

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT
KINGDOM OF THAILAND

THE STUDY ON SUPPORTING SYSTEM FOR LOCAL ADMINISTRATIONS ON NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT IN THE KINGDOM OF THAILAND

Summary Report Final Report



August 2008

Kokusai Kogyo Co., Ltd.
EX Corporation

**THE STUDY ON
SUPPORTING SYSTEM FOR LOCAL ADMINISTRATIONS ON
NATURAL RESOURCES AND ENVIRONMENTAL
MANAGEMENT
IN THE KINGDOM OF THAILAND**

List of Volumes

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This is the Summary Report.

Exchange Rate Used in the Report
US\$ 1.0 = 33.8 Baht, 1 Yen = 0.312 Baht

PREFACE

In response to a request from the Government of Thailand, the Government of Japan decided to conduct “The Study on Supporting System for Local Administrations on Natural Resources and Environmental Management in the Kingdom of Thailand” and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Susumu Shimura of KOKUSAI KOGYO Co., LTD. between June 2007 and July 2008.

In addition, JICA set up an advisory committee headed by Mr. Masami Mizuguchi a Senior Advisor of Institute of International Cooperation, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of Thailand and conducted field surveys in the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the implementation of this plan and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Thailand for their close cooperation extended to the study.

August 2008

Ariyuki Matsumoto
Vice President
Japan International Cooperation Agency

August 2008

Mr. Ariyuki MATSUMOTO
Vice President
Japan International Cooperation Agency

Letter of Transmittal

Dear Mr. Matsumoto

We are pleased to submit the report of the Study on Supporting System for Local Administrations on Natural Resources and Environmental Management in the Kingdom of Thailand.

This Study was conducted to *strengthen the capacity* of agencies responsible for Natural Resources and Environmental Management (NREM) in central, provincial, and local administrations, and at the same time *strengthen the linkage* between the administrative levels, through the formulation of a Provincial Environmental Quality Management Plan (PEQMP) following the National Environmental Quality Management Plan (National EQMP) of 2007-2011 in two model provinces, Phra Nakhon Si Ayutthaya Province (AYP) and Samut Songkhram Province (SKP).

The ultimate objective of the Study is to strengthen capacities of all involved in NREM (including the individual, organization, system, and even society), and therefore the Study carefully stayed within the role of supporting the initiative led by the Thai side. The emphasis of the Study was placed on the process of producing reports or manuals. Therefore, reports, seminar handouts, etc. were all thoroughly discussed with the Thai side beforehand, and only the points agreed upon by the Thai side were included in the final version. Thus, the Study Team placed high importance on discussions held at biweekly meetings, which were held 36 times in total, once a week alternatively in the two Model Provinces.

The PEQMP of the Model Provinces were formulated based on the PEQMP-KPI that those in the Model Provinces themselves formulated and submitted, and are essentially revised and improved editions of the Thai sides' effort. Desired improvements and supplements to the PEQMP-KPI Formulation Manual were noted in the PEQMP revision process, and were similarly collected as a list of suggested revisions.

After the issues and measures to be taken were examined through this process of formulating PEQMP, the Study Team proposed measures in the form of supporting plan for the improvement of administration capacity of organizations and agencies related to NREM in central/provincial/local administrations to strengthen linkages between organizations related to NREM in central/provincial/local administration, raise awareness among local administrations and residents, establish an NREM administration structure at the provincial level, and utilize the NREM GIS database in NREM.

We would like to take this opportunity to express our sincere gratitude to your Agency, the Advisory Committee, the Ministry of Foreign Affairs, and the Ministry of Environment of Japan. We would also like to extend our deep appreciation to the Government of Thailand, The Embassy of Japan and the JICA Thailand office for their vital cooperation during the implementation of the study in Thailand.

Last but not least, we hope that the output of the study presented here will contribute not only to the improvement of NREM, but also to the sustainable development of the whole country.

Respectfully,

Susumu SHIMURA

Team Leader

The Study on the Study on Supporting System for Local Administrations on Natural Resources and Environmental Management in the Kingdom of Thailand..

Executive Summary

1. Outline of the Study

1.1 Objective of the Study

The objective of this Study was to *strengthen the capacity* of agencies responsible for Natural Resources and Environmental Management (NREM) in central, provincial, and local administrations, and at the same time *strengthen the linkage* between the administrative levels, through the formulation of a Provincial Environmental Quality Management Plan (PEQMP) following the National Environmental Quality Management Plan (National EQMP) of 2007-2011 in two model provinces, Phra Nakhon Si Ayutthaya Province (AYP) and Samut Songkhram Province (SKP).

1.2 Study Area

The PEQMP was formulated in two model provinces. Suggestions towards the strengthening of NREM capacity of, and the strengthening of linkage between, central, provincial, and local administrations are made with the whole of Thailand in mind.

The two model provinces are:

- Phra Nakhon Si Ayutthaya Province (AYP)
- Samut Songkhram Province (SKP)

2. PEQMP

2.1 Issues with the Existing PEQMP (PEQMP-KPI¹)

The Ministry of Natural Resources and Environment (MNRE) and Office of Natural Resources and Environment Policy and Planning (ONEP) published the *Action Plan Handbook for Natural Resources and Environmental Management at the Provincial Level* (hereinafter called as PEQMP-KPI Manual) in order to facilitate the formulation of the PEQMP-KPI by each Province. Using this PEQMP-KPI Manual, all 75 Provinces in Thailand formulated, and submitted, their PEQMP-KPI to MNRE by October 2007.

Each submitted PEQMP-KPI was evaluated by the PEQMP-KPI Evaluation Committee, chaired by the Deputy Permanent Secretary of MNRE. According to the Evaluation committee, the PEQMP-KPI had the following general inadequacies:

1. The lack of spatial information (area-based information) in these plans hindered the understanding of *what* issue is present in *which* area.
2. Insufficient measures were taken to reflect stakeholder opinion in the plan formulation process, contrary to MNRE's intentions.
3. The projects in the PEQMP-KPI dealt only with problems solvable within a single Local Administration (LA) instead of addressing provincial-level issues, and there was lack of coordination between plans. As a result, associated budget plans were also kept to LA budgetary limits, instead of providing comprehensive budgetary planning with local, provincial, and national-level assets in sight.

¹ In this Study Report, the PEQMP submitted in 2007 is indicated as 'PEQMP-KPI' (which stands for Provincial Environmental Quality Management Plan for Key Performance Indicator [for Evaluation of Administrative Performance]) in contrast to 'PEQMP', which is the PEQMP to be submitted through the efforts of this Study in 2008.

2.2 Formulation of PEQMP (i.e. the Revision of PEQMP-KPI)

The Thai counterparts in both model provinces formulated their PEQMP-KPI by following the instructions given by MNRE and submitted them in October 2007. This Study commenced in June 2007, but the Study Team did not take part in the formulation of PEQMP-KPI. In the period from June to October 2007, the Study Team collected and analyzed existing data regarding the current situation of NREM in the two model provinces, held discussions with counterparts, and conducted the following supplementary surveys in the two model provinces to obtain additional data necessary for the formulation of PEQMP:

- Supplementary water quality study for additional information about water resources
- Land use study, to grasp the changes in land use patterns over the past 20 years, and to grasp the current land use pattern
- Improvement of the NREM GIS Database through updating information and adding necessary layers for the formulation of PEQMP
- A public opinion survey about NREM among local administrations, NGOs, residents and business establishments

From October 2007, the Study Team and Thai counterparts started the revision of the PEQMP-KPI based on the analysis of existing data, and data from the supplementary studies. The PEQMP 1st draft – the main contents of which were the current situation and issues of NREM – was disseminated among stakeholders through the 1st PEQMP Seminar (held in late December to mid-January in the two model provinces) and a wide range of stakeholder opinion was sought.

The evaluation of the PEQMP-KPI was given by the PEQMP-KPI Evaluation Committee in January 2008, as described above. The PEQMP 2nd draft consisted of a revised 1st draft -- revised in reflection of the Evaluation Committee's evaluations as well as the opinions/ requests from stakeholders voiced at the 1st Seminar – and additionally, Provincial-level Priority Programs determined through discussion with Thai counterparts. To obtain a wide range of stakeholder opinion on the PEQMP 2nd draft, the 2nd PEQMP Seminar was conducted in both model provinces in early March 2008.

Then the detailed contents of the Priority Projects, included in the Priority Programs, were decided through extensive discussion between the Study Team and Thai counterparts, with consideration to stakeholder opinions/ requests voiced in the 2nd PEQMP Seminar. The detailed contents of Priority Projects were added to the PEQMP 2nd Draft to form the PEQMP 3rd draft. To obtain a wide range of stakeholder opinion on the PEQMP 3rd draft, the 3rd PEQMP Seminar was conducted in each model province in early July 2008.

The PEQMP Final Draft reflected the opinions/ requests voiced at the 3rd PEQMP Seminar, as well as the comments at the Steering Committee on July 14th 2008, and will be submitted by both model provinces to MNRE in September 2008.

2.3 Improvement and Dissemination of the PEQMP-KPI Manual

As explained above, the PEQMP in the two model provinces were formulated through a joint revision effort by the Study Team and Thai counterparts in an effort to answer the PEQMP-KPI Evaluation Committee's points of criticism. Through such joint revision efforts, the following suggestions for the improvement of the PEQMP-KPI Manual were made:

- Suggestions for Improvement of PEQMP-KPI Manual

- Utilization Plan for Natural Resources and Environmental Management GIS Database (NREM GIS DB), to supplement the above improvements to the Manual
- Suggestions for Selecting Suitable Public Participation Methods for NREM, to supplement the above improvements to the Manual

To examine the feasibility of these suggestions, to improve upon them, and to work towards their dissemination, a Trainers' Training Workshop for the dissemination of the revised Manual to the 75 Provinces of Thailand was held for three days from June 18th 2008, and was attended by staff members from REO6, REO8, and the 9 PEO under those two REO. The above suggestions were generally accepted by the participants of the workshop, but the following additional issues were pointed out:

- The suggestions of the improved PEQMP-KPI Manual, such as the use of GIS, is impossible to follow in the current situation, where only a few staff members of PEO are put in charge of PEQMP formulation by themselves. A supporting mechanism by REO and NREM-related organizations in Provincial Administration (Changwat) must be put in place.
- A public opinion survey on NREM is a powerful tool in understanding the priority issues as understood by stakeholders, but a supplementary budget will be required to conduct such a survey.
- Additional training, other than the Trainers' Training Workshop, is necessary to learn the uses of PDM (Project Design Matrix) methodology for Priority Program formulation.

MNRE/ONEP will take into consideration the additional issues pointed out by participants towards the dissemination of the improved PEQMP-KPI Manual, and also consider budget allocation and other measures that might become necessary, create an improved version of the PEQMP-KPI Manual based on the suggestions made through the Study process, and disseminate the results to the 75 provinces.

3 Capacity Development

3.1 Study Policy

To attain the objective of this Study, the stronger emphasis of the Study was placed on the capacity enhancement of Thai counterparts and other related personnel, rather than the formulation of the end product, the PEQMP. To accomplish the objective under such understanding of Study priorities, the Study Team followed the following Basic Policies:

Basic Policy 1: Contribute to the capacity enhancement of personnel and organizations involved in NREM in central, provincial, and local administration.

Basic Policy 2: Assist the formulation of a PEQMP that establishes a sustainable NREM.

3.2 Capacity Development conducted through this Study

As mentioned in the Study Policy, this Study aims to strengthen the capacities of all involved in NREM (including the individual, organization, system, and even society), and therefore the Study carefully stayed within the role of supporting the initiative led by the Thai side:

- The emphasis of the Study was placed on the *process* of making a report or manual, instead of the final product. Therefore, reports, seminar handouts, etc. were all thoroughly discussed with the Thai side beforehand, and only the points agreed upon by

the Thai side was put in the final version. The Study Team provided the supporting documents to assist the efforts led responsibly by the Thai side.

- Thus the Study Team placed high importance on discussions held at biweekly meetings, which were held in once a week in one or the other of the two Model Provinces. The biweekly meetings, which numbered 36 in total, were attended by the Thai counterpart team and the staff members who initially formulated the PEQMP-KPI in the Model Provinces. Each meeting lasted over 2 hours and sometimes lasted over 6 hours.
- In addition to biweekly meetings, additional meetings were scheduled as necessary with NREM-related personnel in various departments within MNRE, REO, and LAs. Such activities clarified the issues that have to be solved to establish a sustainable form of NREM, and initiated the process of looking for solutions together with those involved.
- These Study activities led to the formulation, by both the Study Team and Thai counterparts, of plans to strengthen capacities of agencies responsible for NREM in central, provincial and local administrations.

Through such Study activities, the following two capacity development measures were achieved:

- Promotion of mutual understanding and mutual cooperation between organizations and agencies related to NREM in central/ provincial/ local administrations
- Acknowledgement of the necessity for systematic support of organizations and agencies related to NREM in LAs by central, regional, and provincial organizations related to NREM

4 Supporting Plan for the Improvement of Administrative Capacities of Organizations and Agencies Relating to NREM in Central/Provincial/Local Administrations

4.1 Strengthening Linkages between Organizations Relating to NREM in Central/Provincial/Local Administrations

The following measures will be taken by relevant organizations, in order to strengthen the linkages between NREM-related organizations in central/ provincial/ and local administrations:

- Strengthen the local NREM support capacities of REO so that it provides technical assistance and information for the improvement of NREM among PA (Changwat) and LAs within its region, or in other words, functions as a ‘PA/LA *Regional* Support Center for NREM’. Specifically, the REO’s capacity to provide information and conduct public relations activities through its GIS Database Center should be strengthened. To increase the REO’s ability to support PA/LA, the link between REO and regional offices still held by the five non-ex-MOSTE (Ministry of Science, Technology and Environment) departments within MNRE shall be strengthened.
- A ‘PA/LA *Central* Support Center for NREM’ within MNRE will be created, in order to support PA (Changwat) and LAs in the field of NREM. As the Central Support Center will relay assistance requests from PA/LA which cannot be resolved by the REO to relevant departments in MNRE, use the National EQMP as a supporting tool, and strengthen both REO and PA/LA through its activities, it shall be established as a unit of ONEB (Office of National Environment Board) within ONEP (which is the planning and supervisory agency) within MNRE.

4.2 Raising Awareness among LAs and Residents

For LAs to properly execute the NREM responsibilities devolved onto them, especially solid waste management and wastewater treatment, the LAs and especially the Orborjor must be led to assign the necessary staff and budget to NREM. At the same time, the NREM responsibilities of LAs are closely related to the life of residents and their efforts will not be sustainable without the residents' cooperation.

To overcome the above issues, the awareness regarding NREM must be raised among LAs and residents. The following activities will be conducted by the relevant organizations:

- The 'PA/LA Central Support Center' in MNRE, REO, and PEO should hold seminars and workshops about solid waste management and wastewater treatment, and other issues that directly affect on the quality of life of residents and raise awareness about the importance of proper management.
- The DEQP/MNRE, REO, and PEO should collaboratively promote environmental awareness education and the dissemination of environmental information among local residents.
- The PEO should work towards the establishment of public participation in NREM by organizing posting periods for draft PEQMP and arranging for the inclusion of representatives of NGOs and residents in the PEQMP monitoring committee.

4.3 Establishment of a NREM Administration Structure at the Provincial Level

Many NREM projects need a provincial-level approach. Therefore, the strengthening of LAs, especially the Orborjor, which hold jurisdiction over provincial-wide NREM, will be conducted through the cooperation of related agencies as follows:

- The Provincial Office in the PA (Changwat) in cooperation with MNRE/REO/PEO should lead efforts to strengthen the NREM capacities of Orborjor by strongly working towards the establishment of an Environmental Division in Orborjor. Then, to support the new Environmental Division of Orborjor, a NREM supporting team, recruited from staff of various PA (Changwat) offices, with cooperation from PA (Changwat) and MNRE, will be established within the PA (Changwat).
- The Environmental Division of the Orborjor should promote NREM activities that are beyond the scope of Tessaban and Orborjor, e.g. implementation of PEQMP Priority Programs.
- The Environmental Information Center, which already exists in some PEO, should be strengthened or in some cases newly established. The Environmental Information Center will provide Provincial NREM information to local residents, LAs, etc. The Environmental Information Center will also collect provincial NREM information from local residents, LAs, etc., and send the information to the GIS Database Center in REO for the updating of the NREM GIS Database.
- MNRE/REO/PEO will implement the following measures in order for LA to acquire the necessary funds for the establishment of an appropriate system for solid waste management and wastewater treatment:
 - To support LAs to formulate master plans and feasibility studies to acquire the necessary funds for the facilities and equipment

- To assist and support LAs to introduce a new fee system which covers part of the cost to operate and maintain those facilities and equipment

4.4 Utilization of the NREM GIS Database in NREM

The following measures will be taken for the utilization of the NREM GIS Database:

- The database management functions should be concentrated onto the REO which becomes the GIS Database Center for the region. The PEO will keep to the role of user of the NREM GIS Database and rely on the REO to make updates and changes.
- The persuasiveness of visual information, e.g. from satellite and aerial photographs, should be utilized as a tool for building consensus among stakeholders and other relevant personnel. The introduction of GIS for this purpose, and accompanying budgetary measures, will be considered.
- Effort should be put in considering methods to make the information in the NREM GIS Database accessible to a large number of people through freeware, for example ArcReader.
- The GIS Database Center in REO will create an action plan, which will detail daily tasks involving GIS, concrete methods of obtaining data for updating the GIS database, and concrete plans on who will make what kind of digital/analog data and give it to whom.
- In order to coordinate with a provincial development plan and existing land use plan (zoning), area based information which is obtained from the environmental GIS database shall be supplied to relevant organizations and departments in charge of the development plan and land use plan.

5 Recommendations

NREM in Thailand is well established within their central administration structure. However, it is insufficiently established at the LA level, although it is the LAs that hold jurisdiction over NREM aspects that directly affect the residents' daily lives, such as solid waste management and wastewater management. Thus, for example, most LAs still have open dumping in their solid waste disposal sites, and untreated wastewater pollute public water bodies in many locations.

The LAs in Thailand are about a tenth, in both size and population, to comparative administrative organizations in Japan. Many NREM issues that have been devolved as responsibilities of LAs, including solid waste management and wastewater treatment, simply cannot be properly managed by a single LA in Thailand or even a few LAs working together, in terms of area and budget that must be considered. Provincial-level solutions must be considered for some NREM issues.

