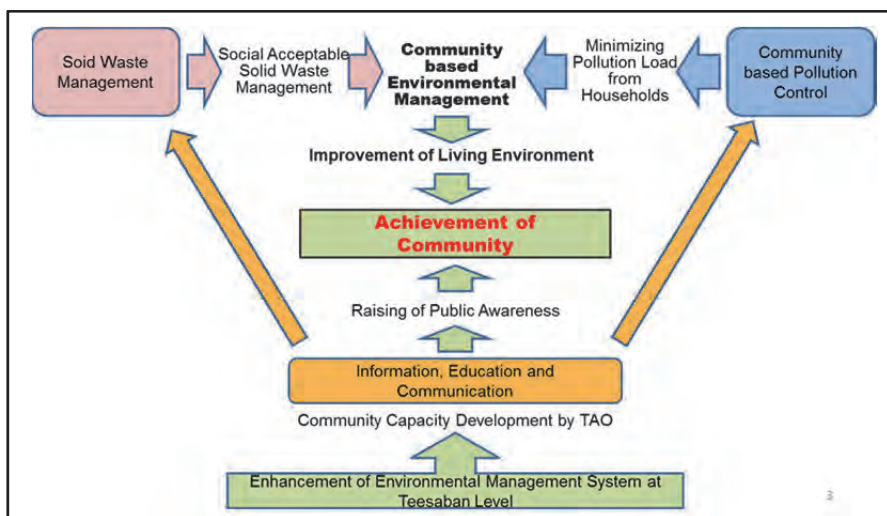
### 14.4 Pilot Project Structure and components

Main output of the Pilot Project 2 was development of a community-based environmental management plan which was formulated by participatory planning with community groups. Participatory planning aims to empower the community, its concept is shown in Figure 14-3.



**Figure 14-3 Concepts on Participatory Approach**

Based on the community meetings, there were two urban environmental issues that would be closely looked into during the implementation of Pilot Project 2 namely: water pollution in the canals and solid waste management. These issues were major concerns of the communities in Pak Tho. Considering this context, the basic principle in the implementation of Pilot Project 2 was the promotion and strengthening of community information, education and communication (IEC). It was hoped that this leads to an increase level of public awareness and knowledge related to water pollution and solid waste. The following figure provides graphical presentation of the proposed conceptual framework.



**Figure 14-4 Basic Structure of Community Based Environmental Management**

## 14.5 Community-based Environmental Management Plan

Contents of the Community-based Environmental Management Plan are described in Table 14-2. Catchy phrases were given in each content in order to easily visualize.

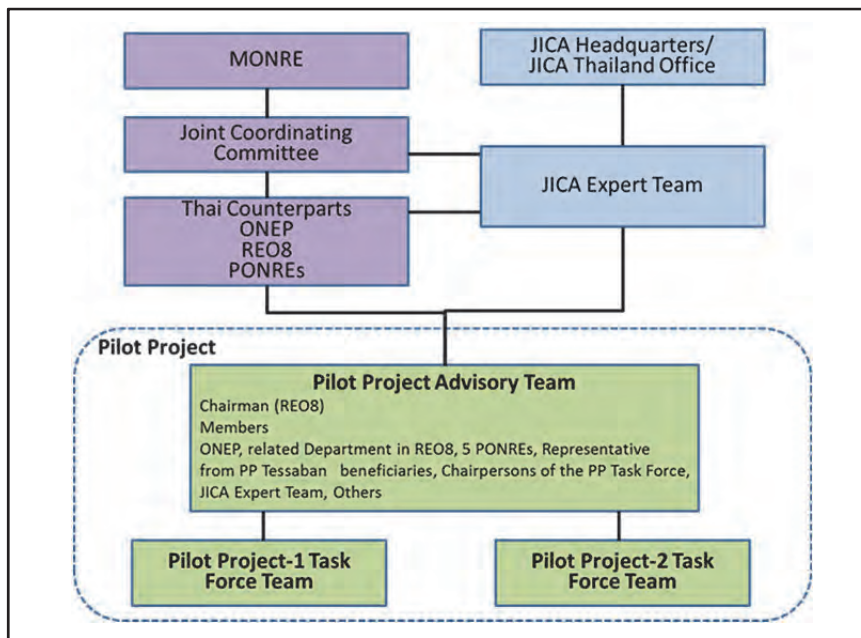
**Table 14-2 Contents of Community-based Environmental Management Plan**

Contents	Catchy Phrases
1. Background	
1.1 Community Profile	- Who are we? -
1.2 Definition of CEM	- What is community-based environmental management? -
2. Planning Framework	
2.1 Purpose	- Why is a CEM established? -
2.2 Organization	- Who develops and implements a CEM? -
2.3 Planning Period	- How long we plan and implement? -
2.4 Vision	- What we want to be? -
2.5 Goal	- What is our goal? -
3. Baseline Condition	
3.1 Methodology	- How we took a baseline survey? -
3.2 Results	- What condition is in our community? -
4. Planning Environmental management	
4.1 Program and Projects	- What we are planning? -
4.2 Action Plans	- What plans we are implementing first? -
4.3 Implementation Schedule	- When we do? -
4.4 Cost estimation	- How we make budget? -
5. Monitoring and Evaluation	
5.1 Monitoring -	- How are our activities Monitored?
5.2 Evaluation -	- How are our activities evaluated?

## 15. Implementation Mechanism for Pilot Project 2

### 15.1 Implementing Structure of Pilot Project 2

Under the Project, two pilot projects were implemented. Implementing organization structure is described as below:

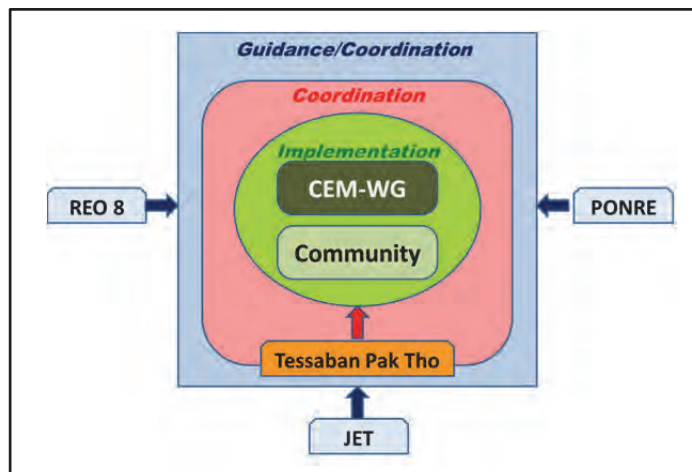


**Figure 15-1 Implementing Organization Structure**

Because key players of community-based environmental management are communities cooperated with Tessaban Pak Tho, Community Environmental Management Working Group (CEM-WG) under each community was formulated.

### 15.2 Roles of Key Related Organizations

The Pilot Project 2 involved various government and social organizations. Key related organization and key roles are summarized in Figure 15-2.



**Figure 15.2 Key Roles**



As shown in above figure, key player must be CEM Working Groups and community member cooperated with Tessaban Pak Tho. REO8, PONRE Ratchaburi and JET can perform as guidance and coordination with Tessaban and CEM working groups. Roles of each organization are described in Table 15.1.

**Table 15-1 Roles of Each Organization**

Organization	Roles
Community Environmental Management Working Group, and Community Member	<ul style="list-style-type: none"> <li>● Conduction of survey, planning and implementation for Community Environmental Management.</li> <li>● Reporting of activities to Pilot Project Task Force Team</li> </ul>
REO 8	<ul style="list-style-type: none"> <li>● Dispatch staff to member of Pilot Project Task Force Team.</li> <li>● Providing technical advise</li> </ul>
PONRE Ratchaburi	<ul style="list-style-type: none"> <li>● Providing technical advice.</li> <li>● Financial supporting for implementation of community environmental management</li> </ul>
Pak Tho SDM	<ul style="list-style-type: none"> <li>● Initiate the whole activities and coordination with community</li> </ul>
JET	<ul style="list-style-type: none"> <li>● Technical and financial support</li> </ul>
Others: university, Private sector, Buddhist Monk, etc.	<ul style="list-style-type: none"> <li>● Working together with Community Environmental Management Working Group</li> </ul>

### 15.3 Pilot Project 2 Task Force Team

Task team was organized for the following roles:

- Providing of guidance, direction, technical advice for implementation of pilot project.
- Monitoring of Pilot Project, Reporting of monitoring result to Pilot Project Advisory Team

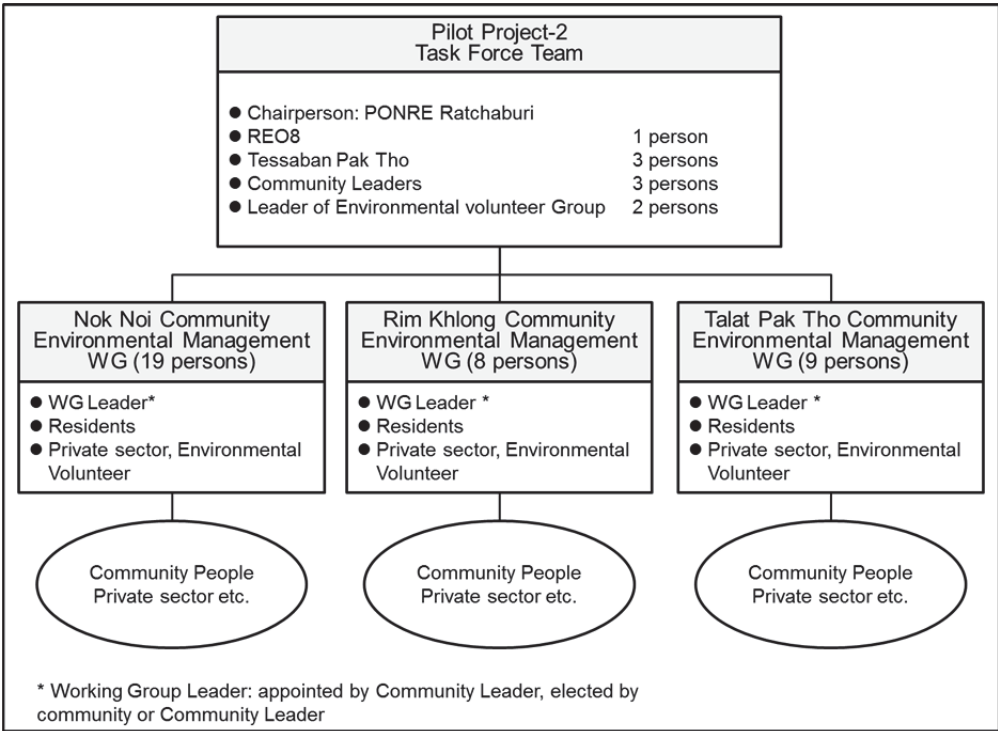
The member of Task Force Team consisted of

- Chairperson: PONRE Ratchaburi
- REO8
- Tessaban Pak Tho
- Community Leaders or CEM-WG leaders

Organization structure of Task Force Team and CEM-WG are described in Figure 15-3.

### 15.4 Pak Tho Sub-district Municipality and Community Working Groups

Because key players of pilot project 2 are communities in cooperation with Tessaban, CEM working group in each community was organized. WG leader was community leader or appointed by the community leader.

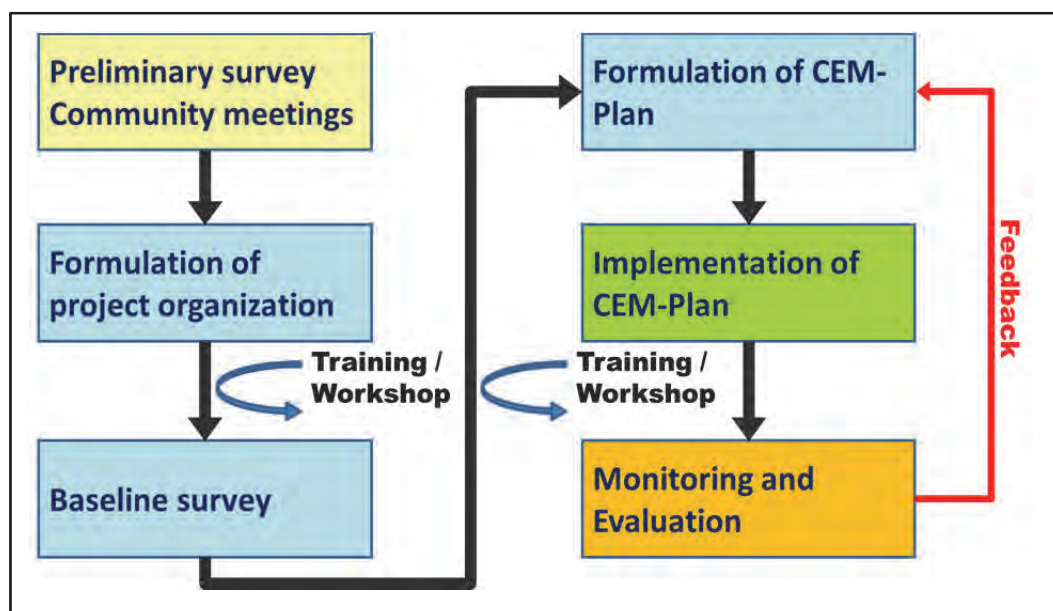


**Figure 15-3 Organization structure of Task Force Team and CEM-WG**

## 16. Tasks and Schedule of Pilot Project 2

### 16.1 Tasks of Pilot Project-2

Tasks of Pilot Project 2 are described in the following figure.



**Figure 16-1 Tasks under the Pilot Project 2**

Each task is described in Table 16-1.

**Table 16.1 Tasks under the Pilot Project 2**

Tasks	Description
Preliminary survey and community meetings	It was for selection of pilot communities for the pilot project 2.
Formulation of project organization	Establish project organization, kick-off and training for participatory planning
Baseline survey	It was conducted by community working group coordination with Tessaban, PONRE, REO8 and JET
Formulation of community-based environmental management plan (CEM Plan)	VEM Plan was established by community working groups through participatory planning.
Implementation of CEM	Implementation of pilot activities under CEM Plan
Monitoring and Evaluation	Self-monitoring and evaluation by Working Groups, monitoring and evaluation by Task force team, and Advisory Team

## 16.2 Task Schedule

Task schedule is described in the following table 16-2.

**Table 16-2 Task Schedule**

Tasks	2014	2015											
	12	1	2	3	4	5	6	7	8	9	10	11	12
Preliminary survey and community meetings	■												
Formulation of project organization		■											
Baseline Survey			■										
Formulation of CEM			■	■									
Implementation of CEM					■	■	■	■	■	■	■	■	■
Monitoring, Evaluation					■	■	■	■	■	■	■	■	■

## 17. Major Pilot Project Activities and Outputs

### 17.1 Planning Community-based Environmental Management Plan

Planning CEM Plan was conducted through participatory planning. Activities under planning phase are listed in Table 17-1.

**Table 17-1 Activities under Planning Phases**

	Activities	Date	Purposes
1	First Task Force Team kick-off meeting	December 25, 2014.	- Kick-off meeting
2	First training / workshop	December 26 – 27, 2014	- Explanation of pilot project 2 - Technical training
3	Second Task Force Team meeting	January 30, 2015	- Further scheduling - Guidance on baseline survey and planning
4	Second training / workshop	January 30 - 31, 2015	- Training and formulation of baseline survey
5	Baseline survey	February 2 – 10, 2015	- Baseline survey
6	Planning Workshop	February 21 and 27, 2015	- Confirmation of results of baseline survey - Planning CEM

### 17.2 First Training / Workshop

The First WG training seminar was organized in December 26 – 27, 2014, and it aimed:

- 1) to provide a venue for sharing about the initiatives of ONEP and REO8 and PONREs to strengthen environmental management in the region thru the JICA project, and
- 2) to conduct brainstorming sessions and share environmental problems and issues. These activities were facilitated with the help of problem analysis and stakeholders' analysis based on the PCM concept.



WG members during problems analysis session

Presentation by each WG member

### 17.3 Second Training / Workshop

Second WG training / workshop was held in January 30 - 31, 2015. Main objectives of the training are:

- Share of the results of the last training / workshop
- Explanation and orientation of baseline survey methodology
- Formulation and scheduling of the baseline survey



Scheduling baseline survey

Orientation on questionnaire survey

### 17.4 Baseline Survey

The baseline survey was conducted in order to identify current environmental conditions and collect community perception about the environment. Baseline survey teams were organized in each community group in cooperation with Tessaban Pak Tho, PONRE Ratchaburi and JET. The baseline survey consists of household questionnaire survey, waste amount survey, water quality survey, and site observation (Tessaban tour). The details of these surveys are outlined in Table 17-2 and Figure 17-1 shows the location of water collection samples as indicated by red dots.

**Table 17-2 Components of baseline survey**

Types of Survey	Date of Survey	Mechanism
Household Questionnaire Survey	February 2 to 6, 2015	<ul style="list-style-type: none"> <li>- Interview with selected households using a questionnaire</li> <li>- Key questions are related to: Waste management; Wastewater; Community awareness.</li> <li>- Number of interviewees: 34 households from Talad Pak Tho, 25 households from Rim Klong 24 households from Nok Noi / total of 83</li> </ul>
Waste Amount Survey	February 2 to 6, 2015	<ul style="list-style-type: none"> <li>- Estimate waste amount using plastic bags</li> <li>- Types of composition of waste: Paper; Plastic bottles;</li> </ul>

Types of Survey	Date of Survey	Mechanism
		Glass bottles; Metal cans, and Others (kitchen waste, e.g.). - Survey periods: 3 days (3 collections) - Number of households: 32 households from Talad Pak Tho, 18 households from Rim Klong 17 households from Nok Noi/ total of 67
Water Quality Survey	February 5, 2015	- Sampling locations (see Figure 5-5): 4 points in Pak Tho Canal 4 points in Nok Noi Canal - Measuring items: water temperature, transparency, pH, DO, COD, ammonium nitrogen, nitrate nitrogen, nitrite nitrogen and Phosphate
Tessaban Tour	February 9 in Talad Pak Tho February 10 in Rim Klong and Nok Noi	- Direct site observation and discussions with community people

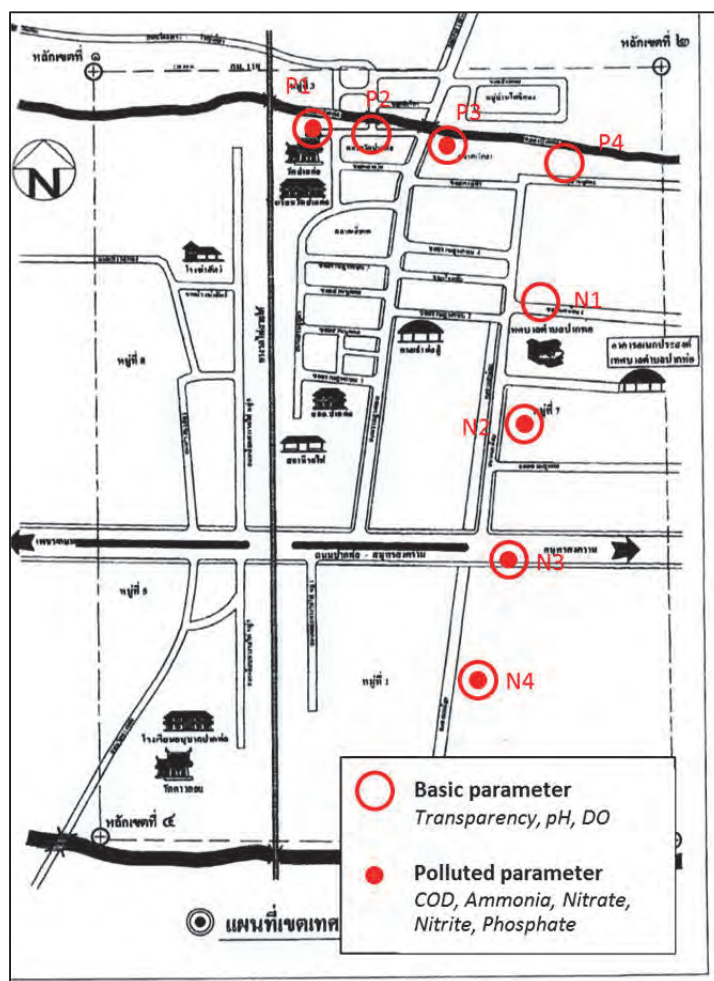


Figure 17-1 Sampling Locations of Water Quality Survey

Based on the above activities, the following are the initial results:



1) Household Questionnaire Survey

The results of the questionnaire survey suggest the following:

**Waste Management**

- Most of the community people discard waste to provided bins near or in front of their houses. Some of them burn waste in the yard.
- 80% of community people separate recycle waste for selling.
- Plastic bottles are the most separated items, followed by paper and glass bottles.