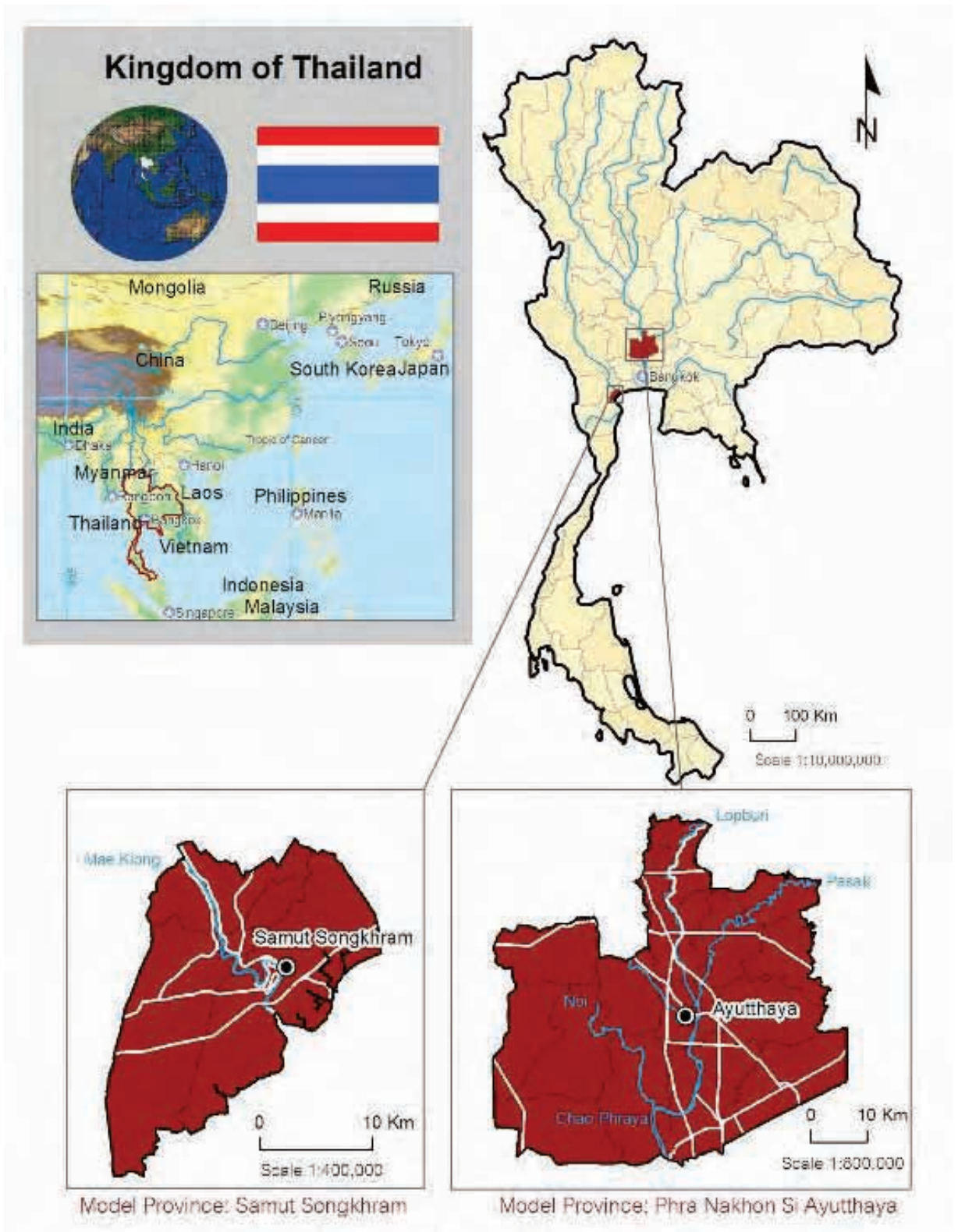
At the provincial level in Thailand, however, exist three tiers of administrations, consisting of agencies of central administration organizations, PA (Changwat), and LAs (Orborjor, Tessaban, Orbortor). The Orborjor (PAO) which holds jurisdiction over province-wide NREM is the least qualified in terms of technical expertise or human resources. Currently, Orborjor plays a minimal part in NREM: for example, while MNRE instructs the assignment of 8% of the local budget to NREM, the Orborjor assigned only 0.2% (AYP) and 0.1% (SKP) of their budget to NREM in 2006, according to the opinion survey among LAs conducted by this Study. The Orborjor of SKP does not have an environmental division, and while such a division exists in the Orborjor of AYP, its 4 staff members also work in urban planning.

Under such conditions, the following recommendations are made to relevant organizations, to work in concordance with the supporting plan described above, so that the currently weak local NREM capacities can be strengthened:

| Organizations | Actions to be Taken |
|---------------|--|
| MNRE | <ul style="list-style-type: none"> • ONEP & OPS shall further strengthen LA NREM support by REO & PEO and the regional support capacities of REO. • MNRE shall establish a PA/LA Central Support Center for NREM which functions as a window organization to relay the inquiries and requests from PA (Changwat) and LAs, which cannot be dealt with by REO, to departments in MNRE. • The department of MNRE, which is appointed by the Center, shall assist PA and LAs through such support as the provision of the latest scientific theories and technical information, technical instruction, sector-based training, dispatch of and instruction by experts, and assistance of formulating plans in their various fields of responsibility. • DEQP/MNRE shall raise awareness among chiefs of relevant LAs, especially Orborjor, of the importance of proper NREM in areas such as solid waste management and wastewater treatment. • In cooperation with REO/PEO, MNRE shall implement the following measures in order for LA to acquire the necessary funds for the establishment of an appropriate system for solid waste management and wastewater treatment: <ul style="list-style-type: none"> - To support LAs to formulate master plans and feasibility studies to acquire the necessary funds for the facilities and equipment - To assist and support LAs to introduce a new fee system which covers part of the cost to operate and maintain those facilities and equipment |
| REO | <ul style="list-style-type: none"> • REO shall, with support from MNRE, strengthen its GIS Database Center's capacity to provide information and conduct public relations activities, and organize itself as a supporting agency that provides technical expertise and information for the improvement of NREM in PA and LA. • REO shall provide necessary training opportunities for PEO, an NREM supporting team in PA (Changwat), and Environmental Division in Orborjor. • REO shall strengthen the linkage with regional offices still held by the five non-ex MOSTE departments within MNRE. • The GIS Database Center shall update the NREM GIS Database periodically, using the information provided by PEO, PA (Changwat), 'PA/LA Central Support Center for NREM' in MNRE, and other agencies under each REO. • REO shall raise NREM awareness in preserving NRE among administrative officers in LAs in cooperation with the PA/LA central support center and PEOs under its jurisdiction. REO shall also raise NREM awareness in preserving NRE among residents in cooperation with DEQP and PEOs under its jurisdiction. • In cooperation with MNRE/PEO REO shall implement the following measures in order for LA to acquire the necessary funds for the establishment of an appropriate system for solid waste management and wastewater treatment: <ul style="list-style-type: none"> - To support LAs to formulate master plans and feasibility studies to acquire the necessary funds for the facilities and equipment |

| | |
|---------------------------------|---|
| | <ul style="list-style-type: none"> - To assist and support LAs to introduce a new fee system which covers part of the cost to operate and maintain those facilities and equipment |
| Regional Offices other than REO | <ul style="list-style-type: none"> • Regional offices other than REO shall support improvement of NREM of PA/LA in cooperation with REO. |
| PEO | <ul style="list-style-type: none"> • PEO shall, with support from MNRE, strengthen or in some cases newly establish an Environmental Information Center. • The Environmental Information Center should provide Provincial NREM information to local residents and others, and collect new information on it from them. The Center should then send the information to the GIS Database Center in REO. • PEO shall raise NREM awareness in preserving NRE among administrative officers in LAs in cooperation with the PA/LA central support center and REO in the Region of PEO. PEO shall also raise NREM awareness in preserving NRE among residents in cooperation with DEQP and the REO. • PEO should work towards the establishment of public participation in NREM by posting the draft PEQMP to the public and inclusion of representatives of NGOs and local residents in PEQMP monitoring committee. • In cooperation with MNRE/REO, PEO shall implement the following measures in order for LA to acquire the necessary funds for the establishment of an appropriate system for solid waste management and wastewater treatment: <ul style="list-style-type: none"> - To support LAs to formulate master plans and feasibility studies to acquire the necessary funds for the facilities and equipment - To assist and support LAs to introduce a new fee system which covers part of the cost to operate and maintain those facilities and equipment • PEO shall provide area based information which is obtained from the environmental GIS database to relevant organizations and departments in charge of the development plan and land use plan in order to coordinate with a provincial development plan and existing land use plan (zoning). |
| PA (Changwat) | <ul style="list-style-type: none"> • The PA (Changwat) in cooperation with MNRE/REO/PEO should lead efforts to strengthen the NREM capacities of Orborjor by strongly working towards the establishment of an Environmental Division in Orborjor. • Then, the PA (Changwat) shall establish a NREM supporting team within the PA to support the new Environmental Division of Orborjor. |
| Orborjor | <ul style="list-style-type: none"> • Orborjor shall strengthen or newly establish an Environmental Division and allocate necessary manpower and budget to the division to establish the sustainable NREM. • The Environmental Division should promote NREM activities that are beyond the scope of Tessaban and Orborjor, e.g. implementation of PEQMP Priority Programs. |
| Tessaban and Orborjor | <ul style="list-style-type: none"> • Tessaban and Orborjor shall strengthen or newly establish an Environmental Unit and allocate necessary manpower and budget to the unit to establish the sustainable NREM. • The Environmental Unit should establish a sustainable NREM in its administrative area through the implementation of PEQMP Priority Programs in cooperation with Orborjor. |

The success of provincial-level NREM relies on the successful raising of awareness in each LA, especially the awareness of the chiefs of Orborjor and major Tessaban, about the necessity of improvement to the current situation of NREM in their local administration and the need to allocate sufficient staff and budget towards NREM. As most LAs in Thailand currently do not have an established NREM structure, an attempt at rapid and widespread establishment is probably unrealistic. Instead, a concerted supporting effort toward a few target provinces/ Orborjor, whose chiefs are open to the idea of improvement of NREM, is recommended. The improvement in Orborjor across Thailand should be attempted on the basis of established improvement records through such targeted efforts.



Location Map: The Study on Supporting System for Local Administrations on Natural Resources and Environmental Management in the Kingdom of Thailand



Cultural heritage coexists with residents and modern urban facilities in the Historic City of Ayutthaya, a World Heritage Site since 1991.



The only bird sanctuary in AYP (approx. 16 ha) includes temple grounds at its center. Bats hang from a tree just outside the bird sanctuary.



The voluminous Chao Phraya River is essential as a transportation route and also as a drinking/ irrigation water source to local residents, but can also be a source of flooding.



The largest solid waste disposal site in AYP, located to the west of Ayutthaya City, is filled to capacity. Construction of a new site is a priority for AYP.



Oxidization wastewater treatment facility operated by Ayutthaya City, located by the Lopburi River in AYP.



The river ports on the Chao Phraya River in AYP (with moorings for coal- and cement-carrying barges) are sources of public complaints about noise and dust.

Plate 1: The Current Situation of NREM in AYP



A floating market on a canal connecting to the Mae Klong River; a famous tourist spot in SKP.



Don Hoi Lot Wetlands, protected by RAMSAR convention, abounds in aquatic and marine resources and is a jewel among SKP coastal sites.



SKP is famous for the Hoi Lot clam, a type of razor clam, from the RAMSCAR-protected Don Hoi Lot Wetlands.



Coconuts piled up at a coconut processing factory, and its wastewater oxidation pond.



Privately owned mangrove forests are exploited as raw material for charcoal. Mangrove forests on public lands are strictly protected in SKP.



Currently, SKP only has a transfer site (above) for solid waste. Waste is transported to final disposal sites in neighboring provinces. Construction of a final disposal site is a priority for SKP.



Office entrance, REO8, in Ratchaburi Province. REO8 oversees SKP.



REO8 has an information section equipped with GIS software and X-Y plotters.



Orbortor office building, SKP.



Tessaban Nakhon Office, AYP.



Orbortor office building, AYP.



Waste collection vehicles parked at the Orbortor office. Waste collection is an important function of Local Administrations.

Plate 3: Provincial Agencies of Central Administration Organizations relating to NREM and Offices of Local Administration (LA)



Sampling at the Mae Klong River mouth, SKP.



Water quality analysis on the bank of Mae Klong River, SKP. A fixed point observation site used by PCD was selected for data comparison purposes.



Sampling at the wastewater treatment center outlet of Suan Autasahakham Rojana Industrial Zone, AYP.



Wastewater treatment pond of Suan Autasahakham Rojana Industrial Zone, AYP. The water quality of treated wastewater met PCD standards.



Interview with the Chief Executive of Orborjor of AYP. The Chief Executive is elected into office.



Opinion survey with the head of an NGO, 'We Love Mae Klong'.

Plate 4: Supplement Studies in the Model Provinces



Biweekly meetings in AYP. Meetings were held in the PEO chief's office due to lack of facilities. 18 meetings were held in one year.



Biweekly meetings in SKP. Around 4-5 staff from ONEP, a Central Government organization, attended each biweekly meeting.



The 1st Seminar at SKP. The content of PEQMP was explained to the public, and their comments were reflected onto the next draft.



Participants of the 1st Seminar at AYP held on December 27th, 2007.



The PEQMP Trainers Training Workshop (TTW) was held in June 2008. Participants learned uses for GIS in creating area-based information for PEQMP.



Around 20 REO and PEO staff participated in TTW, discussed problems they encountered during PEQMP-KPI formulation and suggested improvements to the formulation process.

Plate 5: Biweekly Meetings, Seminars and Workshops

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Abbreviations

| | |
|-----------|--|
| AMP | Administrative Management Plan (4 Year Plan) |
| Amphoe | District |
| AP | Action Plan |
| AYP | Phra Nakhon Si Ayutthaya Province |
| BE | Business Establishment |
| CA | Central Administration |
| CD | Capacity Development |
| Changwat | Province |
| Chum chon | Community |
| CITC | Center for Information Technology and Communication |
| CPEQMPF | Committee for Provincial EQMP Formulation |
| C/P | Counterpart |
| DBIS | Database & Information System Section, ONEP |
| DDPM | Department of Disaster Prevention and Mitigation |
| DEQP | Department of Environmental Quality Promotion, MNRE |
| DF/R | Draft Final Report |
| DGR | Department of Groundwater Resources, MNRE |
| DIW | Department of Industrial Works, MOIND |
| DLA | Department of Local Administration, MOI |
| DMCR | Department of Marine and Coastal Resources, MNRE |
| DMR | Department of Mineral Resources, MNRE |
| DNP | Department of National Park, Wildlife and Plant Conservation, MNRE |
| DOPA | Department of Provincial Administration, MOI |
| DWR | Department of Water Resources, MNRE |
| EQM | Environmental Quality Management |
| EQMP | Environmental Quality Management Plan |
| GIS | Geographical Information System |
| GOJ | Government of Japan |
| GOT | Government of Thailand |
| IC/R | Inception Report |
| IPO | Irrigation Project Office |
| IT/R | Interim Report |
| JICA | Japan International Cooperation Agency |
| KPI | Key Performance Indicator |
| LA | Local Administration |
| MNRE | Ministry of Natural Resources and Environment |
| MOAC | Ministry of Agriculture and Cooperatives |
| MOC | Ministry of Culture |
| MOCm | Ministry of Commerce |
| MOD | Ministry of Defense |
| MOE | Ministry of Education |
| MOF | Ministry of Finance |
| MOPH | Ministry of Public Health |
| MOIND | Ministry of Industry |

| | |
|-----------------------|--|
| MOI | Ministry of Interior |
| MOIT | Ministry of Information Technology and Communication |
| MOJ | Ministry of Justice |
| MOLS | Ministry of Labor and Social Securities |
| MOSD | Ministry of Social Development and Human Settlement |
| MOSTE | Ministry of Science, Technology and Environment |
| MOT | Ministry of Transport |
| MOTS | Ministry of Tourism and Sports |
| Mooban | Village |
| MS | Meteorological Station |
| National EQMP | Environmental Quality Management Plan |
| NESDB | National Economic and Social Development Board, Prime Minister's Office |
| NGO | Non-Governmental Organization |
| NREM | Natural Resources and Environmental Management |
| NREM GIS Database | Natural Resources and Environmental Management GIS Database |
| ODP | Local Administration Development Plan (Orborjor Development Plan) |
| ODPM | Office of Disaster Prevention and Mitigation |
| OJT | On the Job Training |
| ONEB | Office of National Environment Board, ONEP |
| ONEP | Office of Natural Resources and Environmental Policy and Planning, MNRE |
| OP-BE-AYP (SKP) | Opinion Survey to Business Establishments in Ayutthaya Province (Samut Songkhram Province) |
| OP-LA-AYP (SKP) | Opinion Survey to Local Administration in Ayutthaya Province (Samut Songkhram Province) |
| OP-LP-AYP (SKP) | Opinion Survey to Local People in Ayutthaya Province (Samut Songkhram Province) |
| OP-NGO-AYP (SKP) | Opinion Survey to NGO in Ayutthaya Province (Samut Songkhram Province) |
| OPDC | Office of Public Sector Development Commission, Prime Minister's Office |
| OPS | Office of Permanent Secretary, MNRE |
| Orborjor | PAO (Provincial Administrative Organization) |
| Orbortor | TAO (Tambon Administrative Organization) |
| PA (Changwat) | Provincial Administration |
| PAO | Provincial Administrative Organization |
| PAgO | Provincial Agricultural Office |
| PA + LA | Provincial Administration and Local Administration |
| PCD | Pollution Control Department, MNRE |
| PDP | Provincial Development Plan |
| PEO | Provincial Environmental Office |
| PEQMP | Provincial Environmental Quality Management Plan |
| PEQMP-KPI (Provincial | Provincial Environmental Quality Management Plan for Key Performance Indicator |

| | |
|-------------------------|---|
| APNREM) | |
| PFO | Provincial Fishery Office |
| PHO | Provincial Public Health Office |
| PLO | Provincial Livestock Office |
| PMO | Prime Minister's Office |
| P/R | Progress Report |
| Provincial APEQM | Provincial Action Plan for Environmental Quality Management |
| PWA | Provincial Water Authority |
| PWO | Public Works and City Planning Office |
| REO | Regional Environmental Office |
| Regional EQMP | Regional Environmental Quality Management Plan |
| RFD | Royal Forest Department, MNRE |
| RID | Royal Irrigation Department, MOAC |
| St/C | Steering Committee |
| SKP | Samut Songkhram Province |
| SPDP | Strategic Provincial Development Plan (Governor's Budget) |
| Tambon | Sub-district |
| TAO | Tambon Administrative Organization |
| Tessaban (Municipality) | There are three type of Tessaban as follows <ul style="list-style-type: none"> ➤ Tessaban Nakorn (City Municipality) ➤ Tessaban Mueang (Town Municipality) ➤ Tessaban Tambon (Sub-district Municipality) |
| Tessaban Nakorn | City municipality |
| Tessaban Mueang | Town Municipality |
| Tessaban Tambon | Sub-district Municipality |
| TOR | Terms of Reference |
| TWC | Technical Working Committee |
| WBS | Well Being Strategy |

1. Outline of the Study

1 Outline of the Study

To avoid confusion between different plans, following English acronym will be used in the study both in English and Thai report. They are:

PEQMP-KPI is “Provincial Action plan for Natural Resources and Environmental Management 2008-2011” which serves as key performance indicator for administrative evaluation for provinces. It was created and submitted by various provinces in 2007.

PEQMP is revised version of “Provincial Action plan for Natural Resources and Environmental Management 2008-2011”. It was created by counterparts of the model 2 provinces—Phra Nakhon Si Ayutthaya and Samut Songkhram with ONEP, REO, and JICA Study Team in 2008

1.1 Background and Objectives

1.1.1 Background

Thailand’s rapid economic development over the last several decades has put considerable stress on its natural resources and environment. Natural resources and environmental performance assessments from several studies confirm a general deterioration of both natural resources and environmental quality and quantity. The analysis of natural resource deterioration and environmental degradation in various sectors indicated that many natural resources and environmental problems tend to be localized, involve multiple stakeholders and thus involve multiple and often conflicting objectives.

Although the government of Thailand has been promoting decentralization and has already transferred administrative powers over natural resources and environment management (NREM) to Local Administrations (hereafter LA; includes Orborjor, Tessaban and Orbor), LAs remain limited in their administrative capacity for NREM. Furthermore, support systems along the central government line (ONEP, REO and PEO) that accompany decentralization have not been adequately strengthened.

The government of Thailand has formulated the Environmental Quality Management Plan (National EQMP) 2007-2011 as a national environmental quality management policy to provinces and local administrations, and published it in the Government Gazette Vol. 124, Special section 24 Ngor, on 1st March 2007. The Ministry of Natural Resources and Environment (MNRE) requested that provincial and local administrations formulate an environmental quality management plan at the provincial level as an open opportunity to all sectors to take part in the formulation and cooperation for implementation in the future. It is, therefore, indispensable to strengthen the capability of provinces and local administrations on NREM since they shall take responsibility for NREM.

Hence, the Thai Government requested the government of Japan to conduct “the Study on Supporting System for Local Administrations on Natural Resources and Environmental Management in the Kingdom of Thailand” (hereafter “the Study”). The Study aims to strengthen capacities of central and provincial administration (i.e. the central government line) and local administration (i.e. the local government line, see Chapter 2 for details) through the formulation of a Provincial Environmental Quality Management Plan (PEQMP) for two model provinces, Phra Nakhon Si Ayutthaya and Samut Songkhram.