**Wastewater**

- Most community people discharge toilet wastewater (black water) through cesspools or septic tanks. While 26.5% of Talad Pak Tho directly discharges.
- 90% of kitchen wastewater (gray water) is directly discharged to public drainage without treatment.
- 60% of community people reuse kitchen wastewater for gardening.
- More than 90% of community people think Nok Noi and Pak Tho canals are polluted. The greatest cause is from dumping of solid waste followed by inflow of untreated wastewater and stagnated water flow.
- If the canal water is cleaned up, respondents would like to use the water for some traditional ceremonies and for gardening or fire fighting.

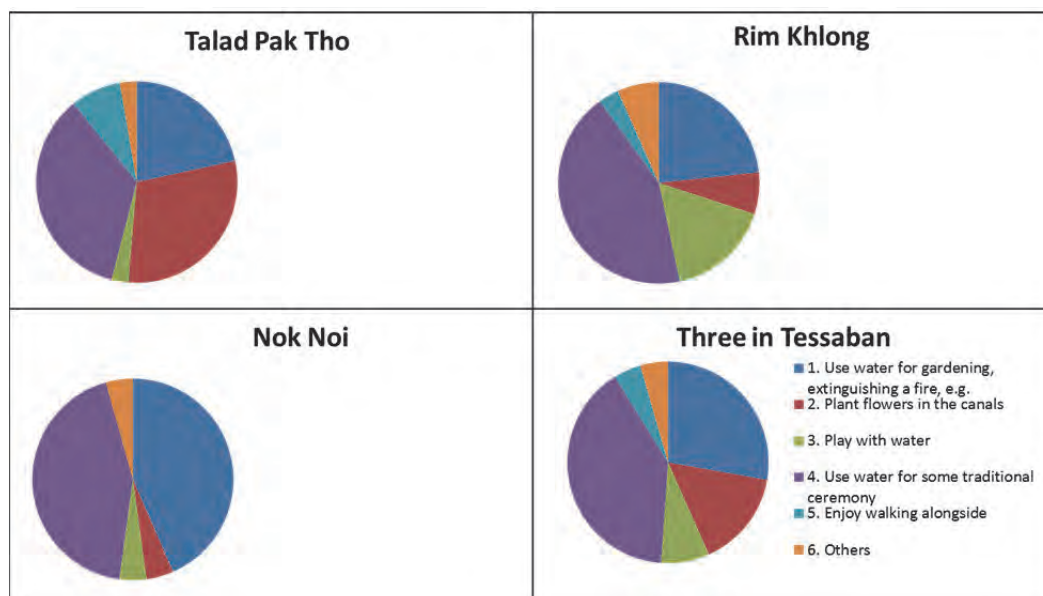
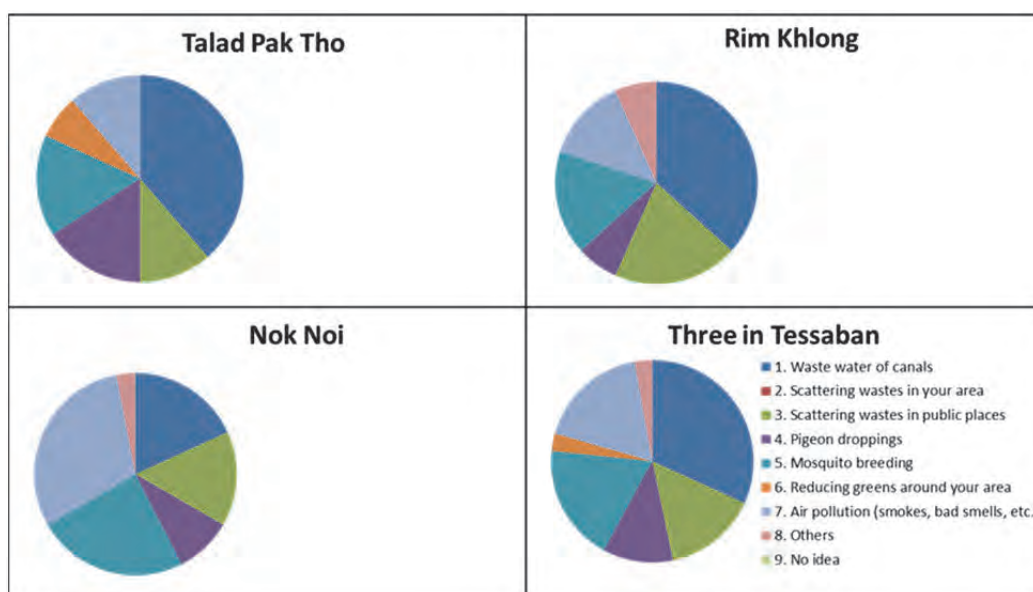


Figure 17-2 Uses of canal water

**Community Awareness**

- Solid waste was the first image that people had come to mind when thinking of an “Environmental problem” followed by “wastewater”.

- Environmental problems in their daily life are mostly caused by wastewater in the canals, mosquito breeding and air pollution, respectively.
- Most eco-friendly activities which are undertaken in people’s daily lives are to segregate and recycle wastes and to save electricity.
- Half of the community people think “training of certain eco-activities” is the most necessary form of raising public awareness, followed by creating a “knowledge center”.



**Figure 17-3 Common environmental problems in the communities**



## 2) Waste Amount Survey

The following conclusions were highlighted through the waste amount survey:

- Plastic bottles (23%) is the most recycled waste, it accounted for 23% of total household waste, following by paper (15%) and glass bottles (8%).
- Average household wastes generated were roughly estimated :

Talad Pak Tho is 11 L/day/HH.

Rim Klong is 11 L/day/HH.

Nok Noi is 18 L/day/HH

### 3) Water Quality Survey

The results of water quality survey are concluded as bellows:

#### Pak Tho Canal

- Location P1 (near temple) showed high transparency, while DO was relatively low.
- Pak Tho canal has very high ammonia, nitrate, phosphate, especially at P3 (near market) and P1.

#### Nok Noi Canal

- N4 (outlet) showed high concentration of COD and ammonia, and low concentration of DO. Water smelled in hydrogen sulphide.
- N1 (water colored green by algae) showed extremely low concentration of DO.

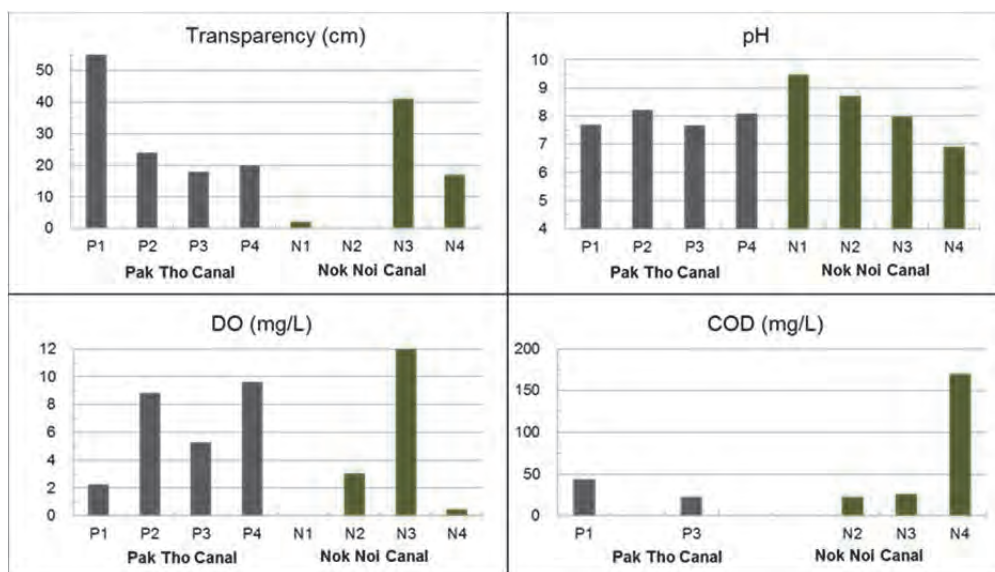
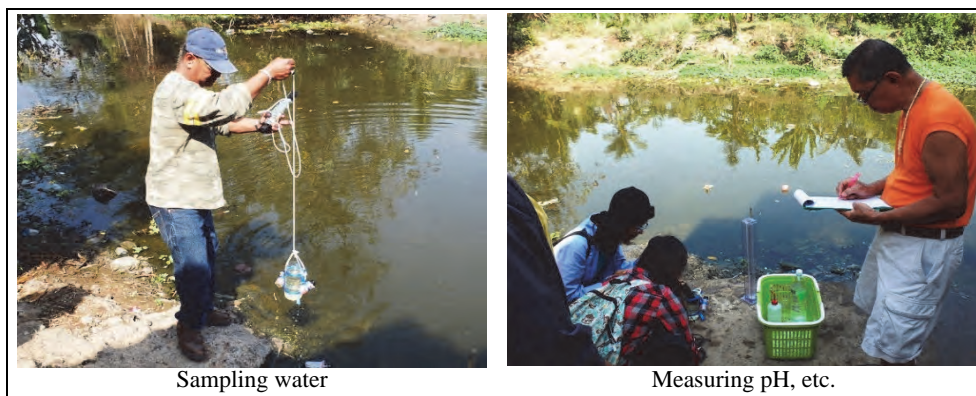


Figure 17-4 Results of Water Quality Survey



#### 4) Tessaban Tour

The following observations were noted during the conduct of the Tessaban Tour:

##### Talad Pak Tho

- Illegal dumping alongside of the railway. Leachate is directly discharged into Pak Tho canal during rain.
- Pigeon dropping (faces) and feathers make school yard and building dirty and students feel uncomfortable.
- Canal water stagnation and insufficient water treatment accelerate water pollution, and cause bad odours.
- Neighbours complain about fumes and noise from the small factory.