1.1.2 Objective

The study aims to strengthen capacities of agencies responsible for NREM in central, provincial, and local administration, and at the same time strengthen the linkage between levels, through the formulation of a Provincial Environmental Quality Management Plan (PEQMP) that takes into account the National EQMP in two model provinces, Phra Nakhon Si Ayutthaya Province (AYP) and Samut Songkhram Province (SKP).

1.1.3 Study Area

The PEQMP was formulated in two model provinces. Suggestions towards the strengthening of NREM capacity of, and the strengthening of linkage between, central, provincial, and local administrations are made with the whole of Thailand in mind.

The two model provinces are:

- Phra Nakhon Si Ayutthaya Province (AYP)
- Samut Songkhram Province (SKP)

1.2 Provincial Environmental Quality Management Plan (PEQMP)

1.2.1 Natural Resources and Environmental Management Plan in Thailand

The following plans concerned with Natural Resources and Environmental Management (NREM) exist in Thailand. The plans and their proponents are shown in the table below.

Table 1-1: Natural Resources and Environmental Management Plan In Thailand

| Short Form | Thai | English | Proponent | Period | Remark |
|----------------------------------|---|---|--|-------------------------|--|
| 1. National EQMP | แผนจัดการคุณภาพสิ่งแวดล้อม | Environmental Quality Management Plan | Ministry of Natural Resources and Environment (MNRE) | 5 Year Plan (2007-2011) | Published in the Royal Gazette Vol. 124 Special section 24 Ngor on 1 st March 2007. |
| 2. Regional EQMP | แผนจัดการคุณภาพสิ่งแวดล้อมภาค | Regional Environmental Quality Management Plan | Regional Environmental Office (REO), MNRE | 5 Year Plan (2007-2011) | This Plan was formulated to disseminate the National EQMP to provinces and local administrations. AYP belongs to Region 6 and SKP to Region 8. A plan for natural resources has not been included in Regional EQMP formulated by Region 6. |
| 3. PEQMP-KPI (Provincial APNREM) | แผนปฏิบัติการเพื่อการจัดการทรัพยากรธรรมชาติและสิ่งแวดล้อมในระดับจังหวัด | Action Plan for Natural Resources and Environmental Management at the Provincial Level ¹ | Provincial Administration (Changwat) and Provincial Environmental Office (PEO), MNRE | 4 Year Plan (2008-2011) | This Plan serves as a KPI for administrative evaluation for both ONEP and provinces, according to the Memorandum of Understandings signed between OPSC of the Prime Minister's Office and MNRE in 2006. |
| 4. Provincial APEQM | แผนปฏิบัติการเพื่อการจัดการคุณภาพสิ่งแวดล้อมในระดับจังหวัด | Provincial Action Plan for Environmental Quality Management | Provincial Administration (Changwat) and Provincial Environmental Office (PEO), MNRE | 1 Year Plan for 2008 | Provinces with areas designated for pollution control and/or environmental conservation are obligated to formulate this Plan based on Article 37 of the Enhancement and Conservation of National Environmental Quality Act. Provinces without such areas prepare this Plan to acquire project budgets. These Plans usually concentrate on wastewater treatment, solid waste management, air pollution control and green area conservation. |

¹ While the exact translation of the name of the Plan is as given here, this plan will be called the PEQMP-KPI (which stands for Provincial Environmental Quality Management Plan for Key Performance Indicator) in this Report.

1.2.2 Provincial Environmental Quality Management Plan (PEQMP)

a. Provincial Action Plan for Natural Resources and Environmental Management for Key Performance Indicator (PEQMP-KPI) and PEQMP

The plans to be formulated in the two model provinces during this Study are equivalent to their PEQMP-KPI (Provincial APNREM) as shown in the Table above. To avoid confusion, a differentiation shall be made by referring to the plans already formulated and submitted by the two model provinces prior to October 2007 as PEQMP-KPI, and the new plans formulated by the two model provinces under assistance of the Study Team referred to as PEQMP.

b. Background of PEQMP-KPI

Act of Administration Policy, Issue 5 (2002), Strategic Plan of Thai Administration Development (2003-2007) and Royal Decree on Good Governance in 2003 directed both central and local government organizations to assess yearly activities by using the Key Performance Indicator (KPI) to measure the efficiency of the action taken.

To emphasize the importance of NREM in long-term development under the “Sufficiency Economy” philosophy, the Office of the Public Sector Development Commission of the Prime Minister’s Office increased the weight of NREM-related KPI in the FY2007 performance assessment, as compared to FY2006. Specifically, OPDC added “the formulation of PEQMP-KPI” as a FY2007 performance indicator at the provincial level. At the same time, “assistance for the formulation of PEQMP-KPI” became a FY2007 performance indicator for the Ministry of Natural Resources and Environment (MNRE).

The PEQMP-KPI thus formulated will be the master plan for NREM in the province for the next 4 years (2008-2011). The PEQMP-KPI should reflect the current conditions of natural resources and environment in each province, and should aim to provide appropriate and specific guidelines for preserving and rehabilitating the natural resources and environment under conditions specific to each province.

The formulation of PEQMP-KPI will be grounded in an area-based approach in order to reflect the needs and concerns of the local people, and to properly align the direction taken by the PEQMP-KPI to economic and social development plans of the province. The formulation of PEQMP-KPI will necessitate the unification of natural resources and environment information, as well as the sharing of ownership of such information. The PEQMP-KPI will lay out a 4-year budget plan where central administration, provincial administrations, local administrations and residents each have a role and responsibility to fulfill in order to achieve various objectives.

The PEQMP-KPI relates to other NREM-related plans at various administrative levels and other NREM-related agencies, as shown in the Figure below:

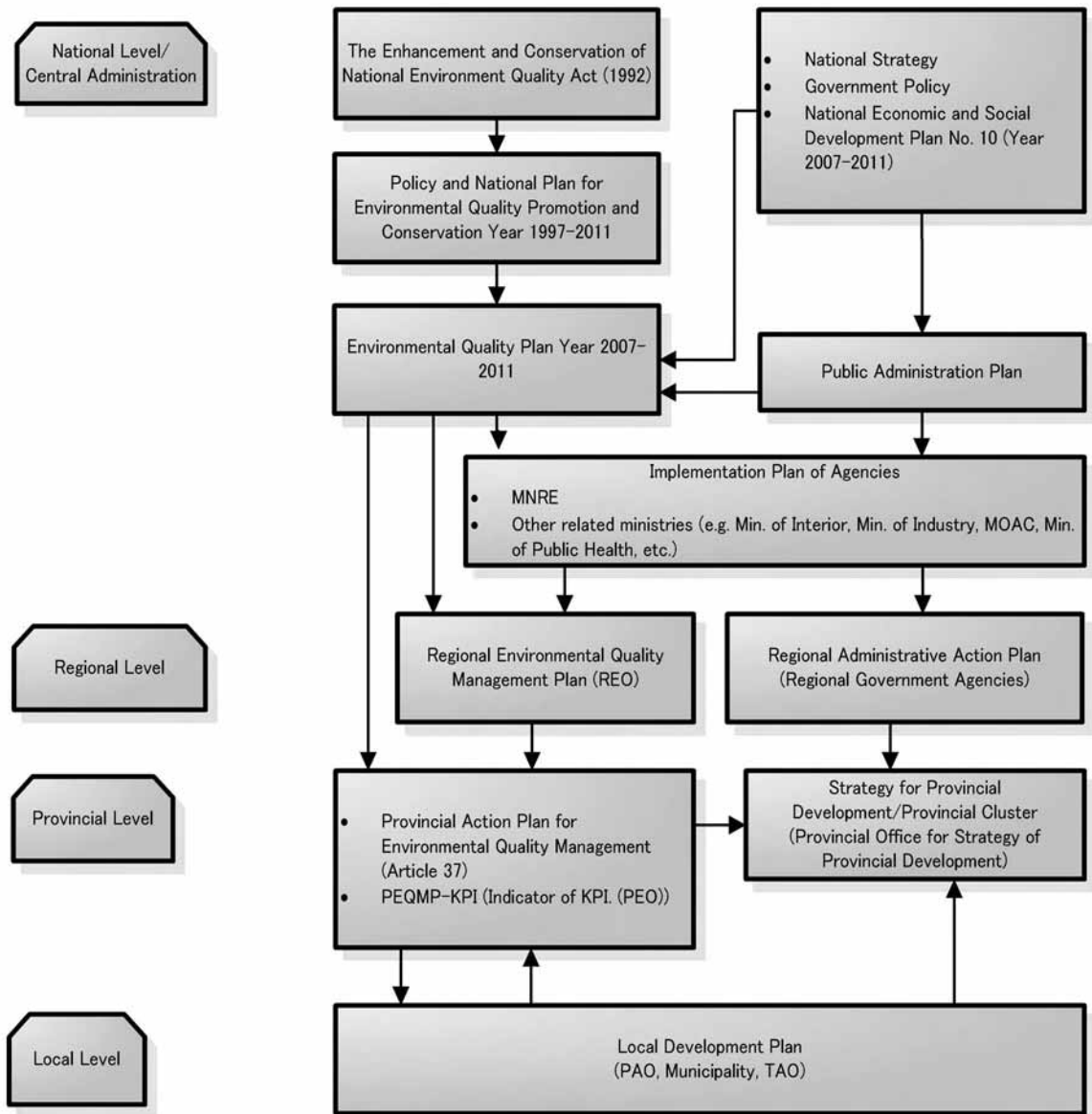


Figure 1-1: Inter-relationship of Plans and Related Agencies for Natural Resources and Environment at All Administration Levels

c. Issues with existing PEQMP-KPI

All 75 Provinces submitted their PEQMP-KPI between 1st October 2007 and 31st December 2007. The submitted PEQMP-KPIs were evaluated by the PEQMP-KPI Evaluation Committee headed by the Deputy Permanent Secretary of MNRE. According to the Evaluation Committee, submitted PEQMP-KPIs showed the following general inadequacies:

1. Although current conditions described in the PEQMP-KPIs present all NREM sectors covered under MNRE, descriptions are general and do not provide specific problems existing in specific and localized areas due to lack of spatial information (area-based

information²). This lack of area-based information hinders the clear understanding of plans outlined in the PEQMP-KPIs.

2. Although the importance of giving open opportunity to all stakeholders in the formulation process was stressed in the National EQMP, the PEQMP-KPIs did not include sufficient opportunities nor procedures for stakeholder participation.
3. A PEQMP-KPI differs from a single-year Provincial Action Plan (APEQM) in its multi-year scope and the necessity to have its long-term plans aligned to policies laid out in the National EQMP. MNRE/ONEP prepared a Handbook (Manual) to address these differences but the submitted PEQMP-KPIs greatly differ from the intended result. Specifically, the submitted PEQMP-KPIs dealt only with problems solvable within a single LA instead of addressing provincial-level issues, and there were no coordination between individual plans. As a result of the former, the submitted budget proposals were limited by LA-level budget constraints, although proposals that comprehensively utilize LA, provincial, and national-level assets were actually sought out.

Comments specific to PEQMP-KPIs submitted by Ayutthaya Province (AYP) and Samut Songkhram Province (SKP) are shown below:

Table 1-2: Comments by the Evaluation Committee on the PEQMP-KPI submitted by Ayutthaya Province (AYP) and Samut Songkhram Province (SKP)

| Part | Comments of the Committee for PEQMP-KPI Improvement |
|--|---|
| Part 1 Introduction | (no comment) |
| Part 2 Situation and Issues in NREM | <ul style="list-style-type: none"> - Describe the current condition of NREM and its problem areas. Clearly describe the linkage between the problem, its current situation, and its impacts on the local residents. - Clearly describe the decision process and procedures in forming preventive measures. Describe how the SWOT analysis results affected the formation process of preventive measures. |
| Part 3 Details of PEQMP-KPI | <ul style="list-style-type: none"> - Clearly describe the connection between a problem and plan/project, and the interrelationship between various plans and projects. - Create an operational time table where each plan/project finishes within the allotted timeframe. - Clearly state the source budgets and/or subsidies for each plan/project. - PEOs must clearly identify plan/projects in which budget allocations and/or subsidies from the province or MNRE are requested. - Define the support structure needed for actual implementation of plan/projects, and include plan/projects in the Provincial Development Strategy. - Provide guidelines on how the plan/project could be followed up and evaluated |
| Part 4 Annex | |
| Others | |

² The Evaluation Committee decreed that the MNRE should assist the provinces in their preparation and maintenance of NREM GIS databases, so that the provinces can obtain and utilize area-based information.

1.3 Outline of the Study

1.3.1 Study Policy

The objective of this Study is “to strengthen capacities of agencies responsible for NREM in central, provincial, and local administrations and at the same time strengthen the linkage between the levels through the formulation of PEQMP in two model provinces”. To rephrase, the stronger emphasis of the Study is on the capacity enhancement of Thai counterparts and other related personnel, rather than the formulation of the end product, the PEQMP. To accomplish the objective under such understanding of Study priorities, the Study Team will follow these Basic Policies:

Basic Policy 1: Contribute to the capacity enhancement of personnel and organizations involved in NREM in central, provincial, and local administration.

Basic Policy 2: Assist the formulation of a PEQMP that establishes a sustainable NREM.

Basic Policy 1: Contribute to the capacity enhancement of personnel and organizations involved in NREM in central, provincial, and local administration.

Local administrative structures in Thailand are currently in a transitional phase as a result of the nation’s decision to decentralize, with central government (central and provincial administration) lines and the local self-governing line interrelating to each other in an intricate pattern. In terms of NREM, the administrative capacities of the local self-governing line, i.e. Local Administration (Orborjor, Tessaban and Orbortor), who are directly responsible for the preservation, management, and improvement of environmental quality are extremely weak, yet the support systems along the central government lines (ONEP, REO and PEO) that accompany decentralization have not been adequately strengthened. As a result, activities which are under the responsibility of the local self-governing line such as solid waste management, domestic wastewater treatment, and natural resource preservation have not progressed, despite the establishment of financial assistance systems such as environmental funds.

The simple formulation of a PEQMP by the Study Team will not accomplish the objective of constructing a sustainable system of NREM nor the strengthening of administrative capacities of NREM-related agencies within central, provincial, and local administrations. Therefore, the Study’s First Basic Policy is to contribute to the capacity enhancement of, and the strengthening of linkage between, various personnel and organizations in central, provincial, and local agencies. Such capacity enhancement and strengthening of linkage shall be encouraged through joint Study activities such as the survey and confirmation of stakeholder views and needs, formulation of a PEQMP, formulation and dissemination of the PEQMP Formation Manual and NREM GIS Database Utilization Manual, and seminars and workshops.

Specifically, the active participation of central, provincial, and local administrations involved in NREM shall be encouraged in order to strengthen practical administrative cooperation between different administrative levels while upholding the independent environmental policy decisions made by each administrative level. Thai counterparts (C/P) shall form the

core among various NREM-related personnel and the Thai side shall themselves formulate the PEQMP, assisted by the Study Team. The Study Team will also assist the Thai side in actively disseminating and publicizing both the methodology of PEQMP formulation and PEQMP contents to relevant parties.

Basic Policy 2: Assist the formulation of a PEQMP that establishes a sustainable NREM.

The formulation of PEQMP will be led by Provincial Administration (Changwat) and its PEO, and the actual implementation of its various plans/projects will be lead by LAs. However, the LAs (Orborjor, Tessaban and Orbortor) that are directly responsible for the preservation, management, and improvement of environmental quality are extremely weak in their administrative capacities, especially in the management of natural resources and environment, as NREM is not considered a high priority issue by LAs. Currently, as the process of decentralization is still undergoing, both PA (Changwat) and Orborjor have not been fully equipped with the administrative structure necessary for the formulation of NREM-related individual sector plans. As a result, the support and assistance of central administration agencies becomes necessary even for the formulation of an improvement plan in each sector of NREM.

Under such existing conditions, the PEQMP must first encourage the development of sustainable NREM in each province and LA. Thus the second Basic Policy for this study is to assist the formulation of a PEQMP that establishes sustainable NREM at the provincial and local level.

An establishment of sustainable NREM at the provincial and local level is not, judging from current conditions, achievable within a short time frame. A step-by-step approach must be taken, beginning with plan/projects that are well within the present capabilities of the LAs. It is extremely difficult for the Study Team to grasp the NREM capabilities of all 159 LAs in Ayutthaya Province and 36 LAs in Samut Songkhram Province, gauge the pertinent issues related to natural resources and environment, and formulate an achievable plan for each issue and LA within the 1-year study period. Thus a Thai-led effort to establish a sustainable NREM, with assistance given where necessary by the Study Team, has become the basic operational mode for this Study as a whole and the PEQMP formulation process in particular. The Study Team centered their attention on improving the understanding of the current situation based on area-based information through the utilization of the NREM GIS database, which has already been disseminated nationwide by the MNRE; the updating and improvement of the already submitted PEQMP-KPI for the two model provinces; and the updating and improvement of the PEQMP-KPI Formulation Handbook.

1.3.2 Organization Structure of the Study

Following the Study Policy outlined in the previous section, the following structure was suggested by the Study Team, and accepted by relevant agencies on the Thai side, as the organizational structure to implement the current Study.

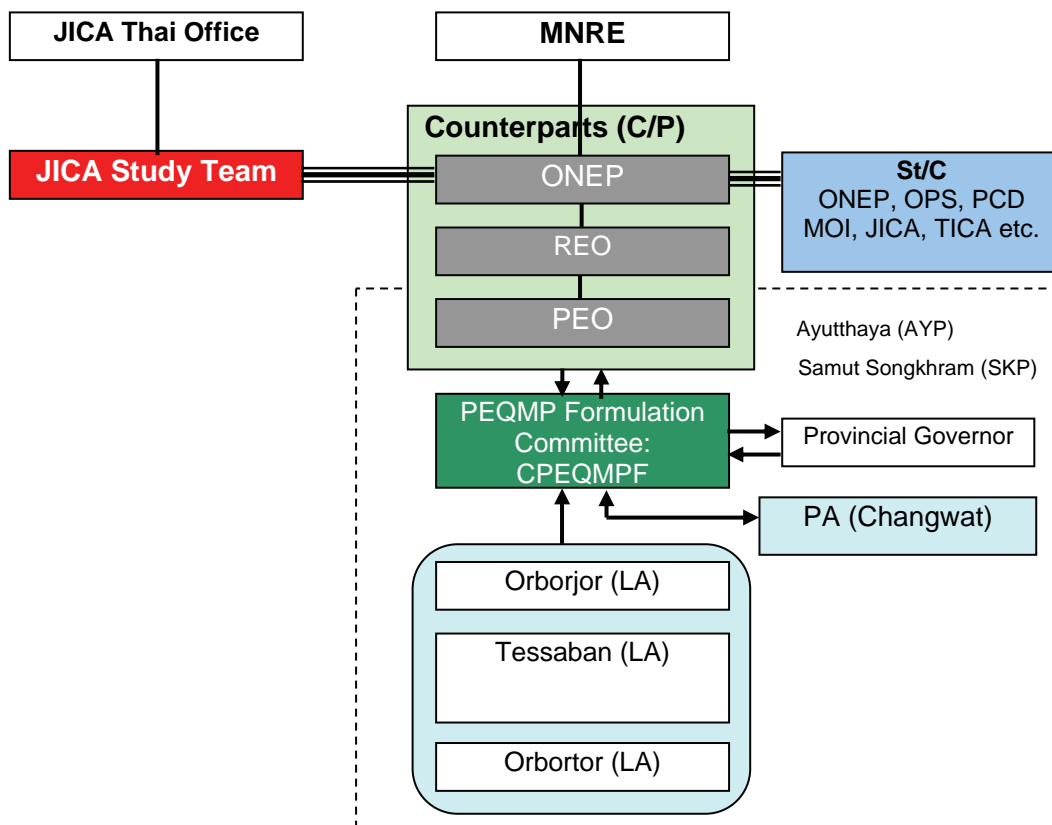


Figure 1-2: Organizational Structure for Implementation of the Study

1.3.3 Study Schedule

The study commenced in June 2007 and is scheduled to finish in August 2008. The study schedule was decided as shown in the following Figure, based on the result of the IC/R (Inception Report) meeting held in June 2007.