##### Rim Klong

- Bad odours from polluted canal water
- Flooding in roads due to clogged drainage
- Dumping solid waste into Pak Tho Canal, causing water pollution

##### Nok Noi

- Bad odours from polluted water and drainage
- Flooding in roads due to clogged drainage
- Scattering and dumping of solid waste into Nok Noi Canal, causing water pollution



Interview with market shop



Scattering waste alongside of road

#### 17.5 Planning Community-based Environmental Management Action Plan

Community-based Environmental Management Action Plan (CEM Action Plan) was developed in the 2 days of planning workshops.

The Planning Workshop 1 was organized on February 21, 2015, and aimed to provide a venue to discuss and share the results of the baseline survey and explain the basic structure of a CEM Plan.

The Planning Workshop 2 was organized on February 27, 2015. Attended by 34 representatives from the communities of Nok Noi, Rim Klong and Talad Pak Tho, the participants discussed the introduction of CEM Action Plan. And then finally CEM Action Plan for each community group has been developed.

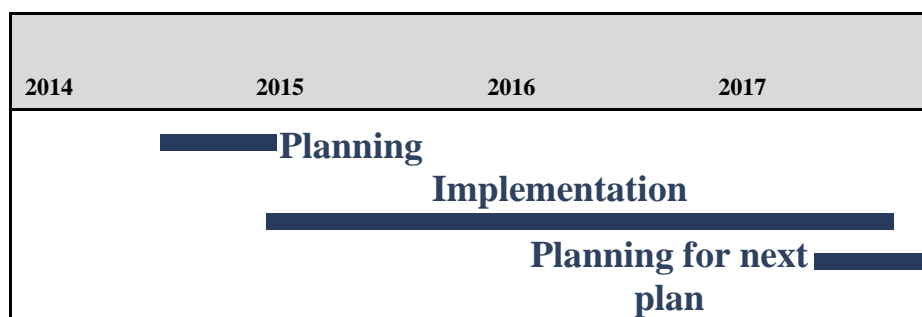


Planning CEM Action Plan



Brief of CEM Action Plan is summarized as below:

Planning Periods: Three years from 2015 to 2017



Vision:

Talad Pak Tho	Clean Water for Talad Pak Tho Community Pak Tho – Zero Waste Area -
Rim Klong	Clean and Useable Water for Us
Nok Noi	Beautiful and clean canal by ourselves

Goal:

Talad Pak Tho	<ul style="list-style-type: none"> <li>- Canal water conditions are improved.</li> <li>- Waste from community is reduced.</li> </ul>
Rim Klong	<ul style="list-style-type: none"> <li>- Canal water conditions are improved.</li> <li>- Community-based water treatment are introduced</li> </ul>
Nok Noi	<ul style="list-style-type: none"> <li>- Community actions for improvement of canal are started.</li> <li>- Canal water conditions are improved.</li> </ul>

In the workshop, proposed action plans (activities) were listed in each community groups. It should be suggestible to prioritize these action plans in order to consider effective implementation. The following four criteria were used for prioritization:

- Urgency: The environmental issue is serious, so it should be commenced immediately.
- Effectiveness: The plan is expected to achieve improvement quickly.
- Cost performance: activity is not costly, cost is reasonable to be implemented.
- Technical level: Methodology is applicable for being handled by community

For instance, Rim Klong WG assessed and judged priority as summarized in the following table.

**Table 17-3 Results of Prioritization (Rim Klong)**

Actions	Urgency	Effectiveness	Cost Performance	Technical level	Priority
Training / Seminar (on using EM)	High	High	Low	Low	1
Pretreatment of household wastewater	Medium	Medium	Low	Low	3
Digging canal	Low	Low	High	High	4
Treatment of wastewater by EM	High	High	Low	Low	2

CEM in each community group has resulted in the following action plans:

Action Plans:

Talad Pak Tho	Priority Activities <sup>1</sup> (1) Clean-up Canals – Removal of Waste and soil from canals - (2) Installation of community wastewater pre-treatment systems Others - Waste recycle bank (Plant bank, EM bank) - Training Seminar/ Workshop on “Waste recycling” and “Wastewater treatment” - Slogan Contest - Public Board Installation
Rim Klong	Priority Activities (1) Public Education (training) on production and use of EM (2) Clean water campaign by bio-treatment Others - Digging the canal - Installation of wastewater pre-treatment system
Nok Noi	Priority Activities (1) Public education (Training) on Recycle (2) Environmental conservation campaign (Exhibition) - Drawing Contest - Establish water monitoring - Warning / announcement

<sup>1</sup> Priority activities were taken under the Pilot Project 2



## 17.6 Implementation of Pilot Activities

Based on the CEM Action Plan developed by the Community Working Groups, The following pilot activities were formulated:

**Table 17-3 List of Pilot Activities**

Action Plan	Date	Contents
1. Canal Clean up	29 March, 2 April, 24 June and more	Cleaning Pak Tho canal
2. Water Quality Monitoring	29 April 7 June	Check the water quality of Pak Tho canal and Nok noi canal
3. Public board installation	May-July	Public boards were made by community people Installed 9 places in the Tessaban area
4. Slogan and Drawing contest	27 July	It was hold at Wat Pak Tho school, and students from Wat Pak Tho, Anuban Pak Tho, and community people joined.
5. Public Seminar	10 August	Seminar on EM and waste recycle at Wat Pak Tho school.
6. Waste Composition survey	4,5,6 September	This is part of Output 2, Public Awareness Activity leading by Tessaban. Selecting Rim Klong Community, and survey waste composition for three days.
7. Community Wastewater Pre-Treatment Tank	August – December	Community people made and installed waste water treatment system in HHs.
8. Public Education on Recycle	6 November	Teachers of Wat Pak Tho school was facilitator and students and community people made gifts by waste such as plastic bottles, milk boxes, etc.,
9. Public Education on EM	20 November	Wat Pak Tho and Anuban Pak Tho school students make EM ball and through to pond.
10. Waste Recycle Bank	27 November	Training for opening waste recycle bank at Wat Pak Tho school involving Anuban Pak Tho school students.

Pilot activities, though, were formulated by each Working Group, Most of the activities were conducted through cooperation among three communities because they have had close communication and environmental issues are raised in all communities.

### 1) Canal Clean-up

The purposes of canal cleaning activity are as below:

- Raise public awareness to community
- Clean canals for formulating Thai ceremony
- Improve landscape to be cultural tourism

The activity was organized by Palad Pak Tho working group (WG) and Rim Klong in cooperation with Nok Noi communities. Main players are community member, while Tessaban as well as JET supported in terms of equipment preparation, announcement, coordination with relevant local authorities, etc. Tessaban also coordinated with district office for transportation of garbage removed from the canal. Equipment and materials has

been stored in the house of Rim Klong WG leader because WGs would continue the activity. Tessaban coordinated with WGs for management of equipment.

Canal cleaning activity was taken in two days in March 29, 2015 and April 2, 2015, and number of participants counted for 25 persons and 36 persons respectively.

Second day of canal cleaning activity was scheduled in the Thai Princess's Birthday. After first day WG members had found necessity of sufficient previous announcement. Tessaban cooperated to announce to public by local radio and speaker, and WG leaders also announced by hand speaker. Number of participants in second day slightly increased.



## 2) Water Quality Monitoring

Water quality monitoring was undertaken based on the results of baseline survey conducted in February, 2015. Two representative locations (Pak Tho and Nok Noi canals) were selected for regular monitoring (see Figure 17-5). The monitoring activity has been organized by the Nok Noi WG, while members of other WG also dispatched participants to observe. The monitoring methods are same as a baseline survey; field sensor equipment for water temperature, pH and DO was lent from PONRE Ratchaburi.