As a result, the Study consists of two phases as follows:

Phase 1: June 2007 - March 2008

Formulation of Draft Provincial Environmental Quality Management Plan (PEQMP) and Proposal of Supporting Plan for the Improvement of Administrative Capacities of Central/ Provincial/ Local Administrations Relating to Natural Resources and Environmental Management

Phase 2: April 2008 – August 2008

Formulation of PEQMP and Development of Supporting Plan for the Improvement of Administrative Capacities of Central/ Provincial/ Local Administrations Relating to Natural Resources and Environmental Management

| Year | 2007 | | | | | | | | | | | | 2008 | | | | | | | | |
|-------------------|-----------------------|--------------------------|---|---|---|----|----|--------------|---|--------------------------|---|---|-------------|--------------------------|-----------------------|-------|---|--|--|--|--|
| Month | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | | | |
| Study in Thailand | | [B] 1st work in Thailand | | | | | | | | [C] 2nd work in Thailand | | | | [D] 3rd work in Thailand | | | | | | | |
| Study in Japan | [A] 1st work in Japan | | | | | | | | | | | | | | [E] 2nd work in Japan | | | | | | |
| | ← Phase 1 → | | | | | | | | | | | | ← Phase 2 → | | | | | | | | |
| Report | ▲ IC/R | | | | | | | ▲ P/R | | ▲ IT/R | | | | | ▲ DF/R | ▲ F/R | | | | | |
| Seminar | | | | | | | | 1st Seminar | | 2nd Seminar | | | | | 3rd Seminar | | | | | | |
| Workshop | | | | | | | | GIS training | | | | | | Trainers Training | | | | | | | |

Note: IC/R: Inception Report IT/R: Interim Report P/R: Progress Report
DF/R: Draft Final Report F/R: Final Report

Figure 1-3: Study Schedule

1.3.4 Overview of the Study

a. Capacity Development

As mentioned in the Study Policy, this Study aims to strengthen the capacities of all involved in NREM (including the individual, organization, system, and even society), and therefore the Study carefully stayed within the role of supporting the initiative led by the Thai side:

- The emphasis of the Study was placed on the *process* of making a report or manual, instead of the final product.
- Therefore, reports, seminar handouts, etc. were all thoroughly discussed with the Thai side beforehand, and only the points agreed upon by the Thai side was put in the final version. Thus the PEQMP of the Model Provinces are based on the PEQMP-KPI that those in the Model Provinces themselves formulated and submitted, and are essentially revised and improved editions of the Thai sides' effort. Desired improvements to the PEQMP-KPI Formulation Manual were noted down in the PEQMP revision process, and were similarly collected as a revision suggestion list. In short, the Study Team merely provided the supporting documents to assist the efforts led by the Thai side.
- Thus the Study Team placed high importance on discussions held at biweekly meetings, which were held in once a week in one or the other of the two Model Provinces. The biweekly meetings were attended by the Thai counterpart team and the staff members who initially formulated the PEQMP-KPI in the Model Provinces. Each meeting lasted over 2 hours and sometimes lasted over 6 hours.
- In addition to biweekly meetings, additional meetings were scheduled as necessary with NREM-related personnel in various departments within MNRE, REO, and LAs. Such activities clarified the issues that have to be solved to establish a sustainable form of NREM, and initiated the process of looking for solutions together with those involved.

- These Study activities led to the formulation, by both the Study Team and Thai counterparts, of plans to strengthen capacities of agencies responsible for NREM in central/ local government lines.

The main capacity development activities of this Study are summarized in the below Table:

Table 1-2: Main Capacity Development Activities conducted in the Study

| Activity | Period | Activity Summary |
|--|---|--|
| 1. Biweekly meeting | Late June 2007 to early July 2008. Total of 36 meetings held (18 in each Model Province). | Discussions on PEQMP contents and NREM issues in each Model Province. |
| 2. PEQMP Seminar in Model Provinces | Late December 2007 to early July 2008. Total of 6 meetings held (3 in each Model Province). | The Seminar aimed to explain the contents of PEQMP in each Model Province to as many stakeholders as possible, get their opinions, and reflect such opinions onto the next draft of the PEQMP. All explanations and Seminar procedure direction were conducted by Thai counterparts. |
| 3. C/P training in Japan | September 2007. 12 days, 10 C/P. | Training on the following topics was conducted: <ul style="list-style-type: none"> • Local administration on environmental management in Japan, • Public participation examples in environmental management, and • Methods of PEQMP implementation. |
| 4. Public Opinion Survey | September 2007, in two Model Provinces. | Stakeholders were divided into four groups: local administrations, NGO, residents, and business establishments. Thai counterparts were central in creating the questionnaire for each. A total of 534 stakeholders were interviewed. |
| 5. GIS Database Manager and User Training Workshop | March 3-4 th 2008. 2 days, total of 16 managers/ users. | Training in data updating, data creation, and the use of area-based information in PEQMP. Two separate sessions were held for managers and users of the NREM GIS Database. |
| 6. Trainers' Training Workshop for the dissemination of the revised PEQMP Formulation Manual | June 18-20 th 2008. 3 days, PEO staff members under REO6 and REO8, and staff members from REO6 and REO8. | The Workshop aimed to explain the suggestions for the revision of the PEQMP Formulation Manual to participants experienced in PEQMP-KPI formulation, get their opinions, and to reflect such opinions onto the revised suggestion list for the PEQMP Formulation Manual. |
| 7. Seminar for the dissemination of the revised PEQMP Formulation Manual | To be conducted by ONEP after August 2008, to staff in charge of PEQMP revision in each Province. | The revised PEQMP Formulation Manual (completed through Activity 6) will be disseminated to staff members in charge of PEQMP revision in all other Provinces in Thailand, by Seminars held by those trainers trained in Activity 6. |

b. Overview of the Study

The overview of this Study is as follows:

b.1 Phase 1: Early June 2007 to late March 2008

First, the Study Team strove to understand the current situation of NREM by comprehending the complicated system of local administration and NREM administration in Thailand and by collecting existing data in the field of natural resources and environment. The existing data was analyzed and the NREM situation in the two Model Provinces grasped. The following additional supplementary studies were conducted, and supplementary data obtained, to formulate the PEQMP in the two Model Provinces:

1. Existing water quality data from the two Model Provinces were supplemented by water quality field surveys at 4 locations in AYP (discharge from industrial estates) and 5 locations in SKP (Mae Klong River water quality).
2. To grasp the changes in land use patterns over the past 20 years, LANDSAT5 TM satellite imagery (resolution 30m x 30m) were used to conduct a land use study. Additionally, analysis of high-resolution (5m x 5m) SPOT 5 satellite imagery was conducted to grasp the current patterns of land use.
3. The existing NREM GIS Database was updated, and improved by creating additional GIS layers where necessary, in order to make it possible to use the NREM GIS Database as a tool for PEQMP formulation, and to also unify the environmental information in each Model Province.
4. For the purpose of formulating a PEQMP that reflects as wide a range of stakeholder opinions as possible, a public opinion survey was conducted among local administrations, NGO, residents, and business establishments to collect a wide range of opinions on NREM topics, including what kinds of issues need to be resolved and priority ranking among issues.

While the Study Team conducted the above supplementary studies and grasped the current situation and issues of NREM in the Model Provinces, both Model Provinces formulated their PEQMP-KPI, and submitted them to MNRE in October 2007. From October 2007, the Study Team and Thai counterparts started the revision of the PEQMP-KPI based on the analysis of existing data, and data from the supplementary studies. The PEQMP 1st draft – the main contents of which were the current situation and issues of NREM in each Model Province – was disseminated among stakeholders through the 1st PEQMP Seminar, held in AYP (late December 2007) and SKP (mid-January, 2008), in order to obtain stakeholder opinion on its contents. The 1st Seminar in both Model Provinces was attended by over 100 participants, and a several dozen opinions and requests were voiced by stakeholders in each Model Province.

The evaluation of the submitted PEQMP-KPI was given by the PEQMP-KPI Evaluation Committee in January 2008. The PEQMP 2nd draft consisted of a revised 1st draft -- revised in reflection of the Evaluation Committee's evaluations as well as the opinions/ requests from stakeholders voiced at the 1st Seminar – and additionally, Provincial-level Priority Programs determined through discussion with Thai counterparts. To obtain a wide range of stakeholder opinion on the PEQMP 2nd draft, the 2nd PEQMP Seminar was conducted in both Model Provinces in early March 2008. Over 100 participants attended and several dozen opinions were aired at the 2nd Seminar in each Model Province.

As a result of the above revision processes, and the experience and knowledge gained by the Study Team, the following manuals were put in as annexes to the Interim Report (IT/R), which together are intended to supplement and improve the PEQMP-KPI Formulation Manual:

Annex 1: Suggestions for Improvement of PEQMP-KPI Manual

Annex 2: Utilization Plan for Natural Resources and Environmental Management GIS Database (NREM GIS DB); and

Annex 3: Suggestions for Selecting Suitable Public Participation Methods for NREM

b.2 Phase 2: Late April 2008 to late August 2008

First, the detailed contents of the Priority Projects, included in the Priority Programs, were decided through extensive discussion between the Study Team and Thai counterparts. The PEQMP 2nd draft was revised through the reflection of opinions/ requests voiced at the 2nd PEQMP Seminar, and detailed contents of Priority Projects were added to form the PEQMP 3rd draft. To obtain a wide range of stakeholder opinion on the PEQMP 3rd draft, the 3rd PEQMP Seminar was conducted in each Model Province in early July 2008.

In addition, the suggested revisions to the PEQMP-KPI Formulation Manual (submitted as annexes of the IT/R) was deliberated and finalized, and a Trainers Training Workshop for the dissemination of the revised Manual to the 75 Provinces of Thailand was held for three days from June 18th 2008. The Trainers Training Workshop was attended by staff members from REO6, REO8, and PEO under those two REO, all of whom had experience in formulating PEQMP-KPI. ONEP will finalize the suggested revisions by reflecting the opinions aired at the Workshop, and instruct the revision of the PEQMP-KPI in all Provinces based on the finalized suggestions.

The Final Report (FR), reflected the opinions/ requests voiced at the 3rd PEQMP Seminar, as well as the comments at the Steering Committee on July 14th 2008, was submitted in late August 2008.

2. Current Conditions and Issues of Local Administrations on Natural Resources and Environmental Management

2 Current Conditions and Issues of Local Administrations on Natural Resources and Environmental Management

2.1 Current Conditions of Local Administrations on Natural Resources and Environmental Management (NREM)

2.1.1 Administration in a Province in Thailand

Administration in a province in Thailand is organized into three lines or layers, and they are interrelated in a very complex manner.

The Central Administration line is locally represented by 49 offices in AYP and 37 in SKP; even in SKP, one of the smallest Provinces in Thailand, there are 1,892 permanent employees or a total of 2,410 employees including temporary workers¹. The Provincial Administration (PA) line, which is headed by the Governor who is at the same time a Ministry of Interior (MOI) official, employs 3,323 permanent or 4,095 total employees including temporary workers in AYP, and 1,339 permanent or a total of 1,974 in SKP².

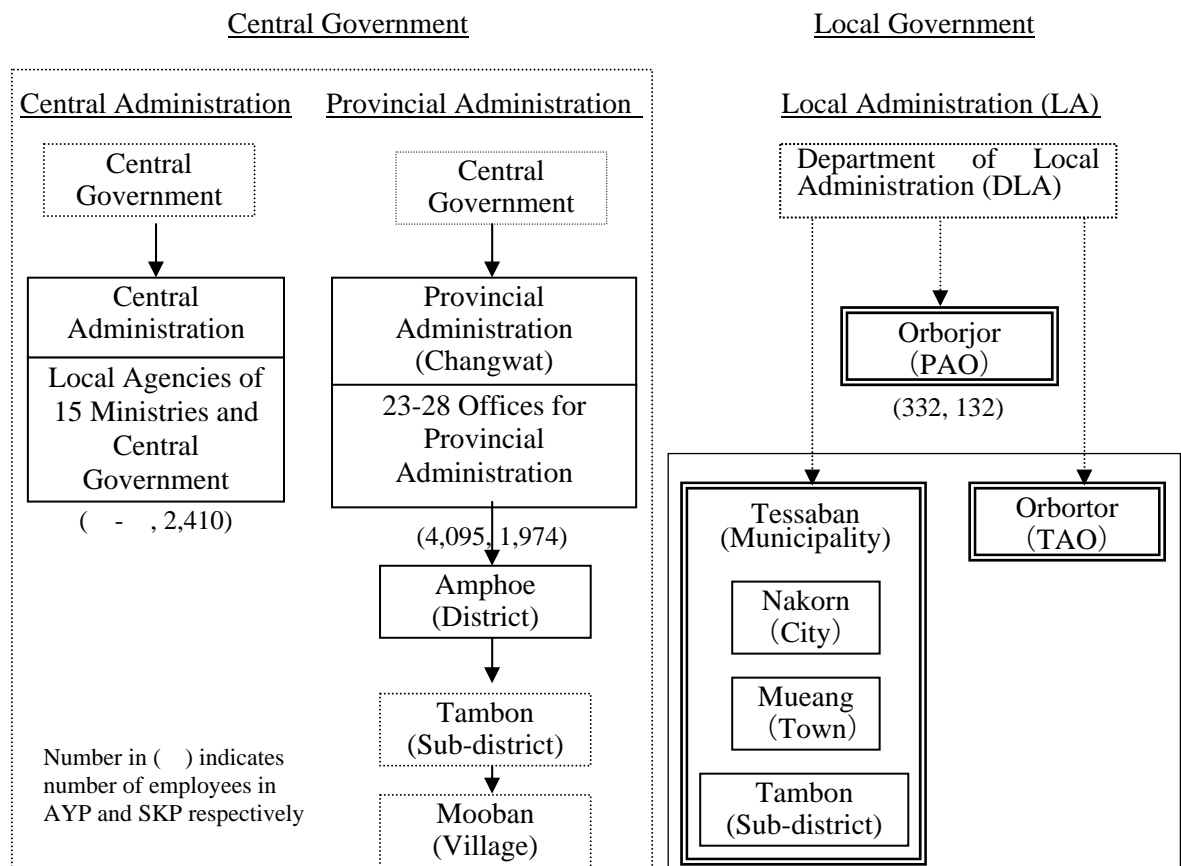


Figure 2-1: Central/Provincial/Local Administration in a Province

¹ Source: Provincial Office records (AYP), website (SKP)

² Source: same as above.

The payroll costs for both Central and Provincial Administration employees are covered by the Central Government, and it is difficult to pinpoint differences in authority between the two lines. It can be roughly stated that the former operates under the direction of the Central Government, and the latter operates under the direction of the Governor.

The indistinctness of the two lines is illustrated by the fact that the PEO falls under the MNRE in the Central Government line in SKP, but is part of Provincial Administration in AYP³.

On the other hand, in the Local Administration line, the Orborjor, whose main function is administration on a Province-wide scale, only employs 106 permanent employees (or 322 total including temporary workers) in AYP and 55 (or 132) in SKP⁴. Legally this makes sense; the number of employees in Orborjor is low because the decentralization process devolved administrative powers directly to Tessaban and Orbortor. However, it is also true that administrative action by Local Administrations from a Province-wide point of view is necessary for certain projects. It is clear from current employee numbers that the Orborjor are not in the condition to exercise their authority to the necessary degree.

2.1.2 Current Conditions of Local Administrations on Natural Resources and Environmental Management (NREM)

NREM in a province is also organized into three lines or layers; central, provincial and local administrations and they are interrelated in a very complex manner.

a. Central Administration

Offices representing Central Administration and offices of the PA (Changwat) (led by the Governor) exist independent of each other in every Province. Around 40 offices represent the former; approximately 25 offices of various PA (Changwat) divisions are also present (Refer to Table 2-3: Agencies and Offices under Central Administration and PA (Changwat) in AYP and Figure 2-2: Organization Chart of Orborjor in AYP). The Provincial Environmental Office (PEO) is the agency responsible for supporting NREM in the Provinces, and falls under the PA (Changwat) (although MNRE has the power to shuffle personnel and bear their salary.). There are 16 Regional Environmental Office (REO) in the country under MNRE to support the PEO, PA (Changwat) and LA for NREM.

b. Provincial Administration (PA)

The various PA (Changwat) divisions under the Governor have not, up until now, actively proposed projects due to the fact that the Governor did not have the authority to obtain project budgets. However, PA (Changwat) encompasses divisions that are heavily related to the preservation and utilization of natural resources and the environment, such as agriculture, fishing, livestock, industry, transportation, public health, and safety divisions, and the management of natural resources and environment is practically impossible without the support of such PA (Changwat) divisions.

Starting fiscal year 2009, Governors in 42 out of 75 Provinces including AYP will be able to obtain project budgets (SKP starts the following year). This new budget scheme would mean that it would soon become possible for the strengthened LAs to return the favor by submitting

³ Source: Provincial Office records (AYP), website (SKP)

⁴ Source: Opinion Survey among Local Administration (LAs) by the Study Team

competent development project proposals, with due consideration to NREM, to the Governor who can then promote environmentally significant projects for his or her Province.

c. Local Administration

There are three kinds of LAs; the Orborjor, which shares their sphere of governance (i.e. the Province) with Provincial Administration (PA or Changwat); the Tessaban, in charge of cities and municipalities; and the Orbortor, in charge of villages. These are formal organizations created and given power under the Constitution of 1997 and the Decentralization Act of 1999, and exist separately from the strictly centralized Changwat-Amphoe-Tambon-Mooban line controlled by MOI officials. Many types of authority that have previously belonged to the Central Government have already been handed over to LAs, but the LAs often do not possess enough administrative capacity due to the rapid pace in which decentralization occurred.

In fact, according to the Opinion Survey to the LA, portion of NREM budget to total budget is very limited except for it of Orbortor in SKP. In addition, there is a few LA which have a division or department responsible for only NREM.

Table 2-1: Budget of LA and its NREM Budget

Unit: 1,000 Baht

| Province | LA | Nos. of LA | Nos. of LA Surveyed | A. Average LA Budget (2007) | B. Average NREM Budget (2007) | Portion of NREM to LA Budget (B/A) | Average Nos. of LA Staffs |
|----------|----------|------------|---------------------|-----------------------------|-------------------------------|------------------------------------|---------------------------|
| AYP | Orborjor | 1 | 1 | 840,024 | 1,668 | 0.2 % | 322 |
| | Tessaban | 34 | 34 | 51,872 | 2,242 | 4.3 % | 105 |
| | Orbortor | 124 | 19 | 15,125 | 724 | 4.7 % | 23 |
| SKP | Orborjor | 1 | 1 | 191,703 | 160 | 0.1 % | 132 |
| | Tessaban | 5 | 5 | 64,578 | 2,899 | 4.5 % | 84 |
| | Orbortor | 30 | 30 | 12,450 | 1,180 | 9.5 % | 17 |

d. Decentralization of NREM Responsibilities

According to the decentralization policy, the responsibilities listed in the following Table has been devolved to Local Administrations (LA), but it is evident that only a few of these tasks can be acted upon by a small Orbortor by itself. For example, ex-ONEP tasks such as “5 Education and research for environmental management” and “2 Promotion of environmental awareness and resident participation”, or ex-MOI tasks such as “12 Wastewater treatment” and “13 Solid waste management”, deal with problems that are fundamentally beyond the scope of small LAs and are rather tasks in which agencies of Central Administration and PA (Changwat) should take the lead.

Table 2-2: Decentralization of NREM Responsibilities

| Ministry | Department | No. | Responsibility | Progress of decentralization |
|----------|------------------------|-----|--|------------------------------|
| MNRE | RFD | 1 | Development of community forests | ○ |
| | ONEP | 2 | Promotion of environmental awareness and resident participation | ○ |
| | | 3 | Monitoring and protection of the environment | ○ |
| | | 4 | Rejuvenation of the environment | ○ |
| | | 5 | Education and research for environmental management | ○ |
| | | 6 | Support for the formulation of environment quality management plan at the provincial level | ○ |
| | DNP | 7 | Preventing wildfire | △ |
| | PCD | 8 | Reporting environmental quality monitoring results and contamination status | ○ |
| | | 9 | Enforcing pollution control regulations as defined by environmental laws | × |
| MOAC | Fishery | 10 | Outreach and training for residents (incl. volunteer training) | ○ |
| | Agricultural Diffusion | 11 | The preservation and rejuvenation of natural resources and environment | - |
| MOI | Public Works | 12 | Wastewater treatment | ○ |
| | | 13 | Municipal solid waste management | ○ |
| | Land | 14 | Administration of publicly-owned lands | ○ |
| | Local Administration | 15 | Preservation and prevention of further deterioration of wastelands | ○ |
| MOIND | Mining | 16 | Monitoring and study of environment and pollution as defined in Ministerial Act (1967), and other activities | ○ |
| | | 17 | Upholding and acting upon laws | ○ |

(Legend) ○: Decentralized, △: In progress, ×: Not decentralized, - : Cancelled

(Source): Decentralization and environmental policies in Thailand, by H. Sato. In *Decentralization and Environmental Policies in Asia*, Institute of Developing Economies Report Series vol. 566: 2008.

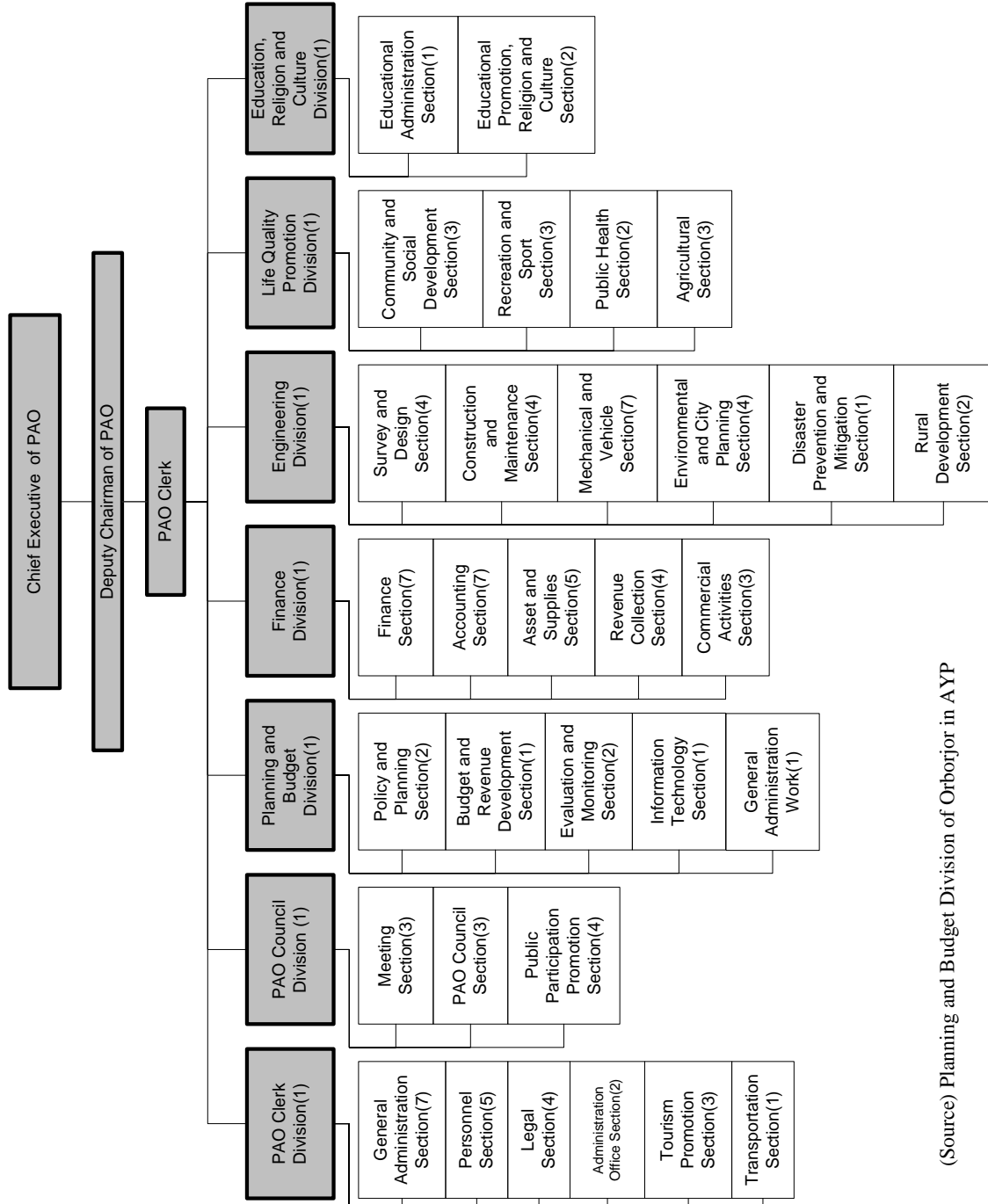
It must be pointed out that the *complete* decentralization and devolvement of NREM-related authority from the Central Government to very small-scale administrative units, i.e. Orbortor and Tessaban, has caused some significant problems. It is recommended to seriously consider the re-assignment of authority for selected NREM-related tasks to larger Orborjor and Provincial Administration (Changwat) organizations.

At present, the capacities of Local Administrations in Thailand are extremely weak compared to equivalent Japanese organizations. The independent implementation of appropriate NREM measures will be extremely difficult for LAs without assistance from the Central Administration and Provincial Administration (Changwat).

Table 2-3: Agencies and Offices under Central Administration and PA (Changwat) in
AYP

| | Ministry | Agencies | Provincial Administration and State Enterprise | |
|--|-----------------------------------|---|--|---------------------------|
| | Central Administration | MOJ | Provincial Attorney | Provincial Administration |
| Provincial Attorney for District Court of Phra Nakhon Si Ayutthaya | | | Provincial Community Development Office | |
| Provincial Attorney of Youth and Family Court | | | Provincial Land Office | |
| Phra Nakhon Si Ayutthaya Correction for Young Offenders | | | Provincial Public Works and City Planning Office | |
| Provincial Central Correction | | | Provincial Public Relations Office | |
| Phra Nakhon Si Ayutthaya Correctional Institution for Drug and Addicts | | | Provincial Finance Office | |
| Provincial Legal Execution Office | | | Social Development and Human Security Office | |
| Provincial Probation Office | | | Agriculture and Cooperatives Office | |
| Provincial Juvenile Observation and Protection Office | | | Provincial Environment Office | |
| MOE | | The 3rd Regional Office of Fine Arts Department | Provincial Agricultural Office | |
| | | Phra Nakhon Si Ayutthaya Historical Park | Provincial Fishery Office | |
| | | Educational Service Area Zone 1 Office | Provincial Livestock Office | |
| | | Educational Service Area Zone 2 Office | Provincial Cooperatives Office | |
| | | Provincial Non-Formal Education Center | Provincial Transportation Office | |
| | | Provincial Special Education Center | Provincial Statistic Office | |
| MOF | | Science Center for Education | Provincial Commercial Office | |
| | | Finance Zone 1 Phra Nakhon Si Ayutthaya | Provincial Labour Office | |
| | | Phra Nakhon Si Ayutthaya Revenue Office | Provincial Labour Protection and Welfare Office | |
| | | Phra Nakhon Si Ayutthaya Revenue Office 1 | Provincial Social Security Office | |
| | | Phra Nakhon Si Ayutthaya Revenue Office 2 | Provincial Employment Office | |
| MOTS | | Provincial Treasury Office | Provincial Public Health Office | |
| | | Provincial Centre of Tourism, Sports and Recreation | Provincial Industrial Office | |
| MOIT | | Sports Authority of Thailand Zone 1 | Phra Nakhon Si Ayutthaya Hospital | |
| | | Phra Nakhon Si Ayutthaya Meteorological Station | Sena Hospital | |
| MOAC | | Information Technology Center Zone 1 | Phra Nakhon Si Ayutthaya Provincial Office | |
| | | Phra Nakhon Si Ayutthaya Rice Research Center | Provincial Land Reform Office | |
| | | Phra Nakhon Si Ayutthaya Irrigation Project Office | Provincial Cultural Office | |
| | | Inland Aquaculture Research Institute | Provincial Buddhism Office | |
| | | Provincial Cooperatives Auditing Office | | |
| | | Provincial Land Reform Office | Provincial Electricity Office | |
| | | Cooperatives Auditing Office 1 | Electricity Zone 1 Central Part Office | |
| MOT | | Provincial Land Development Office | Phra Nakhon Si Ayutthaya Water Authority Office | |
| | | Water Transportation Office Zone 2 (Ayutthaya) | Phakhai Water Authority Office | |
| | | Dredging Center and River Maintenance Zone 1 | Sena Water Authority Office | |
| | | Ayutthaya Highway District | Tourism Authority of Thailand Central Office Zone 6 | |
| MOI | | Provincial Rural Roads Office | Government Saving Bank Zone 4 | |
| | | Provincial Local Administration Office | Government Housing Bank | |
| MOLS | | Office of Disaster Prevention and Mitigation | Ayutthaya National Housing Authority Office | |
| | | Provincial Skill Development Center | Phra Nakhon Si Ayutthaya Postal Office | |
| MOCm | | Wasanawes Social Welfare Development Center for Old Persons | Postal Office Zone 1 | |
| | | Provincial Insurance Office | Provincial Electricity Authority of ThaRue District | |
| | | Provincial Domestic Commerce Office | Provincial Electricity Authority of Sena District | |
| MOD | | Provincial Business Development Office | Provincial Electricity Authority of Wangnoi District | |
| | | Alternate Air Defense Operation Center | Wangnoi Power Plant | |
| | | Tyre Repairing Armanent Division | Ayutthaya Railway Station | |
| MOC | | Explosives Factory Division Industrial Center | | |
| | | Chao Sam Phraya National Museum | | |
| MOSD | Chan Kasem National Museum | | | |
| | Social Development Center Unit 32 | | | |

(Source) Provincial Office in AYP



(Source) Planning and Budget Division of Orborjor in AYP

Figure 2-2: Organization Chart of Orborjor in AYP

2.2 Issues of LAs on Natural Resources and Environmental Management (NREM)

a. Local Administration (LA) NREM need support and strengthening by both Central and Provincial Administrations

Many types of authority that have previously belonged to the Central Government have already been handed over to LAs, but the LAs often do not possess enough administrative capacity due to the rapid pace in which decentralization occurred. Especially the Orborjor (PAO) which holds jurisdiction over province-wide NREM is very weak in terms of technical expertise or human resources. It must be pointed out that NREM is clearly written as one of the main responsibilities of Orborjor in Orborjor Act (1997), and it is an important duty that is yet to be carried out. As a conclusion the Orborjor plays a minimal part in NREM at present.

The PA (Changwat) encompasses divisions that are heavily related to the preservation and utilization of natural resources and the environment, such as agriculture, fishing, livestock, industry, transportation, public health, and safety divisions, and the management of natural resources and environment is practically impossible without the support of such PA (Changwat) divisions. Therefore, for the time being, problem-solving in NREM of LAs will be difficult without the strong support of Central Administration organizations and their agencies, as well as various PA (Changwat) offices.

Having said that, the various PA (Changwat) offices are themselves unable to support LAs in the field of NREM on a technical/specialist level, and the organizational structure necessary to support localized administration of NREM also have not been sufficiently built up in MNRE, which is the relevant Central Administration organization for NREM. Therefore, both Central and Provincial Administrations need to strengthen their supports to NREM of Local Administration (LA).

b. The current size of administrative units are unsuitable for NREM in certain sectors

Many international organizations including the IMF and World Bank have criticized the extremely small scale of LAs, which prevent them from tackling projects that require a certain amount of funds. In particular, projects related to pollution control require a larger-scale administrative approach and their implementation and/or maintenance can be beyond the scope for individual LAs. Thus the scale merits of clustering must be considered.

As a comparative exercise, the average population and area of SKP Tessaban and Orborjor are 8,610 persons/12.0km² and 5,082 persons/13.2km² respectively, while in comparison the 1,820 Japanese local administrative organizations (779 cities, 844 towns, and 197 villages) average 70,202 persons/207.6km² (see below).

Table 2-4: Comparison of Size of LAs in Thailand to local administrative organizations in Japan

| Name of Province | LA | Number of LA | Average Area LA (km ²) | Average Area Japan (km ²) | Average Population LA | Average Population Japan | Japanese Administrative organization |
|------------------|----------|--------------|------------------------------------|---------------------------------------|-----------------------|--------------------------|--------------------------------------|
| AYP | Orborjor | 1 | 2,556.6 | 8,039.0 | 760,645 | 2,718,467 | Province |
| | Tessaban | 34 | 16.3 | 207.6 | 8,799 | 70,202 | City, town, village |
| | Orbortor | 19 | 18.9 | | 4,480 | | |
| SKP | Orborjor | 1 | 416.7 | 8,039.0 | 195,068 | 2,718,467 | Province |
| | Tessaban | 5 | 12.0 | 207.6 | 8,610 | 70,202 | City, town village |
| | Orbortor | 30 | 13.2 | | 5,082 | | |

Source for LA: Opinion survey among LAs

c. The seat of authority over issues that go beyond the administrative capacities of Orbortor and Tessaban is not clearly defined, but at the same time, the authority of Orborjor over these issues is not recognized

The opinion that “solid waste management and wastewater treatment projects are completely beyond the administrative capacity of Tessaban” was voiced in the 1st PEQMP Seminar, which was conducted to disseminate the contents of the draft PEQMP and to gather the opinions of relevant stakeholders.

Such problems stem from the fact that the administrative scale of Orbortor and Tessaban is too small, and the necessity arises for the clustering of administrative units or, alternatively, the implementation of joint projects between multiple Orbortor and Tessaban. In the latter scenario, the Orborjor (PAO) is expected by law to play a coordinating role. It has become clear through interviews with the PEO, however, that both Orbortor and Tessaban are reluctant to accept coordination attempts by the Orborjor. There are three possible causes behind such reluctance; because the relationship between organizations are not clearly defined, because they do not understand each others’ role, or because they do not understand that cooperation is necessary for the success of such projects. Thus the Central or Provincial Administration must mediate, instruct, and initiate the construction of a cooperative structure between LAs. Only after such an intervention can master plans regarding solid waste management and wastewater treatment be formulated under leadership of the Orborjor.

d. The Local Administration expenditure is proportionately too small within the total national expenditure

To establish the independence of LAs, the LAs must by themselves improve their local areas for better living of their residents, and this requires funds. At present, only 1/4 of the national expenditure is expended locally (i.e. by Local Administration), and the remaining 3/4 are disbursed by the Central Government. The strengthening of administrative capacities of LAs should be accompanied by an increase in the local allocation of budget. The Central Government has already set a goal to allocate 1/3 of its expenditure locally, and the early realization of this goal is desirable.

Incidentally, in Japan, 3/5 of the national expenditure is local.

e. The distribution of Central Government subsidies to LAs is mainly weighted by population figures

The distribution of Central Government subsidies to LAs is mainly weighted by population figures. For example, in the case of the Strategic Provincial Development Plan (SPDP), 40% of the total budget is distributed equally to all Provinces, an additional 40% is distributed according to population size, and the remaining 20% by income per capita within the Province. According to interviews with the NESDB and World Bank reports, population, student population, aged population, and per capita earnings of a Province commonly become the basis of budget allocation decisions. While it is important to have such clear basis for budget allocation and distribution, it is also crucial in the case of NREM that the seriousness of issues and problems within each Province be considered on a policy and priority basis, and that the budget allocation process be weighted by such considerations. At minimum, policy decisions and priorities set out in the National EQMP should play a role in determining Central Government subsidy allocations to LAs. The formulation of sector-based master plans by Orborjor and its study teams will, for example, in addition to being important in proposing area-based solutions for serious issues in NREM, allow such decision-making to proceed without relying on the petitions by individual Orborjor and Tessaban of problems within their individual jurisdictions.

f. At present, neither a section for NREM, nor sufficient budget for it, exists within Orborjor (PAO)

A Province-wide viewpoint is a requirement in finding a solution to pollution control problems; thus the Orborjor (PAO) plays an especially important role in this sector. Both the increase in numbers of environment-related staff in Orborjor and an abundant budget are necessary to solve pollution control problems.

The Orborjor of AYP already has an Environmental and City Planning Section in the Engineering Division, but since their 4 staff members are also in charge of city planning. There are no environmental divisions in the Orborjor of SKP. The environmental budget within Orborjor for FY2006 was 0.2% of the total budget for AYP and 0.1% of the same in SKP⁵. The MNRE has instructed LAs to commit 8% of the total budget to environment in the National EQMP, and thus it can be said that a drastic increase is required.

g. The number of PEO staff is insufficient in e.g. wastewater and solid waste management

The PEO is a branch office of MNRE, represents the MNRE in the Provinces, and in theory promotes environmental administration as intended by the Central Government within the Provinces. In reality, however, a small staff covers the whole range of sectors in natural resources and environment. Staff dedicated to natural resources management, solid waste management, and wastewater management is, at minimum, required in order for PEO to fulfill its intended duties. In PEO of AYP, of the 5 permanent environment-specialized employees, only 2 are in charge of NREM and the other 3 are involved in work unrelated to environment. In this example, at minimum, the commitment of all 5 PEO staff to NREM is desirable.

h. LAs currently do not play an active role in the Well Being Strategy (WBS)

WBS is a strategic plan for the improvement of living conditions at the Mooban and Community levels that will be implemented by the Changwat-Amphoe-Tambon-Mooban

⁵ Source: Opinion survey among LAs

line. As the plan will unfold within the LA sphere, the Orbortor and Tessaban should become involved with this plan and cultivate the relationship between LAs and local residents, which is important for NREM.

i. Local residents are not sufficiently involved in the formulation and implementation of PEQMP at present

The opinion that “local residents should take part in the formulation and implementation of PEQMP” was voiced in the 1st PEQMP Seminar.

The PEQMP-KPI Formation Handbook (Manual) prepared by ONEP instructs the user to establish a PEQMP-KPI formulation committee led by the Governor, and to include LA staff as members. However, the inclusion of local residents is not among its instructions, and the form of resident participation is left up to the discretion of each Governor. It is desirable to revise the PEQMP-KPI Formulation Manual and at the same time consider the ways in which local residents can participate.

j. It is currently difficult to access the NREM GIS Database

The opinion that “the NREM GIS Database needs to be improved and easily accessible” was voiced in the 1st PEQMP Seminar.

In AYP, an Environmental Information Center has been established within the PEO and responds to inquiries by local residents and companies, but such inquiries are handled non-systematically. SKP does not have an Environmental Information Center.

k. There is insufficient promotion of environmental awareness education and insufficient publicity for environmental information by organizations responsible for NREM

The opinion that “environmental awareness education and the increased publication of environmental information should be actively promoted by governmental organizations” was voiced in the 1st PEQMP Seminar. The Opinion Survey conducted by the Study Team also showed that the residents wished for more public access to environmental information.

3. PEQMP for AYP

3 PEQMP for AYP

The PEQMP-KPI for Phra Nakhon Si Ayutthaya Province (AYP) was submitted to MNRE in October 2007 and subsequently accepted. Although it was evaluated at the second highest score (Very Good) in a 6-tiered system (Excellent, Very good, Good, Fair, Poor, Fail), the PEQMP-KPI Evaluation Committee also indicated in its comments some improvements that would be required, as described in Chapter 1, Section 1.2.2. This PEQMP has been compiled as a response to comments by the Evaluation Committee, and also reflects the questions and comments of seminar participants voiced at the “Third Seminar for Formulation of PEQMP for Phra Nakhon Si Ayutthaya Province” held on 8th July 2008. This chapter summarizes the contents of the PEQMP of which details is in Main Report Chapter 4.