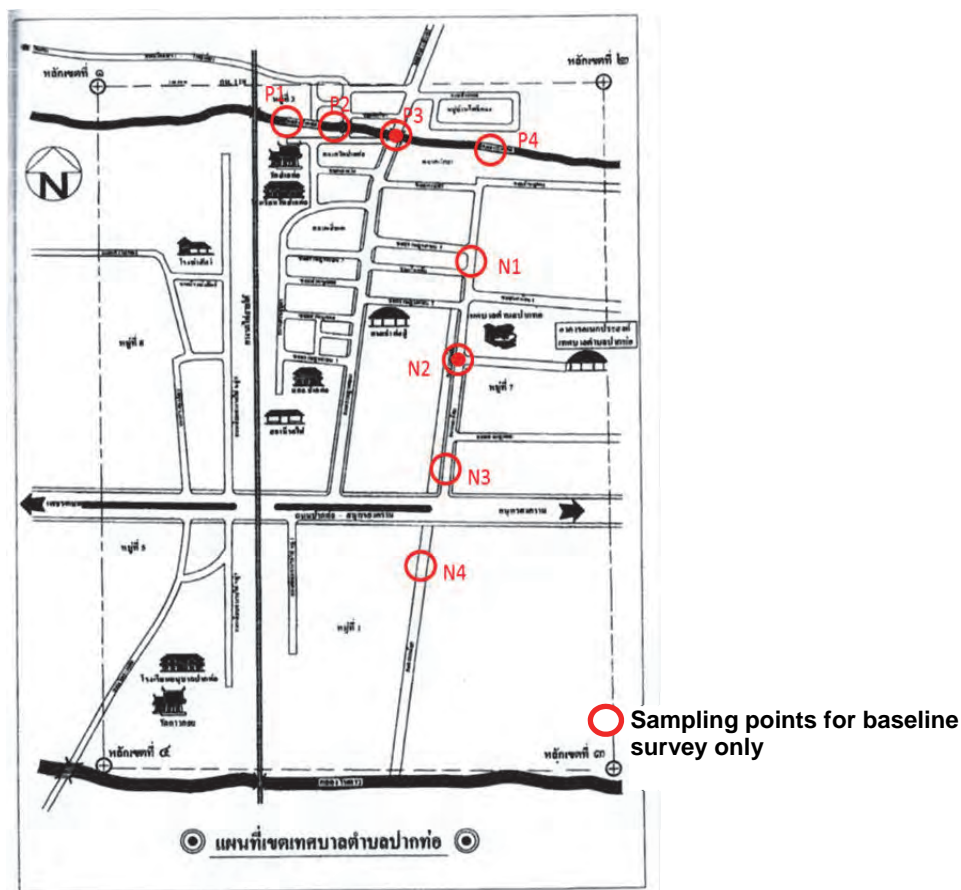
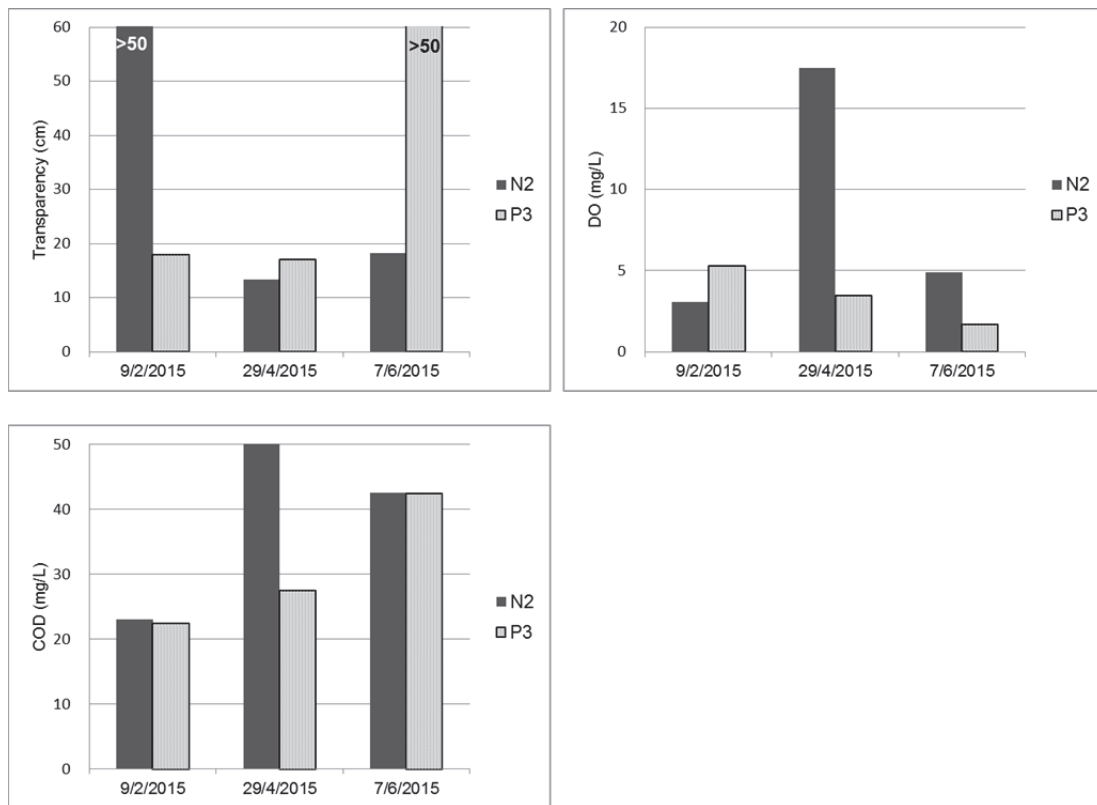


Figure 17-5 Sampling Location of Water Quality Monitoring

The results of the water quality monitoring are shown in Table 17-4 and Figure 17-6. As shown in the results, the transparency in Pak Tho canal seems to be getting better, probably due to the increase of the amount of inflow starting in the rainy season. However, results of COD did not indicate any quality improvement of water.

Table 17-4 Results of Water Quality Monitoring

Location	Pak Tho Canal (P3)		
Date of sampling	2015/2/9	2015/4/29	2015/6/7
Transparency (cm)	17.87	17.00	>50
Water temperature (°C)	22.47	27.57	25.93
pH	7.68	7.54	6.91
DO (mg/L)	5.28	3.43	1.67
COD (mg/L)	22.5	27.5	42.5
Ammonia-nitrogen (mg/L)	17.5	1.65	0.26
Location	Nok Noi Canal (N2)		
Date of sampling	2015/2/9	2015/4/29	2015/6/7
Transparency (cm)	>50	13.33	18.17
Water temperature (°C)	24.78	29.17	26.03
pH	8.70	9.12	8.29
DO (mg/L)	3.04	17.49	4.91
COD (mg/L)	23	75	42.5
Ammonia-nitrogen (mg/L)	0.7	0.4	0.425



**Figure 17-6 Results of Water Quality Monitoring**



As part of water quality monitoring, a demonstration using a biological indicator was held in cooperation with Dr. Somsak Panha of Chulalongkorn University. A field survey and sampling work were conducted on August 15, 2015 in Pak Tho canal and a rapid assessment of the water quality in Pak Tho canal was conducted. The results revealed that the water quality in the canal is categorized as low-medium level as shown in Figure 17-7.



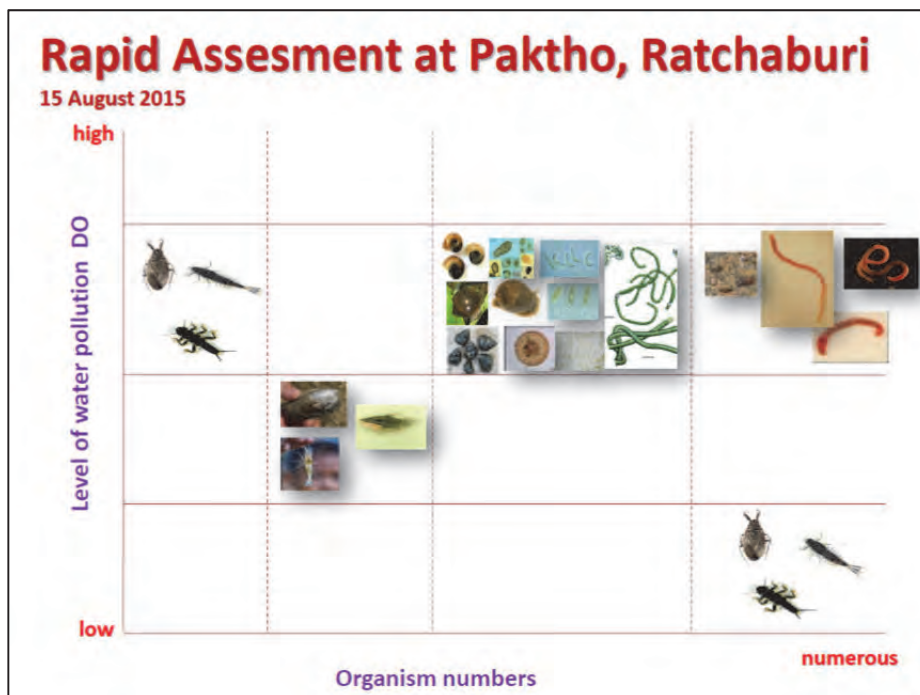


Figure 17-7 Result of Rapid Assessment on Water Quality in Pak Tho canal



### 3) Public board installation

The installation of public boards was conducted as a result of the lessons learned from the previous activities. It aimed to be utilized for the announcement and dissemination of activities and other related information such as slogan/drawing contest, public seminars, among others.

The WG members, in cooperation with Tessaban Pak Tho organized a survey team to select appropriate locations of the public boards in terms of accessibility, appropriateness and effectiveness. There were eight (8) locations selected from ten (10) recommended sites as indicated in Figure17-8 and Figure 17-9.