3.1 Structural Changes and Improvements made to PEQMP-KPI¹

3.1.1 Structure of PEQMP-KPI

The PEQMP-KPI of AYP, submitted in October 2007, was organized into four parts following the *Action Plan Handbook for Natural Resources and Environmental Management at the Provincial Level* (hereinafter called as PEQMP-KPI Manual), published by Ministry of Natural Resources and Environment (MNRE) and Office of Natural Resources and Environment Policy and Planning (ONEP):

Part 1: Introduction

Part 2: Situation and Issues of NREM

Part 3: Details of the PEQMP

Part 4: Annex

3.1.2 Summary of Improvements made to PEQMP-KPI

The Study Team and Counterparts revised the PEQMP-KPI in response to comments made by the PEQMP-KPI Evaluation Committee. The improvements and changes made to PEQMP-KPI, resulting in the PEQMP, are shown below:

¹ The plans already formulated and submitted by the two model provinces prior to October 2007 as PEQMP-KPI, and the new plans formulated by the two model provinces under assistance of the Study Team referred to as PEQMP.

Table 3-1: Improvement to Overall Structure of PEQMP

| PEQMP-KPI | | | PEQMP | | |
|---|-------------------------------------|--|--|---|--|
| Part/Section Title (from PEQMP-KPI Manual) | Section | Content (submitted by AYP) | Comments by PEQMP-KPI Evaluation Committee | Part/Section Title (Changes in bold) | |
| Part | Section | | | Part | Section |
| Part 1 | Introduction | Circumstances leading to PEQMP-KPI formulation, and the Governor's signature. | None. | Part 1 | |
| Part 2 | Situation and Issues of NREM | Basic data of province, such as population and economy, given in table format, following the PEQMP-KPI Manual. | 1. Although current conditions of NREM are described, there is a lack of Area Based Information and thus it is unclear which NREM issues occur in which problem areas. | Part 2 | 1) |
| | | | | | |
| | | | | | Changes and Improvements (by Study Team and counterparts) |
| | | | | | None suggested. |
| | | | | | <ul style="list-style-type: none"> • Add more detail, and add area-based information using NREM GIS Database. • Add population and economical growth estimates, and analysis of socioeconomic impact from these growths. |

| PEQMP-KPI | | PEQMP | |
|--|--|--|---|
| Part/Section Title (from PEQMP-KPI Manual) | Content (submitted by AYP) | Part/Section Title (Changes in bold) | Changes and Improvements (by Study Team and counterparts) |
| Part | Section | Part | Section |
| 2) Situation of Natural Resources and Environment in the Province | The current situation of NREM, described through charts and formats given in the PEQMP-KPI Manual. | 2) Situation and <u>Issues</u> of Natural Resources and Environment in the Province | <ul style="list-style-type: none"> • Add more detail, and add area-based information using NREM GIS Database. • Review each NREM sector through a narrative description in the following order, and also include 'issues' and 'measures to be taken' when describing the situation: <ol style="list-style-type: none"> 1: description/analysis of current situation, 2: description/analysis of likely future situation, when nothing is done to improve current situation, 3: issues that must be solved (considering both current and future problems), and 4: prevention measures and methods to solve issues |
| 3) Analysis of Current Issues and the Impact from Socioeconomic Development | The situation of NREM and a summary analysis of impact from socioeconomic development, given in two tables, Table 20 ² ('Summary of Issues, Cause, Impact and Countermeasures for Solving Issue of Natural Resources') and Table 21 ² ('Summary of Issues, Cause, Impact and Countermeasures for Solving Issue of Environment'). | 3) Summary of Situation and Issues of NRE of Province | <ul style="list-style-type: none"> • Summarize the current issues and the impact of socioeconomic development described in Section 1) and 2) in table form. Use the same table format as the PEQMP-KPI. In the table, refer back to area-based information in Section 2). • Acknowledge that not all issues can be resolved by the target year 2011, and organize contents of table into a diagram showing long-term strategy of NREM: 'Vision, Goals, Issues, and Direction of Measures for NREM' |
| Comments by PEQMP-KPI Evaluation Committee | | | |
| <p>2. Issues and their problem areas must be clarified, and the linkage between a problem, its current situation, and its impacts on the residents must be described.</p> <p>3. The relationship between SWOT analysis results and the decision process and procedures behind the formulation of the guidelines for preventive/improvement measures must be clarified.</p> | | | |

² Tables from the PEQMP-KPI Manual

| PEQMP-KPI | | | PEQMP | | | | |
|-----------------------------------|---|---|---|--|--|--|--|
| Part | Part/Section Title (from PEQMP-KPI Manual) | Section | Part/Section Title (Changes in bold) | | | | |
| | | | Part | Section | | | |
| Part 3 Details of the PEQMP | 4) Priority Setting of Issues | Priority ranking and summary of discussions/ brainstorming about NREM issues, given in the format of Table 22 ² ('Priority Setting of Issues of Natural Resources and Environment'). The brainstorming session was held together with SWOT analysis. | 4) | Changes and Improvements (by Study Team and counterparts) | <ul style="list-style-type: none"> • Discuss Priority Issues to be targeted in this PEQMP's time span (2008-2011). • Use results from stakeholder opinion surveys when deciding on Priority Issues in addition to the results of priority setting done by the PEQMP-KPI. | | |
| | | 5) Provincial Potential Analysis by SWOT Analysis | | | | 5) | None suggested. |
| | | 6) Prevention Measurement and Solution for Problems | | | | 6) Selection of Priority Programs | <ul style="list-style-type: none"> • Select Priority Programs to be implemented by 2011, based on Section 4). |
| | | Summary of priority issues identified and ranked in Section 4), in Table 26 ² (Topic of Problem/ Objective/ Target/ Strategy/ Plan'), Table 27 ² ('Plan/ Project/ Fiscal year/ Activity/ Production and Indicator'), Table 28 ² ('Summary of Plan/ Project/ Budget/ Time Period and Responsible Agency'), and Table 29 ² | Part 3 | | <p>Currently, provincial-level master plans do not exist in most NREM sectors. Thus, proper detailed PEQMP formulation is difficult, especially considering the available time frame and resources. Thus the detailed plans were formulated in the following way:</p> <ul style="list-style-type: none"> • Focus on Priority Programs from Section 6). • Use the PDM (Project Design Matrix) format to show the details of Priority Programs. • A PDM shows the relationship between priority issue and individual projects (i.e. | | |
| | | 1. Clearly describe the connection between an issue and program/project, and the Interrelationship between various programs and projects. 2. Create an operational timetable where each program/project finishes within the allotted timeframe. | | | | | |

| PEQMP-KPI | | | PEQMP | | |
|---|---|---|---|---------|--|
| Part/Section Title (from PEQMP-KPI Manual) | | Content (submitted by AYP) | Part/Section Title (Changes in bold) | | |
| Part | Section | | Part | Section | |
| | | (Summary of Plan/ Project and Budget of Central Government to be Implemented in Province). Support system and monitoring/ evaluation guidelines for the implementation of the plan described. | | | Changes and Improvements (by Study Team and counterparts) Priority Projects) formulated to solve these issues. <ul style="list-style-type: none"> • Include the details required by the Evaluation Committee in the PDM; specifically, the budget, budget source, responsible and supporting agencies, verifiable indicators, and means of verifications. • Show the implementation and budget plan for Priority Programs/ Projects on a modified version of Table 28* ("Summary of Plan/ Project/ Budget/ Time Period and Responsible Agency"). |
| Part 4 Annex | Details of Important Projects of Province | Not included. | Part 4 | | Describe each Priority Project listed within Priority Programs in Part 3. |
| | Data or Details related to PEQMP | Not included. | | | None suggested. |
| | | | | | |

3.2 Summary of PEQMP for AYP

This chapter summarizes the contents of the PEQMP, but it should be noted that the following parts are excluded from this summary. Refer to Main Report, Chapter 4 for the parts and sections below:

Part 1: Introduction

Part 2: Situation and Issues of NREM

- 1) Basic Data of the Province
- 2) Situation and Issues of Natural Resources and Environment (NRE) in the Province
- 5) Provincial Potential Analysis by SWOT Analysis

Part 4: Annex

3.2.1 Key Indicators for Current Situation of NRE in AYP

Key indicators which present current situation of NRE are summarized as follows.

Table 3-2: Key Indicators for Current Situation of NRE in AYP

| Sector of NREM | Key Indicators which present Current Situation |
|----------------------------|--|
| Water Quality ³ | <ul style="list-style-type: none"> • Noi River: Class 4 • Lopburi River: Class 5 • Pasak River: Class 4 • Chaophraya River: Class 4 |
| Air Quality | Annual average AQI ⁴ : 65 in 2007 |
| Municipal Solid Waste | Generation Rate ⁵ in 2005 <ul style="list-style-type: none"> • Tessaban: 0.995 kg/day/person • Orbotor: 0.602 kg/day/person |
| Hazardous Waste | <ul style="list-style-type: none"> • Medical Waste⁶: 0.739 tons/day • Domestic Hazardous Waste: 0.380 tons/day • Hazardous Industrial Waste⁷: 224 tons /day |

³ Water quality monitoring results in 2006 by PCD, class definitions of water quality standards are shown in Chapter 4 of Main Report.

⁴ AQI is an air quality Index which indicate ambient air quality conditions and details are shown in Chapter 4 of Main Report

⁵ Data source: REO 6 environmental report in 2006

⁶ Estimated amount by using unit generation rate in BKK.

⁷ Details are shown in Chapter 4 of Main Report.

3.2.2 Situations and Issues of Natural Resources and Environment

This section corresponds to Part 2 Situation and Issues on NREM, 3) Summary of Situation and Issues of Natural Resources and Environment of the PEQMP.

a. Situations and Issues of Natural Resources and Environment

Following the table format given in the PEQMP-KPI Manual, the current situation and issues resulting from socioeconomic development has been summarized for each NREM sector.

Table 3-3: Summary of Issues, Causes, Impact and Measures for Solving Issues of Natural Resources

| Natural Resources | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|---------------------------|---|---|--|---|---|---|
| 1. Soil and Land Resource | Decrease of natural land such as “wetland and rangeland” and active extraction of soil and sand | <ul style="list-style-type: none"> See Figure 4-11 in Main Report (Land Use) See Figure 4-15 in Main Report (Location of Sand/Soil Pit) | <p>Demand for soil and sand to reclaim land are very high</p> <ul style="list-style-type: none"> Increase in agriculture cycles per year results in more fertilizer and chemicals Salt damage to soil and contaminated groundwater due to overdrawing of groundwater by industrial complexes | <ul style="list-style-type: none"> Degradation of natural resources and loss of flood mitigation function of nature. There may be an impact to neighboring areas from landslides <p>Deteriorated soil lowers agriculture production</p> | <p>Provincial industrial office supervises and LAs checks in initial stage before giving permission</p> <p>Provincial agriculture office promotes organic farming</p> | <p>Promotion of appropriate land use with consideration to both environmental protection and social and economic activities</p> <ul style="list-style-type: none"> Benefit of proper land use and soil conservation shall be disseminated to the residents Develop a standard for groundwater usage to control over-pumping |
| | Deterioration of soil quality | Bang Bal district, Pak Hai district, Lad Bualuang district, Wang Noi district, Nakhon Luang district | <ul style="list-style-type: none"> Lack of embankment protection Frequent river and channel traffic | <ul style="list-style-type: none"> Risk to land and property Transportation problems and risk of flood | - | Protection of riverbanks such as slope protection |
| | Erosion of rivers and channel embankments, and sedimentation of eroded soil in river and channel beds | Whole AYP | | | | |

| Natural Resources | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|---------------------------------|--|---|---|---|--|---|
| 2. Forest Resource and Wildlife | Greenery area in towns needs to be increased | Whole AYP | Insufficient effort for having greenery areas in urban areas | Poor urban environment | - | Support for increasing greenery areas in urban areas |
| 3. Water Resource | Floods in rainy season | Outside world heritage area and along main rivers | Whole province is low-lying land and receives water from northern part | Residents face difficulties from long-term floods | Canal digging, flood prevention system for world heritage area | Formulation of comprehensive provincial flood prevention and mitigation plans |
| 4. Mineral Resource | Natural and artificial canals are not well maintained Usage of excavated holes after extracting soil and sands is a major environmental issue | Whole AYP See Figure 4-15 in Main Report (Location of Sand/Soil Pit) | Lack of maintenance system at provincial level Demands for soil and sand to reclaim land are very high | Cause of floods and insufficient water intake • Since many of the holes are used as waste disposal sites without proper protection, they have adverse impacts on the surrounding area • There may be an impact to neighboring areas from landslides | - | • Rehabilitation and improvement of natural and artificial canals • Support water hyacinth removal Monitoring usage of borrow pit sites, evaluation and approval of appropriate development plans for the sites |
| 5. Marine and Coastal Resource | Ayutthaya is an inland province and there are no marine and coastal resources. | | | | | |

| Natural Resources | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|-------------------|---|-------------------------------------|----------------------------|--|---|---|
| 6. Biodiversity | Lack of supervision and awareness for preservation of biodiversity, especially wetlands and sanctuaries | Tal Aen Temple, Bang Pahan district | No interest from community | Population decrease in endangered bird species | Monks and residents around Tal Aen Temple take care | <ul style="list-style-type: none"> Formulate conservation plan Support residents and organizations actively conserving biodiversity |

Table 3-4: Summary of Issues, Causes, Impact and Measures for Solving Issues of Environment

| Environment | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|------------------|---|---|---|---|----------------|---|
| 1. Water Quality | Safe and quality water supply is not assured | Water supply facilities which use water are affected by water pollution sources as shown in Figure 4-23 in Main Report (Location Map of Major Water Utilization Facilities) | Inappropriate treatment and/or lack of treatment of wastewater from various sources | <ul style="list-style-type: none"> Increase in water purification costs Deterioration of purified water quality | - | <ul style="list-style-type: none"> Formulation of water distribution plan in Province Formulation of master plan on domestic water supply |
| | Water quality of public water bodies is not preserved | Various public water bodies affected by water pollution sources as shown in Figure 4-22 in Main Report | Inappropriate treatment and/or lack of treatment of wastewater from various sources | <ul style="list-style-type: none"> Increase in water purification costs Deterioration of purified water quality | - | <ul style="list-style-type: none"> Pollution source survey Formulation of Water Quality Preservation Plan in Public Water Bodies |

| Environment | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|------------------|--|---|--|--|---|---|
| | | (Location Map of Water Pollution) | | | | |
| 2. Air Quality | PM10 concentration exceeds environmental standards for 11-16 days a year | Agricultural areas | <ul style="list-style-type: none"> Burning of agricultural waste after harvesting Vehicles on the road | Possible impact on public health due to air pollution | Request cooperation from related agencies | Develop a cooperative system among stakeholders to treat agricultural wastes appropriately |
| | Dust and smoke from river ports, and dust, smoke and odor emitted from factories | See Figure 4-26 in Main Report (Location Map of River Port) | Dust and smoke results from loading and unloading of coal and flour using backhoes at river ports | Possible impact on health of residents in vicinity | Provincial water transport office coordinates with ports to take control measures before giving permission to operate | Agencies that issue business licenses to river ports should warn operators to take preventive measures such as installing a dust collector or planting trees for protection |
| | The level of pollution from mobile emission sources such as vehicles is not properly monitored | Whole AYP | Lack of monitoring for mobile emission sources | No evaluation of the adverse impact by mobile emission sources, especially along trunk roads | - | Regularly analyze air quality of major roadways to investigate impact of vehicles and other mobile emission sources |
| 3. Noise Quality | Loud noise from cargo river port and factories | See Figure 4-26 in Main Report (Location Map of River Port) | Loading and unloading operations from boats using backhoes, trucks and motorboats with boat engines | Possible impact on local residents' quality of life | Provincial water transport office coordinates with ports to take control measures before giving permission to operate | Stricter control by Provincial water transport office before giving ports permission to operate |

| Environment | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|--|---|---|---|--|--|---|
| 4. Solid Waste | Open dumping operation at most disposal sites | See Figure 4-30 in Main Report (Location of Disposal Site in Flood Prone Areas) | Lack of knowledge in sanitary disposal system by all players, including local administration officials, has led to the lack of attention to sanitary disposal | <ul style="list-style-type: none"> Contamination of surface and underground water by leachate Air pollution by spontaneous combustion of wastes | Orborjor conducted master plan study for waste disposal system | Implement the proposed projects in the master plan |
| | Improper municipal Solid Waste Management (SWM) | Most LAs in AYP | Lack of knowledge in proper and sustainable SWM | <ul style="list-style-type: none"> Unsanitary conditions in LAs such as heaps of waste Inactive 3Rs (Reduce, Reuse and Recycle) activities | - | Implement the proposed projects in the master plan |
| 5. Hazardous waste and toxic substance | The amount of hazardous wastes generated from factories (HIW) is estimated at 224 tons/day in 2005 and information on their disposal has not been identified; improper HIW management could have significant impact | Whole AYP | Lack of studies to assess the current situation | <ul style="list-style-type: none"> Significant negative impact on environment of AYP by improper HIW management Multiple instances of illegal dumping of HIW | - | <ul style="list-style-type: none"> Carry out investigation on industrial wastes, especially hazardous wastes, with cooperation from Provincial DIW Prioritize HIW treatment among industrial waste issues |

| Environment | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|------------------------------------|--|--|--|--|---|---|
| | Information on medical waste disposal has not been identified; but the amount of medical waste generated is limited to less than 1 ton/day in 2005 | Whole AYP | Lack of studies to assess the current situation | <ul style="list-style-type: none"> Significant negative impact on environment of AYP by improper medical hazardous waste management | - | Intensive education activities promoting proper disposal, aimed at sources of medical waste generation |
| 6. Urban Environment | Urban area is expanding without appropriate direction and tends to cause physical and visual congestion: specifically the expansion of residential areas near industrial estates lack proper basic infrastructures | U-tai district, Bang Pa-in district, Phra Nakhon Si Ayutthaya district, Sena district, Nakhon Luang district | The industrial sector expanded rapidly, causing the spread of slums which lack basic infrastructures | Impact on the quality of life to urban residents | Promote the expansion of green areas in public areas and around government agencies | <ul style="list-style-type: none"> Develop community areas according to comprehensive urban planning Government agencies and citizens cooperate in the development of green boulevards, urban neighborhood parks, recreational facilities, etc. |
| 7. Natural Environment and Culture | Restoration, maintenance, management, use, and conservation of cultural assets is not done properly | See Figure 4-34 and Table 4-78 in Main Report (Locations of Natural and Cultural Heritage; List of same) | Inappropriate of land use, change of goodwill, spread of less traditional lifestyles in Thai society, lack of public awareness, utilities construction and pollution | Deterioration of cultural assets | Related agencies follow master plan of historical city | <ul style="list-style-type: none"> Conserve the natural environment Inform the public on the protection of cultural assets through educational activities and community participation |

| Environment | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|-------------------|---|----------------------------|---|--------------------------------------|----------------|---|
| | Insufficient and improper conservation of nature where it intrudes into the living environment | Whole AYP | Inappropriate land use, change of goodwill, spread of less traditional lifestyles in Thai society, lack of public awareness, utilities construction and pollution | Deterioration of natural environment | - | <ul style="list-style-type: none"> Inform the public of the importance of tourism resources in providing income for management and conservation Strengthen the capacity of staff in local administrations |
| 8. Global Warming | <p>The countermeasures set up in the National Strategy on Climate Change (NSOCC) are not implemented well; for example, afforestation is hardly done in spite of extremely few greenery areas remaining</p> <p>Rangeland/Wetland decreased significantly</p> <p>Final disposal sites are operated using open dumping methods despite significant GHG emissions from waste, and 3Rs (Reduce, Reuse and Recycle) activities are hardly taking place</p> | Whole AYP | Lack of knowledge on global warming issues | Deterioration of environment | - | <p>Implement countermeasures which are set up in NSOCC, especially the following:</p> <ul style="list-style-type: none"> Increase forest area by afforestation Enforcement of land use laws to preserve "Rangeland/Wetland" which has flood control functions Implement sanitary landfill operation measures and promote 3Rs by public relation and education activities in cooperation with REO 6 |

b. Vision, Goals and Issues, and Direction of Measures

It is impossible to implement all of the issues and measures discussed in the section above by the PEQMP target year of 2011. Therefore, the ideal state of NREM that the Province should aspire to on the long term was expressed through Vision and Goals, and the Issues and Direction of Measures were sorted accordingly. Vision and Goals must reflect the opinions of as many stakeholders as possible, and it is only presented here to stimulate discussion. In this summary version, Visions, Goals, and Strategies are presented below.

b.1 Vision and Strategy

b.1.1. Vision

The vision is to realize a secure and abundant social environment with World Cultural Heritage at its nexus through conservation and rehabilitation of natural resources and the propulsion of sustainable industrial development.

b.1.2. Goals

1. Conservation of World Cultural Heritage in harmony with industrial development.

The following issues should be resolved to realize this harmonious relationship.