Location		Type of board
1	Public toilet	Built-in type
2	Hattaya Market	Stand-type
3	Wad Pak Tho Market	Built-in type
4	Wad Pak Tho school	Stand-type
5	Sea Kae Market	Built-in type
6	Health park	Stand-type
7	Tessaban office	Stand-type
8	Anuban Pak Tho School	Built-in type
9	District office	Use existing one

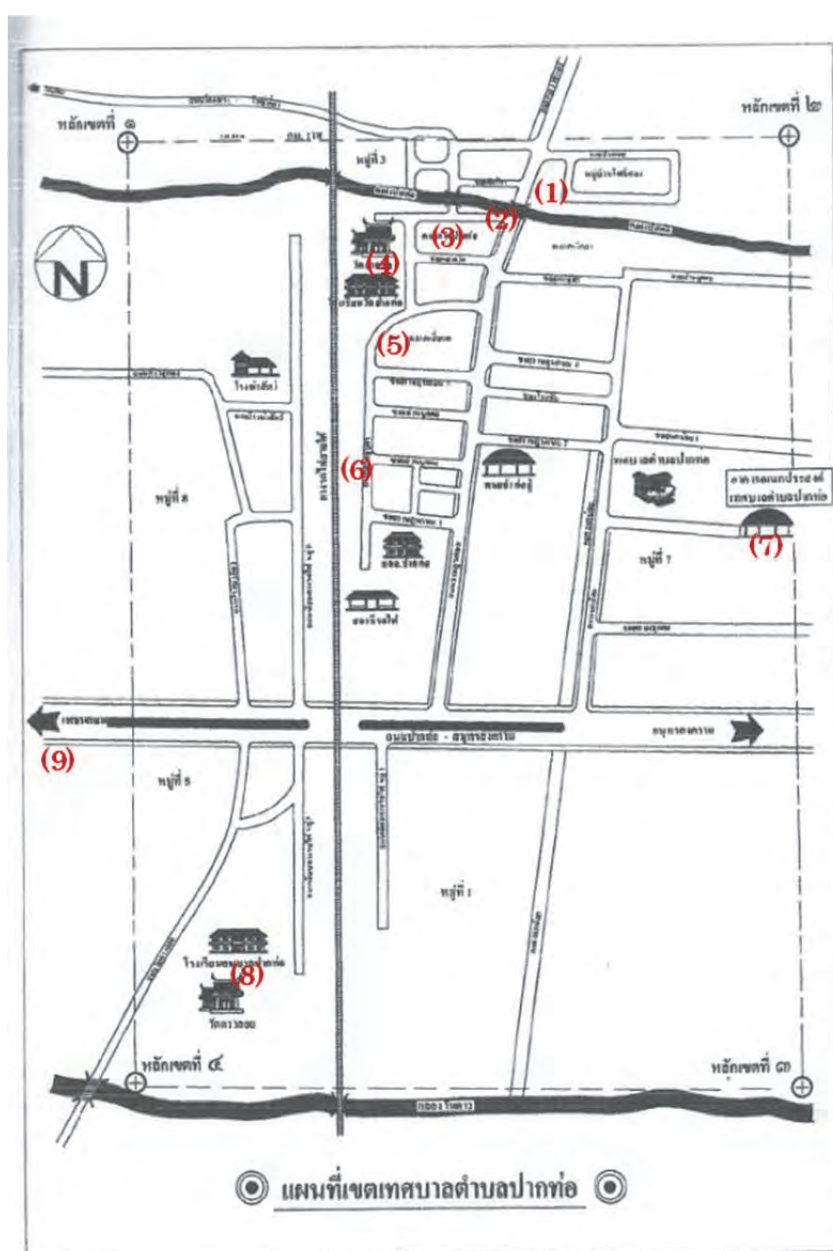


Figure 17-8 Location of Public Boards Installation



**Figure 17-9 Location of Public Boards**

#### 4) Slogan and Drawing Contest

Slogan and Drawing contests were conducted in July 27, 2015 in order to raise awareness on environmental conservation in Pak Tho. Announcement of the contest was given through local radio and posters were placed on the public boards. The target participants are categorized in the following:

**Table 17-5 Target Participants**

Class	Slogan	Drawing
Kindergarten		○
Preliminary 1-2	○	○
Preliminary 3-4	○	○
Preliminary 5-6	○	○
Junior high	○	○
Adult	○	

The application of entry for slogan contest was announced to the public on July 25, 2015. A total of 180 slogans were received by the Evaluation Team, which is composed of five (5) members representing Tessaban, PONRE Ratchaburi and REO8. The criteria for evaluation consist of the following: the meaning and message it conveys, harmonization and presentation. Table 17-6 shows the results.

**Table 17-6 Results of the Slogans Contest**

(Adults)	
Winner	Canal will be beautiful, water will be clean, if everybody concern, not discard waste, not distroy water resource safe beaty for our Pak Tho Canal
First runner up	Environment is belong to our community, everybody help saving house, road are beautiful and clean. Please keep river and canal
Second runner up	Pak Tho is clean and beautiful canal town Pak Tho is keeping cooperative town Pak Tho is developing cooperative town Pak Tho is the town of road and canal keeper



Complementary	Pak Tho will be beautiful because of our helps. Water will be clean because of our environmental cares
(Primary grade 1-2)	
Winner	Pak Tho Canal looks attractive, house looks livable because of no waste
First runner up	Solid waste should discard in bins. We need to be careful not discarding into the canal
Second runner up	Solid waste is not attractive, stop discarding into canal, but discarding into bins
Complementary	Pak Tho is united, and has cleaning discipline
(Primary grade 3-4)	
Winner	Canal is beautiful, town is lively because of Pak Tho community concern
First runner up	Pak Tho is clean because we keep watching, canal is beautiful because we care, water is clear because we help
Second runner up	Pak Tho is clean and no solid waste, canal will be beautiful, water will be clear if everybody help developing
Complementary	Canal is beautiful, town is lively by caring of Pak Tho people
(Primary grade 5-6)	
Winner	Pak Tho is livable, canal is clean, everybody should care and not discarding into canal
First runner up	water in canal is clean, people appreciate
Second runner up	Canal is beautiful and clear, full of care, good livable. It is our town
Complementary	No discouraging development Pak Tho is clean canal, water, air is clean every time
(Junior high 1-3)	
Winner	Pak Tho is clean because our unity Canal is beautiful because of our helps
First runner up	Pak Tho is clean, canal is clear two hand one heart help together
Second runner up	Pak Tho is clean, water is clear because of our cooperative keeping
Complementary	Pak Tho is clean, nature is livable canal looks attractive, live together for development

As to the drawing contests, there were 115 entries received and the winners were evaluated based on certain criteria namely: beauty, meaning of the drawing, composition and color combination. Figure 17-10 and 17-11 shows the winners, runner-up and complementary of the drawing contest.



Figure 17-10 Drawings of Winner







##### 5) Public Seminar

A public seminar was held on August 10, 2015 at Wad Pak Tho School aimed to raise the public awareness of the community and school children; promote the 3R to the community and school children and give experience on EM and waste recycling to the children. Speakers of the seminar included Mr. Piloong Sreesang, Electricity Generating Authority of Thailand (EGAT); Mr. Samrueng Baramee, REO8; Mrs. Sawai Prangngam, Pak Tho Primary School and Mrs. Nichakamon Chaowarungrangkit, Wat Pak Tho School. The WG of Rim Khlong and Nok Noi WG also provided their experience in EM and waste recycle, respectively. A total of 83 people consisting of the Pak Tho community (15); Wad Pak Tho School (29) and Anuban Pak Tho School (39 of which 24 were from Junior High).





Lecture on EM by EGAT



Demonstration on making EM by WG leaders



Lecture on waste recycle by REO8



Demonstration on product of waste recycle

## 6) Waste Composition survey

Waste composition survey was conducted in the area of Rim Klong Community; Number of households to be surveyed counted for approximately 100 HHs. The survey was handled by Tessaban and Rim Klong Community WG in coordination with PONRE Ratchaburi and JET.

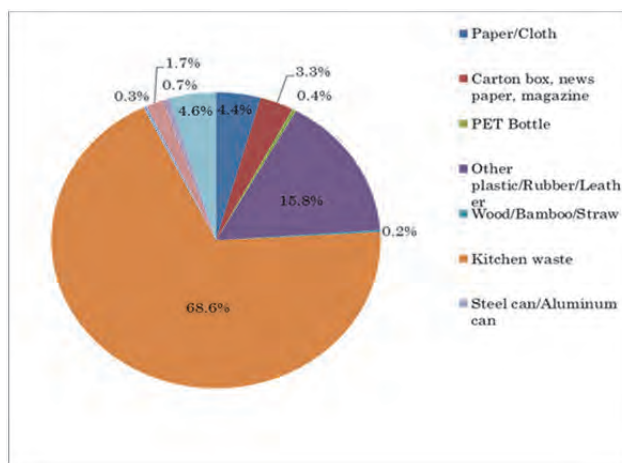
The survey method is sorting garbage collected by the following 10 waste types:

**Table 17.6 Types of Garbage to be sorted**

1) Paper/Cloth	2) Carton box, news- paper, magazine
3) PET Bottle	4) Other plastic/Rubber/Leather
5) Wood/Bamboo/Straw	6) Kitchen waste
7) Metal can	8) Glass/Glass bottle
9) Hazardous waste (battery, light, e.g.)	10) Others

As indicated in the results (Figure 17-12), kitchen waste had high contribution of 68%.

Based on this result, it was decided to search possibility of compost making by kitchen waste.



**Figure 17-12 Types of Garbage to be sorted**

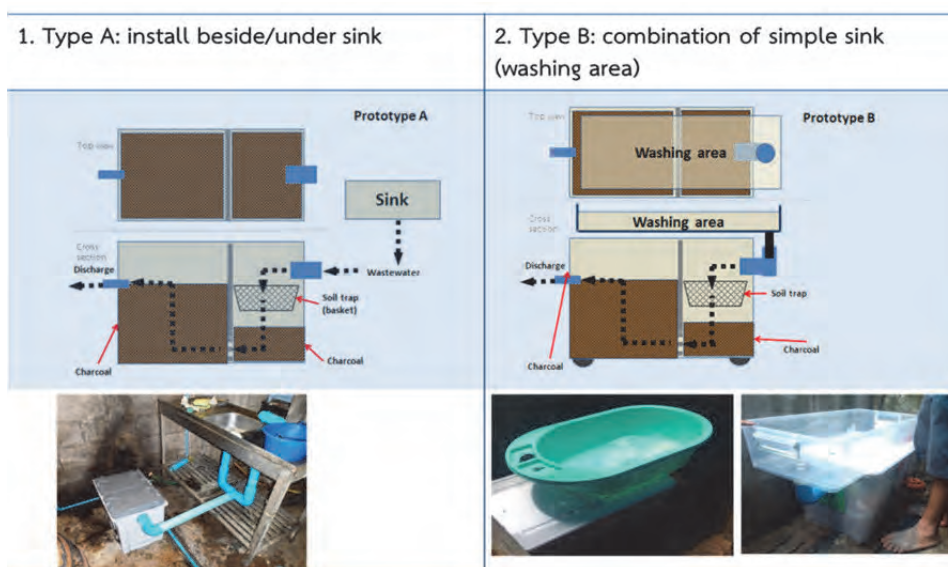
### 7) Community Wastewater Pre-Treatment Tank

The system installation is conducted to improve household wastewater quality before discharging to the Pak Tho Canal. For this activity, a total of 24 pilot houses are targeted to be the beneficiaries of the community wastewater pre-treatment system. The appropriate pilot houses are selected based on willingness to accept the system, accessibility, appropriateness and effectiveness.