- Social infrastructure is prepared according to demand by confirming the non-registered population.
- Agricultural land covering 87% of provincial territory is made more productive.
- Industrial development is promoted which is sympathetic to environmental conservation.
- The environment is protected from deterioration due to increase of tourists.
- Industry is encouraged to use local wisdom and property efficiently.
- A prosperous coexistence is created of the urban environment and the conservation of World Cultural Heritage.
- Nature and cultural heritage is conserved and utilized effectively.

2. The creation of a secure and abundant social environment.

- Safe and good quality water is provided to all residents in the province.
- Safe and good quality water is secured.
- An appropriate and sustainable system of solid waste management is constructed.
- Good air quality is maintained.
- Adverse impact by noise and vibration is prevented.
- Appropriate system for hazardous waste management is constructed.
- A system is set up to confront global warming problems.

3. Provincial development is harmonized with conservation and rehabilitation of natural resources.

- Soil and land resources are used effectively and conserved according to the local features.
- Forest resources are conserved and rehabilitated.

- The lives and property of residents in the province are protected by setting up a management system of water resources.
- The management system of mineral resources is set up and maintained.
- Biodiversity is ensured.

b.1.3. Strategies

The following six strategies were established based on National EQMP in order to reach the goals shown above.

Strategy 1: Allow joint ownership of environmental data, public access to information and knowledge of NREM, and encourage public participation in NREM.

Basic information of NREM is disseminated to residents in the province, residents' awareness is developed and they are encouraged to participate in NREM. Especially facts on adverse impact on health and living by degradation of environmental quality are clarified so that residents may monitor and protect local natural resources and environment by themselves. In order to realize this, the opening of information on natural resources and environment to the public is promoted. Moreover, a monitoring committee is set up including representatives of local residents and business establishments so that they can join the meeting for evaluation of the progress of PEQMP implementation.

Strategy 2: Improve the efficiency of NREM and develop stakeholder capacity.

Jurisdiction of the organizations related to NREM is made clear and duplication of activities can be avoided in addition to strengthening the linkage between each organization. Information of NREM is unified and commonly owned, and the capacity of the organizations and their staff is developed.

Strategy 3: Support local administrations to manage NREM.

The organization for NREM in local administration is strengthened and its administrative capacity is developed. Local administrations are given support to establish their regulations to strengthen the organization for NREM. Moreover, in order to support and strengthen weak local administrations, joint investment and cooperative management are driven forward for NREM with Orborjor at its nexus.

Strategy 4: Reduce poverty through the fair utilization of natural resources so that they reach grassroots society.

Win-Win measures by which all stakeholders can gain profit are introduced by promoting empowerment to local residents based on the principle that beneficiaries should pay part of the cost.

Strategy 5: Promote efficient and sustainable use of natural resources with consideration to environmental conservation.

The mechanism of cost burden is developed to rehabilitate natural resources and environment (NRE), in cooperation with local residents and relevant organizations, by setting up rules and regulations prescribing the provision for payment to an agency to manage NRE.

Through a variety of study processes, whether official or unofficial, education is conducted for all members of the younger generation and knowledge of natural resources and environment is disseminated. In order to set up the production target

taking a serious view of natural balance, research and development are actively conducted regarding sustainable and effective use of natural resources.

Strategy 6: Conduct balanced and sustainable environmental development through conservation, monitoring and the rehabilitation of nature.

Based on Social Measurement, which applies the Polluter Pays Principle (PPP) and Beneficiary Pays Principle (BPP) and published information of impact on natural resources and environment, etc., conservation, monitoring and rehabilitation of the natural environment are conducted. Protected areas are managed according to the principle of biodiversity, and wildlife habitats are managed according to forest classifications.

b.2 Ideal State of NREM, Issues, and Direction of Measures

All of the above suggestions are represented in the following figure, which depicts the ideal state of NREM that AYP should aspire to over the long term, including current issues and the direction of measures:



Figure 3-1: Vision, Goals, Issues and Direction of Measures for NREM in AYP

3.2.3 Priority Setting of Issues

This section corresponds to Part 2 Situation and Issues on NREM of the Province, 4) Priority Setting of Issues of the PEQMP.

As mentioned above, there are many issues to be resolved in NREM in AYP. However, there are limited financial and human resources available. In this section, we examine the priority issues to be resolved by the target year 2011 in PEQMP (2008-2011) for AYP.

a. Opinion survey of Stakeholders

a.1 Target groups

An opinion survey was conducted among the following four stakeholder groups. Their answers were collected, added and analyzed according to target group.

Table 3-5: Target Group for Opinion Survey

| Target Group | Abbreviation | Number |
|------------------------|--------------|--------|
| Local Administration | OP-LA-AYP | 54 LA |
| Resident | OP-RE-AYP | 226 |
| Business Establishment | OP-BE-AYP | 97 |
| NGO | OP-NGO-AYP | 5 NGO |

a.2 Problems within Local Administration (LA)

The most serious problems within LAs were indicated as follows:

Table 3-6: Problem in LA

| Target Group | Most Serious Problem | Reply Rate (%) | Second Most Serious Problem | Reply Rate (%) |
|------------------------|-----------------------|----------------|--|----------------|
| LA | Deterioration of NRE | 41.1 | Insufficient administrative capacity of LA | 29.6 |
| Resident | Deterioration of NRE | 44.7 | Stagnation of Economy | 31.4 |
| Business Establishment | Stagnation of Economy | 45.4 | Deterioration of NRE | 39.2 |
| NGO | Deterioration of NRE | 40.0 | Insufficient administrative capacity of LA | 20.0 |

a.3 Problems of NREM

Serious problems of NREM according to each target group are listed in the following table. The percentage value shown in the table is the ratio of respondents who selected "4 Very Serious" among six possible choices (1 Not serious at all, 2 Not very serious, 3 Somewhat serious, 4 Very serious, 5 Can't choose, 6 No response).

Table 3-7: Problem of NREM

| Target Group | Most Serious Problem | Reply Rate (%) | Second Most Serious Problem | Reply Rate (%) |
|------------------------|----------------------------|--------------------|-------------------------------|--------------------|
| LA | Water Resources Management | 53.7 | Solid Waste Management | 42.6 |
| Resident | Water Resources Management | 38.5 | Global Warming/Climate Change | 19.5* ¹ |
| Business Establishment | Water Resources Management | 35.1 | Global Warming/Climate Change | 15.5* ¹ |
| NGO | Solid Waste Management | 60.0* ² | Water Resources Management | 60.0* ² |

*1: A slightly larger number of interviewees actually chose "4 Very serious" for Water Quality than Global Warming. However, those who said Global Warming was "3 Somewhat serious" clearly outnumbered those who considered Water Quality as "3 Somewhat serious", so Global Warming is shown here as the overall second most important problem.

*2: While the reply rates for the most/second important problem are the same in the "4 Very serious" category, Solid Waste Management is shown here as the overall most important problem, as more interviewees ranked it as "3 Somewhat serious".

The respondents indicated the following reason for their choice of which item was the most serious problem, as follows:

Table 3-8: Reason for Selecting Most Serious Problem

| Most Serious Problem | Specific issue | Reason for choice |
|----------------------------|---|---|
| Water Resources Management | <ul style="list-style-type: none"> Flood | <ul style="list-style-type: none"> Loss of agricultural land and property Isolation of transportation |
| Solid Waste Management | <ul style="list-style-type: none"> Non-sanitary landfill | <ul style="list-style-type: none"> Occurrence of environmental and sanitary problems |

The respondents indicated the following reason for their choice of which item was the second most serious problem, as follows:

Table 3-9: The Reason for Selecting the Second Most Serious Problem

| Second Serious Problem | Specific issue | Reason for choice |
|----------------------------|--|--|
| Solid Waste Management | <ul style="list-style-type: none"> Improper disposal of huge amounts of waste Difficulty of acquisition of disposal site | <ul style="list-style-type: none"> Occurrence of serious environmental problems |
| Global Warming | <ul style="list-style-type: none"> Rise in temperature | <ul style="list-style-type: none"> Health problems Increase of power fees |
| Water Resources Management | <ul style="list-style-type: none"> Flood | <ul style="list-style-type: none"> Loss of agricultural land and properties Loss of fertile land |

a.4 Resident requests to LA

There are 42 LAs to which residents require improvement of the local area (78% of all LAs). The request for "Construction of infrastructure like roads and bridges" is the most common

request (requested in 69.0% of LAs) and “Lighting of public areas” is the second (38.1% of all LAs), with “Socioeconomic development” as the third (31.0% of all LAs).

b. Priority Examined in SWOT Analysis

The PEQMP-KPI Formulation Committee was held at the AYP Conference Room on 27th June 2007 chaired by the Vice Governor, and a SWOT Analysis of provincial potential was conducted with 20 relevant participants directed by a moderator from Ayutthaya University. SWOT Analysis analyzes the Strengths (S), Weaknesses (W), Opportunities (O) and Threats (T) of AYP to resolve the problem of NREM.

In addition to SWOT Analysis of provincial potential, the priority among issues to be resolved for NREM was examined in the PEQMP-KPI Formulation Committee.

The results of the latter discussion are as shown below:

Table 3-10: Priority Issues on NREM in AYP Discussed in SWOT Analysis Meeting

| Priority | NREM Problems | Suggestion for Preventive Measures and/or Solution |
|----------|---|---|
| 1. | Solid Waste Management (SWM) | <ol style="list-style-type: none"> 1. Promote LAs to have integrated SWM system 2. Support LAs to gain knowledge and guidelines for appropriate SWM 3. Study form and method of SWM appropriate for LAs 4. Support establishment of a waste disposal center 5. Create public awareness for residents to reduce, separate and recycle waste 6. Support LAs to make a cluster to construct waste disposal system and support recycling activities |
| 2. | Surface Water Resources and Flood Control | <ol style="list-style-type: none"> 1. Support residents to use septic tanks for primary treatment of wastewater 2. Support LAs to have wastewater treatment system in their communities 3. LA should exert control over building construction in accordance with Building Control Act regarding wastewater treatment from buildings 4. Exert control over business enterprises so that they will not discharge wastewater to public water bodies without treatment 5. Establish volunteer network to monitor environmental quality 6. Rehabilitate and improve canals and natural water courses in order to receive water and drain water effectively 7. Support activities to remove weeds in canals in order to reduce pollutants from water sources 8. Formulate flood prevention and disaster mitigation plan |
| 3. | Tourism Places for Art, Culture and History | <ol style="list-style-type: none"> 1. Follow master plan of historical city 2. Campaign for tourists to keep tourist sites clean 3. Systematic cooperation and coordination between LAs and related agencies 4. Build up capacities of LA staff to conserve and protect art, cultural and historical places |
| 4. | Air Pollution and Noise | <ol style="list-style-type: none"> 1. Promote agricultural technology without open burning 2. Increase efficiency in control burning of vacant lots in |

| | | |
|----|-----------------------------|--|
| | | <p>urban areas in order to reduce impact to air quality</p> <p>3. Control activities or enterprises that cause air pollution problems, noise and vibration in community areas</p> |
| 5. | Biodiversity | <p>1. Support residents who participate in conservation and rehabilitation of biodiversity in important areas</p> <p>2. Support knowledge exchange among community network in the field of biodiversity</p> |
| 6. | Groundwater Resources | <p>1. Prepare guidelines to prevent groundwater contamination</p> <p>2. Improve quality of contaminated groundwater to a level suitable for drinking and domestic use</p> <p>3. Rehabilitate water sources which were damaged due to flood</p> |
| 7. | Soil Resources and Land Use | <p>1. Educate local residents in land use benefit, soil conservation, and water quality management, and also develop volunteer network</p> |
| 8. | Urban Environment | <p>1. Develop community areas in accordance with comprehensive city plan</p> <p>2. Increase green areas, vacant areas and public parks in urban areas and around government agencies, and also conduct scenery improvement in public recreational areas</p> <p>3. Support residents in community environment management by development of public land</p> <p>4. Create understanding and awareness among all stakeholders so that they take part in community environment management</p> |

Source: PEQMP-KPI (2008-2011), AYP

c. Examination of Priorities

Since NREM encompasses a wide-ranging variety of sectors, it is quite difficult to decide the priority ranking among projects from differing sectors. Additionally, individual NREM projects routinely require a huge sum of money to implement. Thus it becomes important to conduct sufficient survey, research, and planning activities and to exhaustively consider the feasibility of each project, in order to make each individual NREM project cost-effective. Specifically, priority among projects should be determined only after extensive comparative analyses between sector *master plans*. AYP lacks these basic master plans in various NREM sectors. Therefore, the Study Team suggested the following regarding priorities:

- First of all, top priority should be given to the formulation of master plans for each NREM sector.
- For solid waste management and conservation of cultural heritage, both opinion survey among stakeholders and priority issues discussion at the SWOT analysis meeting have confirmed their high priority status. In both sectors, master plans ‘Provincial Master Plan for Solid Waste Management’ and ‘Master Plan for Historical City’ have been formulated. We recommend that the priority projects in the solid waste management sector be implemented according to its master plan. For the cultural heritage sector, our recommendation is different. First of all, the ‘Master Plan for Historical City’ is still incomplete as a master plan, due to its lack of concrete implementation schedule and budget plan. Secondly, in Thailand, the Department of Fine Arts is responsible for the conservation of cultural heritage and have their own policies and methods. Thus, we recommend that the conservation of cultural heritage be left to the Department of Fine Arts.
- For master plan formulation, the priority among NREM sectors aside from solid waste management and cultural heritage can be ranked as follows, based on the result of the opinion survey among stakeholders and examination of priority issues conducted during SWOT analysis.
 - Flood protection
 - Preservation of water quality
 - Tackling global warming
 - Air pollution protection measures
 - Preservation of biodiversity
 - Conservation of water resources
 - Conservation of soil and land resources
 - Improvement of urban environment
- This Study has confirmed that surface water quality is deteriorating, and thus water quality improvement measures and improvement of the water supply system, in areas where surface water is utilized as a water source for tap water have top priority. It is recommended that the current situation be urgently examined and an improvement plan be formulated as a top priority issue.
- Finally, strengthening the NREM administrative capacities of LAs has equal priority with any urgent individual issue, as they hold responsibility over NREM in their respective localities.

Based on the suggestions mentioned-above, the Study Team and C/P examined the priority on the issues of NREM in AYP.

3.2.4 Selection of Priority Programs

This section corresponds to Part 2 Situation and Issues on NREM, 6) Selection of Priority Programs of the PEQMP.

a. Selection Procedure

Through the examination of priorities (see previous section), the Study Team and their counterparts (C/P) selected priority issues based on the following thought process:

- The priority issues for PEQMP (2008-2011) are issues in NREM on the provincial scale, and issues that should be dealt with by 2011.
- Since available finance for the investment on NREM by 2011 is limited, it is difficult to improve all NREM issues identified in the above section by the year.
- To solve the issues by 2011, several Priority Projects must be implemented. The Priority Projects with a common goal (i.e. solving the same priority issue) were combined as a Priority Program.
- Priority Programs can be divided into two major categories:
 1. Improvement in individual NREM sectors
 2. Strengthening of NREM administrative capacities in AYP

b. Selection of Priority Programs

Through the selection procedure described above, and discussions with counterparts, the following Priority Programs were selected for implementation by 2011:

1. Improvement in individual NREM sectors
 - Program for improvement of solid waste management
 - Program for flood prevention and disaster mitigation
 - Program for water quality preservation in public water bodies
 - Program for safe and quality water supply
2. Strengthening of NREM administrative capacities in AYP
 - Program to strengthen linkage between Central, Provincial, and Local Administrations
 - Program to strengthen NREM capacities of LAs

3.2.5 Details of the Provincial Environmental Quality Management Plan (PEQMP)

This section corresponds to Part 3 Details of the PEQMP of the PEQMP.

a. PDM (Project Design Matrix)

In response to the comments of the PEQMP-KPI Evaluation Committee, a Project Design Matrix (PDM) was made for each Priority Program:

- A PDM was made for each Priority Program, which is a common-goal cluster of individual projects for solving priority NREM issues by 2011.
- A PDM shows the relationship between priority issue and individual projects (i.e. Priority Projects) formulated to solve these issues.
- A PDM shows indicators to monitor and evaluate each individual project (i.e. Priority Project).
- A PDM shows the responsible and supporting agencies for each individual project (i.e. Priority Project).

b. Priority Programs and Priority Projects

b.1 Program for Improvement of Solid Waste Management (SWM)

The current system of municipal solid waste management (SWM) mainly consists of a collection system and final disposal system. An important point is that there are over 18 disposal sites for a population of about 750,000 in the province; an incredibly redundant situation. Almost all of disposal sites are open dumping operations as shown in the photos below. Consequently, the adverse impacts of the disposal site are very serious to the surrounding environment, especially among disposal sites located in the flood-prone area as shown in the figure below. In addition, although the national EQMP promotes 3Rs (Reduce, Reuse and Recycle) as important activities for sustainable SWM, LAs do not promote 3Rs activities well.