Purposes of this activity aimed not only installation of pre-treatment tank itself but also

- Providing knowledge, guideline for operation and maintenance of community based-wastewater pre-treatment system before draining, and also improve water quality of the canal nearby communities.
- Raising awareness of water pollution problems for community people and promote community involvement in environmental pollution both management and prevention.
- Persuading the pilot communities being role community about wastewater pre-treatment system in local level.

There were two types of pre-treatment tank designed, because not a few houses wash dishes without sink, so that type B is attached washing area on a tank (Figure 17-3).



**Figure 17-13 Types of Pre-treatment Tank**

The wastewater pre-treatment systems have been installed in cooperation with the WG and Tessaban Pak Tho. Monitoring on the usability of the wastewater pre-treatment system installed in the houses was conducted to check and improve the systems.



In addition, the following two documents (Figure 17-4) were built as a part of activity:

- Brochure on Installation of Community-based Wastewater Pre-treatment System (Household type)”
- Installation and Operation Manual for Community-based Wastewater Pre-treatment Tank





Figure 17-14 Documents on Guidance for Pre-treatment System

## 8) Public Education on Recycle

As a second event related to recycle waste, public education was conducted on November 6, 2015 for the following purposes:

- Expand and share knowledge of making goods from recycle wastes.
- Raise public awareness to school children and community on valuable goods from recycle wastes.

Total number of participants counted for 81 persons including school children, 29 persons from Wat Pak Tho school, 34 persons from Anuban Pak Tho school.

Major outcomes were:

- School children and community people aware about recycle wastes.
- Recycle waste knowledge is expanded to school children and community people
- Amount of community wastes has been decreased.

Based on the experiences of previous events, children enjoyed making products by recycled waste such as piggy bank, pencil sharpener, basket



## 9) Public Education on EM

As a second event related to bio-treatment by EM ball, public education was conducted on November 20, 2015 for the following purposes:

- Raise public awareness to school children and community biological treatment on
- Improve water quality in canals and water bodies

Total number of participants counted for 82 persons including school children, 30 persons from Wat Pak Tho school, 38 persons from Anuban Pak Tho school.

Major outcomes were:

- School children and community people aware about EM ball advantages.
- Using biological treatment (EM ball) has been increasing in community and household level.

After making EM balls, children threw the ball in the municipal lake in Dao Loy.



## 10) Waste Recycle Bank

The seminar on establishment of recycle bank was taken on November 27, 2015 at Wad Pak Tho School for the following purposes:

- Raise Public Awareness on value of waste recycling
- Reduce amount of the waste from school and community areas
- Strengthening discipline of saving behavior for school children and community

Total number of participants counted for 94 persons including school children, 39 persons from Wat Pak Tho school, 36 persons from Anuban Pak Tho school.

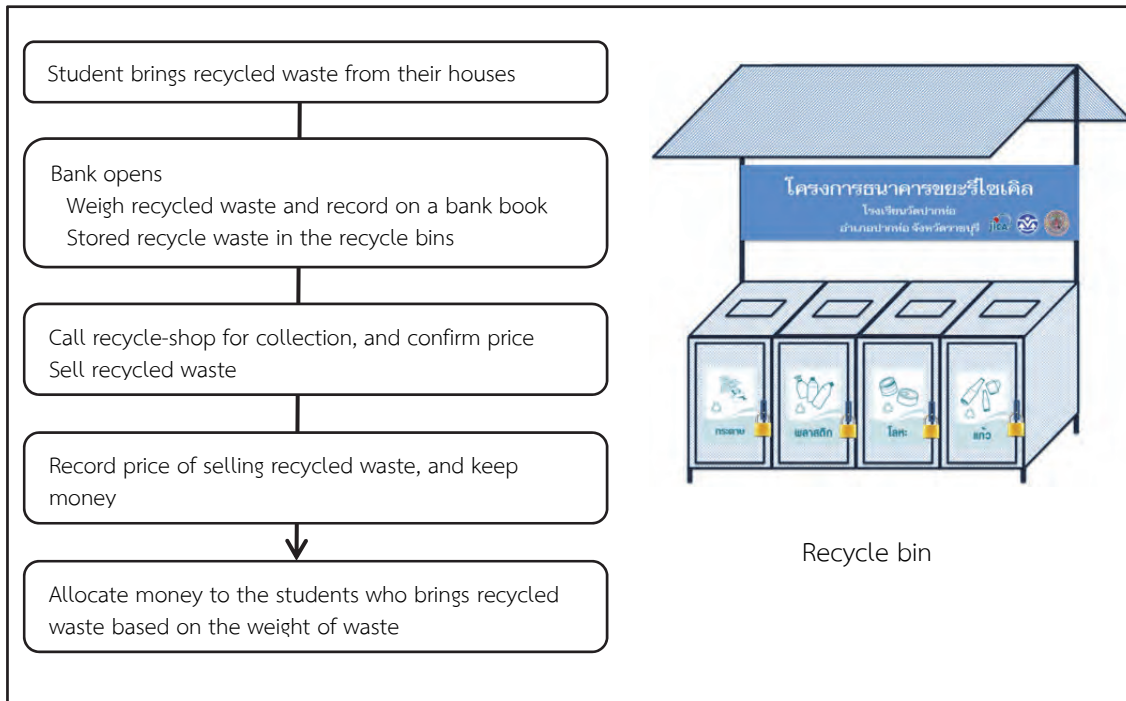
Major outcomes were:

- Amount of wastes is decreased.
- School children have of money saving discipline.
- Community and school are involved together in activity.

The bank has been established in Wad Pak Tho School. Two students have been appointed as bank presidents and teacher handles money on charge on selling recycled materials.

Brief of process on recycle bank is explained as Figure 17-5:





**Figure 17-15 Procedure of Operation of Recycle Bank**



## 18. Monitoring/Evaluation and Lessen Learned from Pilot Project 2

### 18.1 Methods of Monitoring and Evaluation

Monitoring and evaluation was conducted in the following three levels:

**Self-Monitoring:** Self-Monitoring was taken by the Community WGs in cooperation with Tessaban Pak Tho. Manly this activity was undertaken through interview/hearing with community members, school students, teachers, etc. who were involved in the pilot activities. In addition, number of participants involved in the activities, number of materials in those events such as contest, public education could be also indicators.

**Monitoring/Evaluation by Task Force Team (TFT):** TFT meetings were periodically held in order to monitor and evaluate the pilot activities, and to guide for improvement and suggestion on further activities. Table 18-1 lists a series of TFT meeting.

**Table 18-1 Task Force Meeting**

Title	Date	Agenda
3rd TFT Meeting	9 April	<ul style="list-style-type: none"> <li>- Finalization of the CEM-Plan</li> <li>- Monitoring and Evaluation for the Clean Canal Activities done on 29 March and 2 April.</li> </ul>
4th TFT Meeting	17 July	<ul style="list-style-type: none"> <li>- Monitoring and Evaluation for                             <ul style="list-style-type: none"> <li>➢ Canal Cleaning</li> <li>➢ Water Quality Monitoring</li> <li>➢ Installation of Public Boards</li> </ul> </li> <li>- Discussing on upcoming activities</li> </ul>
5th TFT Meeting	24 September	<ul style="list-style-type: none"> <li>- Monitoring and Evaluation for                             <ul style="list-style-type: none"> <li>➢ Slogan/drawing contest,</li> <li>➢ public seminar on EM and recycle wastes</li> <li>➢ public awareness activities by Tessaban and PONRE Ratchaburi (baseline-waste composition survey)</li> </ul> </li> <li>- Discussing on upcoming activities</li> </ul>

**External Monitoring/Evaluation:** It was conducted by the advisory Team through the field survey and meeting held in December 8 – 9, 2015. This field survey and meeting focused on both pilot project 1 and 2.

The concept on monitoring and evaluation mechanism is described in the figure below:

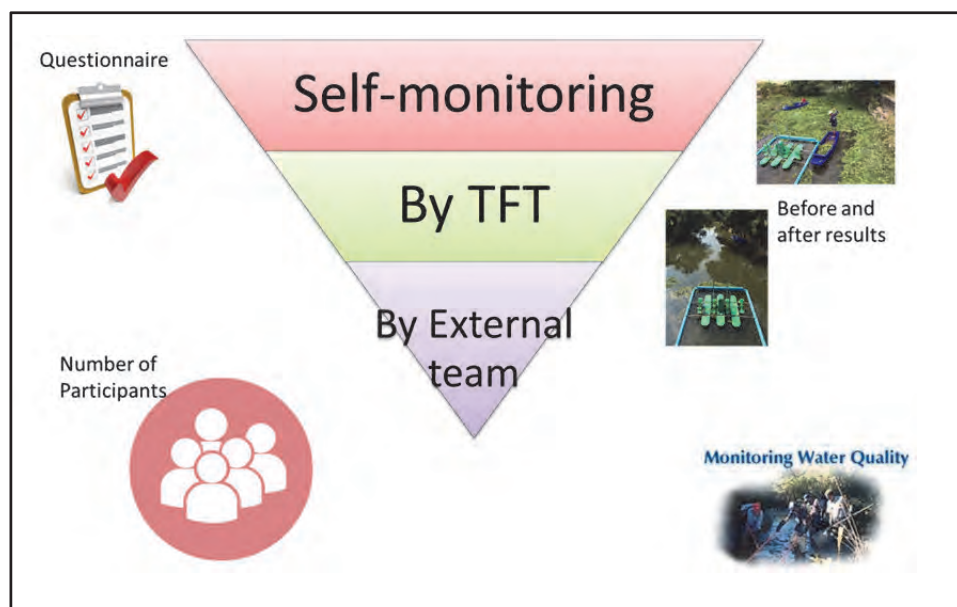


Figure 18-1 Concept on Monitoring and Evaluation mechanism

## 18.2 Results of Monitoring and Evaluation

Monitoring and evaluation on each pilot activity were resulted through above mechanism as follows:

### 1) Canal clean-up

- Prior announcement to communities is important. While it is effective to notice the activity to them even during implementation. Invitation letter to school shall be facilitated to encourage joining.
- Coordination among communities, leaders, Tessaban is important.
- Concrete procedures shall be made before implementation otherwise it is risk to stagnate the schedule.
- A survey and check shall be previously taken to identify cause of pollution, location, e.g.
- Results of activity shall properly disseminated through public boards, e.g.
- For lesson and learn, the following comment was recommended
- Coordination among related government organization is important to effectiveness of the project implementation.

### 2) Public board

- Planning of implementation process should concretely facilitate before implementation, e.g. survey team formulation, board making team formulation and budget estimation.
- A site survey for installation is important for project implementation to decide location, measure area for appropriate boards, prior ask for permission and check whether suitability of location to target group or not.



- Announcement after board installation for attraction is necessary activity to promote the feedback of the project implementation, such as announcement via local communication tower about location and content of the boards.
- Other activities to promote the feedback of the project implementation is for example EM distribution at the boards, using cartoon as media, putting good people picture on the boards, guessing those people's name in the picture and providing awards.
- Monitoring and evaluation after board installation activity should include assessment on location of the installation whether it could get more attention or need of changing location, e.g.

### **3) Slogan/Drawing Contest**

- It is much better to use the products for further dissemination (poster, calendar, e.g.).<sup>2</sup>
- It was suggested that contest criteria for slogan should be more specified and cleared such as identify sellable more tightly, also that selection of winner slogan should be more tight and memorable easily.
- Also it was suggested to consider gender on both participant who gave products and judges.
- Students participated have been already encouraged about environmental matters, but their actual activity had been still less comparing their motivation. Hence, activities should be continuously undertaken.

### **4) Public seminar (1st event on recycling waste and EM)**

- It should be considered children to keep their interest in lectures. Therefore, not only explanation and/or showing products but also involving in demonstration is important.<sup>3</sup>
- It was suggested to hold a seminar with separate (single) topic to avoid confusing participants and giving sufficient time. In addition, suggested that divide small group in order to effectively look into the participants interesting.
- Also it was suggested to arrange using learning station of each topic for students to more participate and attract interest of the student.
- Suggested arranging with lecture session of topics to set up a learning station for demonstration. By the way, number of student in one group should not be more than 10-15 people to cover all students.
- There should be ensured the capacity of EM and EM balls for using in cleaning the canal due to EM from water hyacinth may be less effective. Continuous use of EM is one of key success.

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<sup>2</sup> Finally, calendars were produced by slogans and drawings.

<sup>3</sup> As a second education event, seminars on recycling waste and EM was separately conducted with more concentration on active involvement.

### **18.3 Conclusion**

The pilot projects can be evaluated according to the four (4) criteria, that to say, Feasibility, Replicability, Sustainability and Recommendation as below

#### **1) Feasibility**

- Pilot Project 2 succeeded in public involvement as obviously seen that community people consent the installation of sewage systems in households. Building acceptance from the public need time to coordinate and communicate with the community people. In addition, public understanding and public awareness are also important for receiving acceptance and need the implementation continuously.
- Target group has been emphasized and school activities were continuously implemented. School activities have been plan as a series from educate to implement as establishing the waste bank in school. Having the activities as step by step encourages student to interested and willing to attend the activities.
- Creating the appropriate activities by considering context of school will increase more collaboration from student and parent as well. For example, establish the waste bank in school which located the heart of community will provide the convenient for students and parent in bringing their waste to school.
- Community environmental management plans were formulated by community participation. Since, projects and activities are initiated by community people therefore community people have the ambition to complete the activities as planned.
- Strengthening of community could be created from community participation.
- Public awareness should be inculcated to the youth.
- Water quality improvement by involving community people bring about the better water quality. As a result, Tessaban do not have to invest an expensive wastewater treatment system.

#### **2) Replicability**

- The process introduced by JET is different from conventional process which PONREs usually do. Hence, PONREs applied the JET's process in their job.
- The equipment used in pre-water treatment system is quite fragile. May not be suitable to replicate in other area unless design and assembly are improved.

#### **3) Sustainability**

- Tessban Pak Tho plans to promote ancient houses in community for tourism purpose. This project will impact on the sustainability of cleanliness of the canals.
- Tessaban is going to formulate Tessaban development plan (3 years plan). Community environmental management plans will be taken into the consideration of Tessaban council and incorporated to 3 years plan. However, the possibility of implementation depends on budget approval from Tessban council.

- Tessaban plans to continue operation of waste bank. PONREs and REO8 will also continuously support and advice.
- Nowadays, environment is the priority issue (guided by policy). However, responsible organization needs to be strengthened in practice. Beside, each organization differs in implementation skills.
- Volunteer spirit is one of the factors that make the project a success. However, encouraging the implementation of volunteers as well as educating, allocating the budget and having the coordination / assistance from the relevant authorities will allow the sustainable implementation of environmental volunteer.

#### **4) Recommendation**

- Tessaban Pak Tho should consider promoting urban visual quality (lifestyle of community people, identity of community for tourism attraction)
- In the process of coordination, implementer needs to understand the context of stakeholder as well as relationships of related sectors in pilot area such as relationship between communities or relationship between community and organizations.
- Beside installation of wastewater treatment system, the knowledge in water quality monitoring should be transferred and volunteer groups for water quality monitoring should be established. Moreover, the results of water quality monitoring should disseminate to public in order to raise public awareness.
- Social measurements should be added to solid waste management measure or more attractive activities should be initiated such as introduction of point card system to award people who use the ecobag.

#### **18.4 Lesson and learns**

Pilot project 2 mainly focused on community participation, therefore the most important points to broad to other areas could be related to how much involve and encourage communities in environmental management.

For upon point, it is highlighted the following recommendation as results from lesson and learns:

##### **1) Community selection process**

It was good to hold meeting in every community in the selection process in order to understand local situation and select appropriate community as pilot sites.

Besides, selection results were clearly announced to all communities to promote their understandings, especially for unselected community.

Those steps generated good relationships between each community, and could be a key for smooth application to unselected communities.

## **2) Involvement of community people broadly**

Involving ordinary community people is essential but most difficult matter.

Community leader and environmental volunteer can be facilitator for ordinary people to raise their awareness.

But due to some limitations such as busy for work, or bothersome to participate, involvements of ordinary people are limited.

To raise their awareness and understandings, continuous approaches in many channels are really necessary.

## **3) Cooperation among communities on formulation of community-based environmental management plan**

CEM Plan was formulated individually based on environmental aspects in each community even though training and planning workshop were held together. CEM Plan itself was issued individually, while most of the pilot activities jointly conducted by three Working groups. Actually back ground, environmental issues faced, etc. are common in Pak Tho and three communities in the pilot project have had close relation and communication, so that the pilot project 2 could succeed in terms of coordination among different communities. It, however, may be fact that there can be different issues or approaches to be individually managed.

Therefore, it is important to identify what issues can be jointly managed or shall be separately handled when community environmental groups are formulated.

## **4) Demarcation and role sharing between communities and government (Tessaban)**

It might be not easy to handle this issue. But it shall be highlighted that coordination between communities and government section.

For above point, it is important to respect, consider each situation and roles, and then highly suggestible Tessaban to have regular meeting especially with communities in order to understand well each other.

## **5) Limitation of experiences/knowledge in community**

There are limitations to conduct seminars/ training to enhance skills and knowledge on environment within community. It is suggestible to continue and strengthen a network among concerned groups in order to introduce sufficient experiences, technical knowledge, etc.

In addition to said network, Tessaban shall be key player for coordination with communities. Therefore it is suggestible Tessaban to conduct regular meeting with community to share same direction.

**6) Effective use of local resources**

Tools and materials are necessary to implement activities. Also, to accordance with local situations, equipment should be adjustable.

In order to remove any inconvenience to implement activities, necessary tools, and materials are provided and managed by community. Also, equipment is usually made by community people to adjust local situation.

**7) Budgetary matters**

Budget allocation by Tessaban is important. While if community activities are shouldered by this allocated budget, communities too much rely on it and the activities can be constrained.

It is important community themselves to search possible chance of budget allocation such as donation, charity, selling community products

**8) Coordination mechanism**

Finally, it is highlighted that the key point to address effective model on community-based environmental management should be to develop a good coordination mechanism.

The TFT team was organized in the PP-2, the functions aimed to provide guidance and technical advices to the communities, and to monitor and evaluate the community actions. In addition, the team could perform to coordinate among parties concerned. One role could be, for instance, introduction of technical, financial support from any outside groups such as university, private company.

Therefore it is suggestible to organize such a coordination team to guide / support community groups. And then, local government (tessaban) should be key performer fo those coordination.