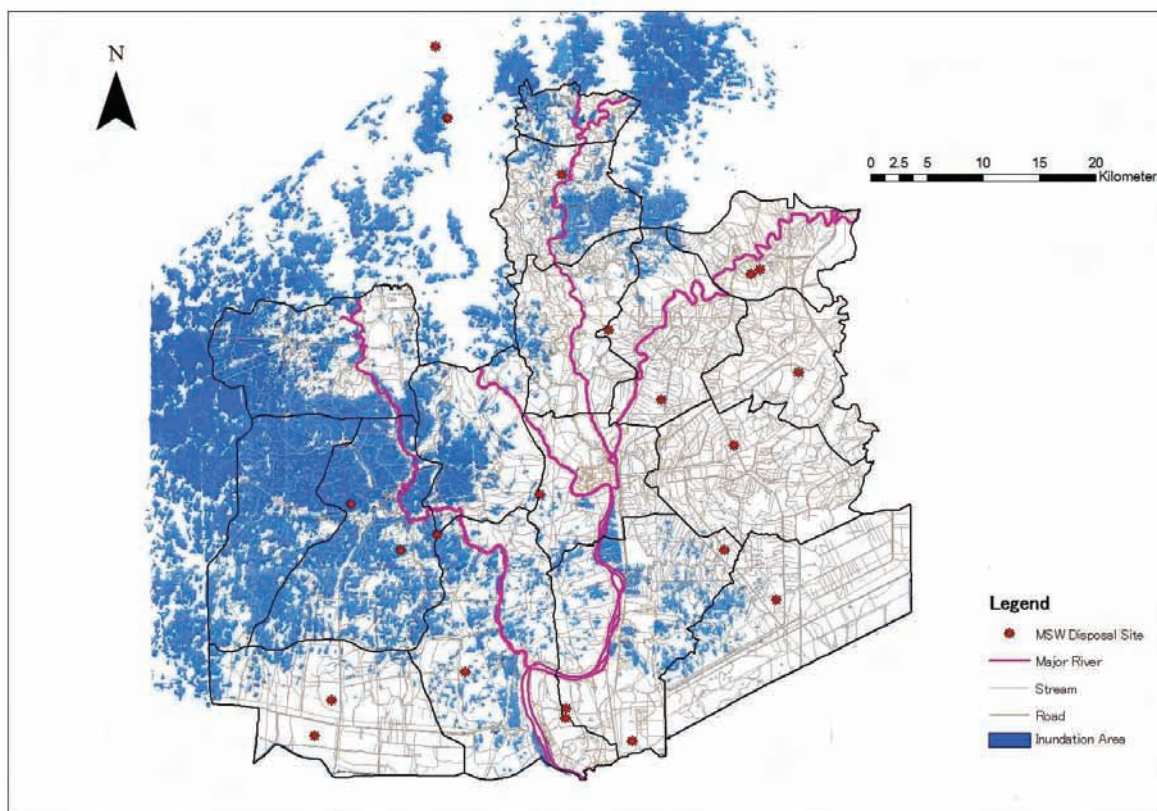


Figure 3-2: Location of Disposal Sites and Flood Prone Area in AYP (2006)

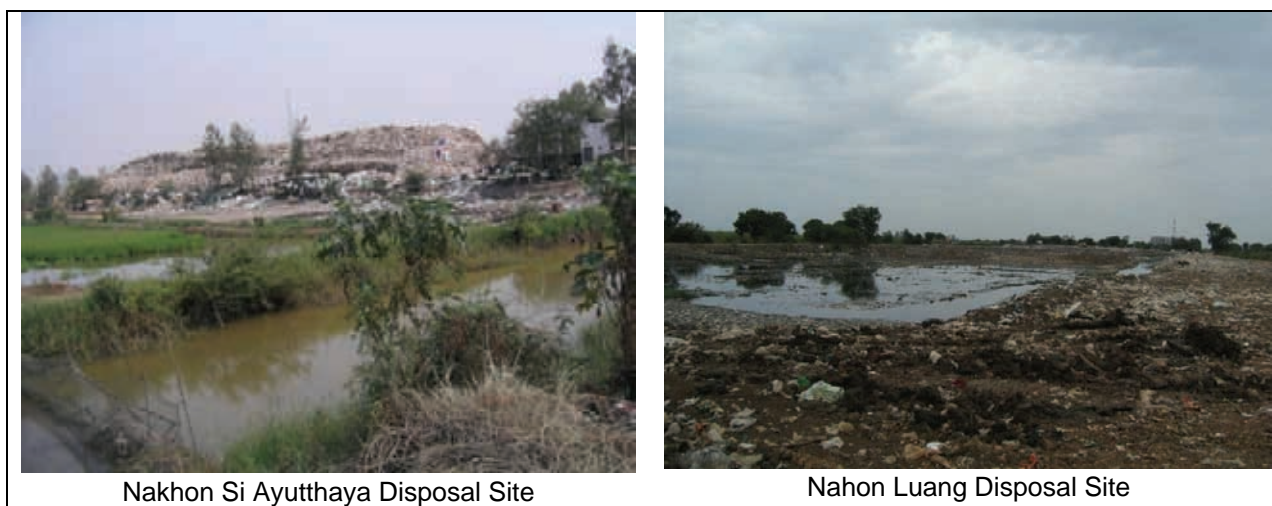


Table 3-11: Project Design Matrix (PDM) for Program for Improvement of Solid Waste Management in AYP

Program Name: Improvement of Solid Waste Management (SWM) in Ayutthaya Province (AYP)

Target Area: Ayutthaya Province

Target Group: Residents of Ayutthaya Province

| Narrative Summary | Objectively Verifiable Indicators | Means of Verification | Important Assumptions |
|---|--|---|---|
| Overall Goal Construct a sustainable SWM system in AYP that affects the environment minimally | The clustering of LAs are implemented and a wide-area waste disposal system is established | Questionnaire to LAs | AYP does not change its SWM policy |
| Program Purpose 1. Urban waste generated in AYP is disposed in sanitary landfills 2. 3Rs activities are firmly established | 1. The central disposal centers (CDC) and their environment 2. 30% of urban waste generated in AYP is recycled | 1. Operation records and questionnaire to nearby residents 2. Questionnaire to LAs | AYP does not change its policy of building central disposal centers |
| Outputs 1. CDCs are constructed with - suitable volume for 20 years sanitary landfilling operations. - the recycling facilities (i.e. sorting and composting factory) - the incineration of medical waste 2. School recycling system is developed | 1. The disposal capacities of two new CDCs; recycling facility capacities; medical waste incineration facilities. 2. Number of schools implementing waste bank and their recycling record | 1. Design drawing of the CDCs 2. Recycling report from school | Agreement among residents is established for the construction of CDCs |
| Individual Priority Projects (Numbers correspond to Output numbers) | Responsible Agency | Supporting Agency | Input (Baht) |
| 1. Construction of two CDCs 1-1. Land purchase for CDC 1-2. Site preparation for construction 1-3. Detail design of CDCs 1-4. Construction of CDCs | Orborjor in collaboration with all LAs | PC, PCD, DOLA | 25,000,000 4,000,000 25,000,000 474,646,000 |
| 2. Development of school recycling system | LA, PHO, Schools | PEO, PCD, DEQP, MOE | 5,300,000 |

DOLA: Department of Local Administration

PEO: Provincial Environment Office

PCD: Pollution Control Department/MNRE

DEQP: Department of Environment and Quality Promotion

MOE: Ministry of Education

PHO: Public Health Office

b.2 Program for Flood Prevention and Disaster Mitigation

According to the opinion survey, LAs, residents and business establishments replied that the most serious problem of NREM in AYP is water resources management, specifically the management of floods. The reasons given were that floods cause “Loss of agricultural land and property” and “Isolation of transportation”. In fact AYP had experienced considerable flood damage as shown in the table below, according to the Office of Disaster Prevention and Mitigation of MOI in AYP.

Table 3-12: Flood Damage in AYP

| Year | Number of Affected People | Number of Deaths | Number of Damaged Houses | Affected Agriculture Area (rai) |
|------|---------------------------|------------------|--------------------------|---------------------------------|
| 2006 | 378,891 | 70 | 10,252 | 303,507 |
| 2007 | 50,140 | 7 | 1,879 | 42,432 |

Main rivers, canals, and flooded areas in AYP in 2006 are shown in the following figure and photos of flood disaster are presented below.

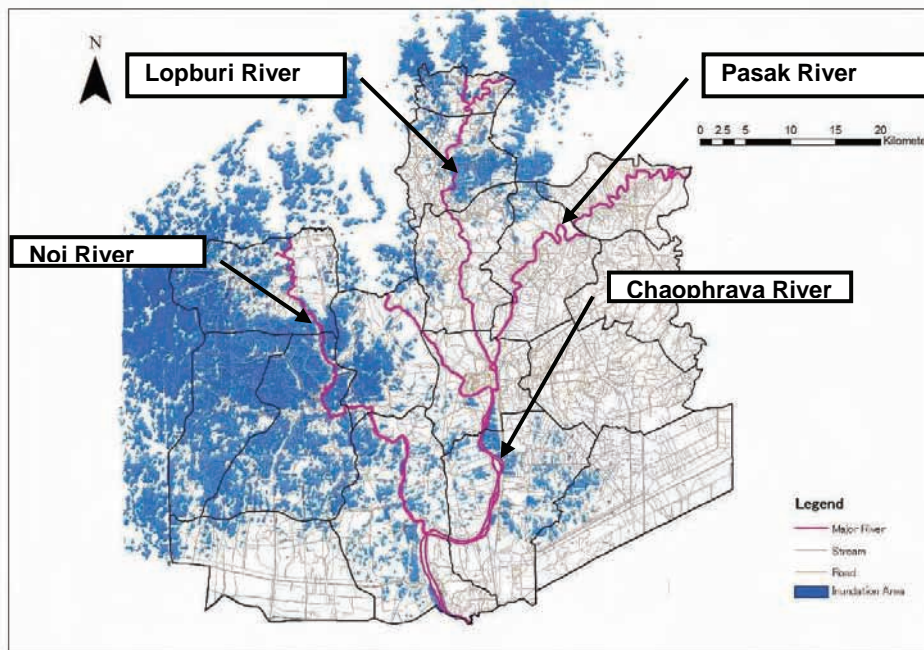


Figure 3-3: Main Rivers/Canals and Flood Disaster Area in AYP (2006)



Flood in AYP

Table 3-13: Project Design Matrix (PDM) for Program for Flood Prevention and Disaster Mitigation in AYP

Program Name: Flood Prevention and Disaster Mitigation (FP/DM) in Ayutthaya Province (AYP)

Target Area: Flood risk areas of Ayutthaya Province

Target Group: Residents, organizations, and other relevant stakeholders in flood risk areas of Ayutthaya Province

| Narrative Summary | Objectively Verifiable Indicators | Means of Verification | Important Assumptions |
|--|---|---|--------------------------------------|
| Overall Goal Strengthen AYP against flood. | Flood damage amount; awareness of relevant stakeholders | Statistics on flood damage; questionnaire | AYP does not change its FP/DM policy |
| Program Purpose An effective FP/DM plan that considers cost-benefit is formulated | Prioritization and action plans for flood FP/DM measures | Provincial FP/DM plan | |
| Outputs 1. A FP/DM plan that considers cost-benefit is chosen 2. River and canal function be improved and maintained to reduce the effect of floods. 3. Measures for flood damage mitigation will be outlined and risk of disaster will decrease | 1. FP/DM plans and their EIRR/FIRR (Economic./Financial Internal Rate of Return) 2. Management and responsibility structure of various river and canal sections 3. Contents of flood damage mitigation plan | 1. FP/DM plan study report 2. River and canal management plan report 3. Flood damage mitigation plan report | |
| Individual Priority Projects (Numbers correspond to Output numbers) | Responsible Agency | Supporting Agency | Input (Baht) |
| 1. Formulation of FP/DM plan by 1.1 Study of hydrology in the area 1.2 Research and analysis the past damages and its costs. 1.3 Examination of flood disaster mitigation measures 1.4 Selection of priority measures | ODPM | MS, IPO, PWO, PAO, PFO, PLO | 7,000,000 |
| 2. Formulation of action plan on renovation and maintenance of river and canal. | LAs | DOLA, RID | 3,000,000 |
| 3. Formulation of action plan on flood damage mitigation | LAs | DEQP, DWR | 3,000,000 |

ODPM: Office of Disaster Prevention and Mitigation

MS: Meteorological Station

IPO: Irrigation Project Office

PWO: Public Works and City Planning Office

PAO: Provincial Agricultural Office

PFO: Provincial Fishery Office

PLO: Provincial Livestock Office

DOLA: Department of Local Administration/Ministry of Interior

RID: Royal Irrigation Department/Ministry of Agriculture and Corporate

DEQP: Department of Environment and Quality Promotion/MNRE

DWR: Department of Water Resources/MNRE

b.3 Program for Water Quality Preservation in Public Water Bodies

There are nine water quality monitoring stations in AYP as shown in the Figure below: two in Noi, two in Chao Phraya, three in Pasak, and two in Lopburi River.

According to the results of past monitoring data, the water quality of all four main rivers shows a worsening trend. Based on the assumption that the same conditions (amount of pollutant, treatment, etc.) would continue in the future, water quality of all four major rivers will worsen compared with the current situation. According to the water quality class of PCD, the water quality of all four major rivers in 2006 was Class 4 or Class 5, which meant that the water required a special water treatment process before being used.

Table 3-14: Summary of Water Quality Class Results (2006) for Four Main Rivers in AYP

| River name | Point | DO P20 | BOD P80 | TCB P80 | FCB P80 |
|-------------|-------|--------|---------|---------|---------|
| Noi | NO 01 | Class4 | Class2 | Class3 | Class3 |
| | NO 02 | Class4 | Class4 | Class4 | Class4 |
| Lopburi | LB 01 | Class5 | Class4 | Class4 | Class4 |
| | LB 02 | Class4 | Class5 | Class4 | Class4 |
| Pasak | PS 01 | Class4 | Class4 | Class4 | Class4 |
| | PS 02 | Class4 | Class4 | Class3 | Class4 |
| | PS 03 | Class4 | Class4 | Class4 | Class4 |
| Chao Phraya | CH 18 | Class4 | Class3 | Class3 | Class3 |
| | CH 20 | Class4 | Class4 | Class3 | Class3 |

Note; P20: 20 percentile value, P80: 80 percentile value, TCB: Total Coliform Bacteria, FCB: Fecal Coliform Bacteria

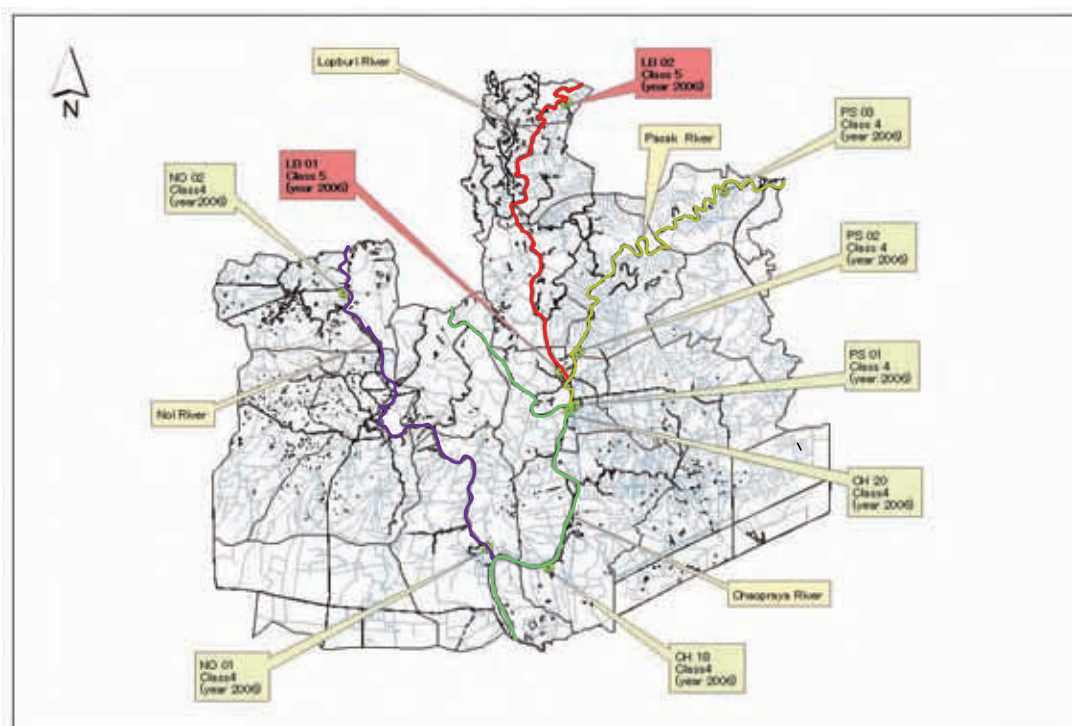


Figure 3-4: River Water Quality Monitoring Stations in AYP and Water Quality Class

Water pollution of public water bodies can seriously affect human health through water utilization facilities, in particular water supply facilities such as water purification plants and wells. If water pollution becomes serious, it raises the cost of purification or makes the water unsuitable for consumption and use. Also, as shown in the photos below, river water volume is greatly reduced in the dry season while pollution sources remain constant, resulting in worse water quality in the dry season. The serious effect of water pollution on water supply facilities using rivers as their water source must be kept in mind.



In fact there are several water purification plants along the Lopuburi River (such as three plants in Tessaban Tambon Rong Chang) which changed their water source from the Lopuburi River to underground water sources. Since the scale of these plants was small (about 1,000 m³/day capacity on average), changing the water source was not difficult. The water source for a large scale plant like the one in Tessaban Nakhon Si Ayutthaya (City of Ayutthaya), however, is very difficult to change as the capacity of the plant is about 40,000m³/day. Furthermore, water demand of AYP, especially around the City of Ayutthaya, is considerably high due to growth in the economic and tourism sectors, and it is expected that a switch to groundwater sources will be highly difficult.

A map showing the location of major water pollution sources and water utilization facilities in AYP was developed using the overlay function of GIS.

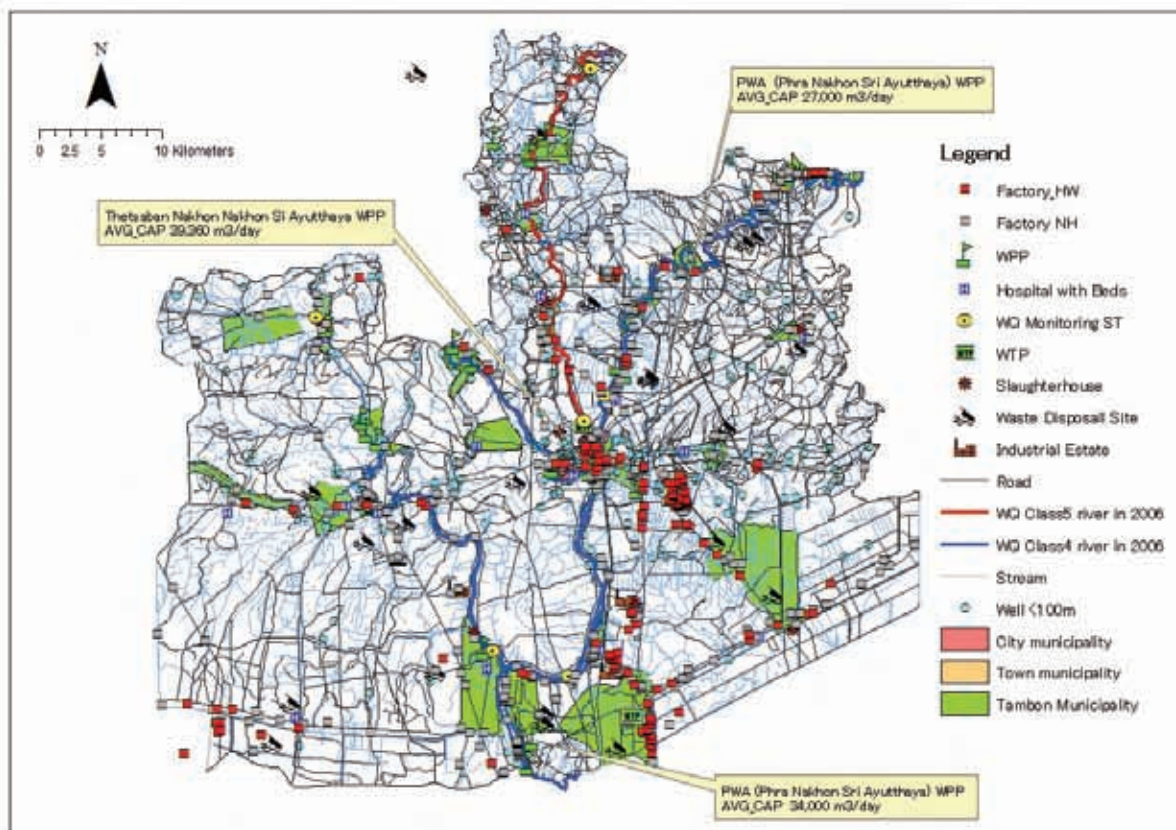


Figure 3-5: Location Map of Major Water Pollution Sources and Water Utilization Facilities in AYP

As shown in the figure above, there are three major water purification facilities in AYP where rivers are the water source, which means it would be difficult to change the sources to underground given the large amount of water intake. Therefore, priority should be given to the preservation of water quality upstream from these major purification facilities.

In order to formulate a water quality preservation plan, information will be required such as the amount of pollution load, location of discharge into public water bodies, amount of water inflow at the location, amount of river water flow from upstream (special consideration must be given to river water flow during the dry season due to the critical effect of pollutants). Nevertheless, there is no such information in the existing database.

The following figure shows an enlarged view of the map of Phra Nakhon Si Ayutthaya as a sample highlighting the relationship between a major water purification facility and various possible pollution sources.

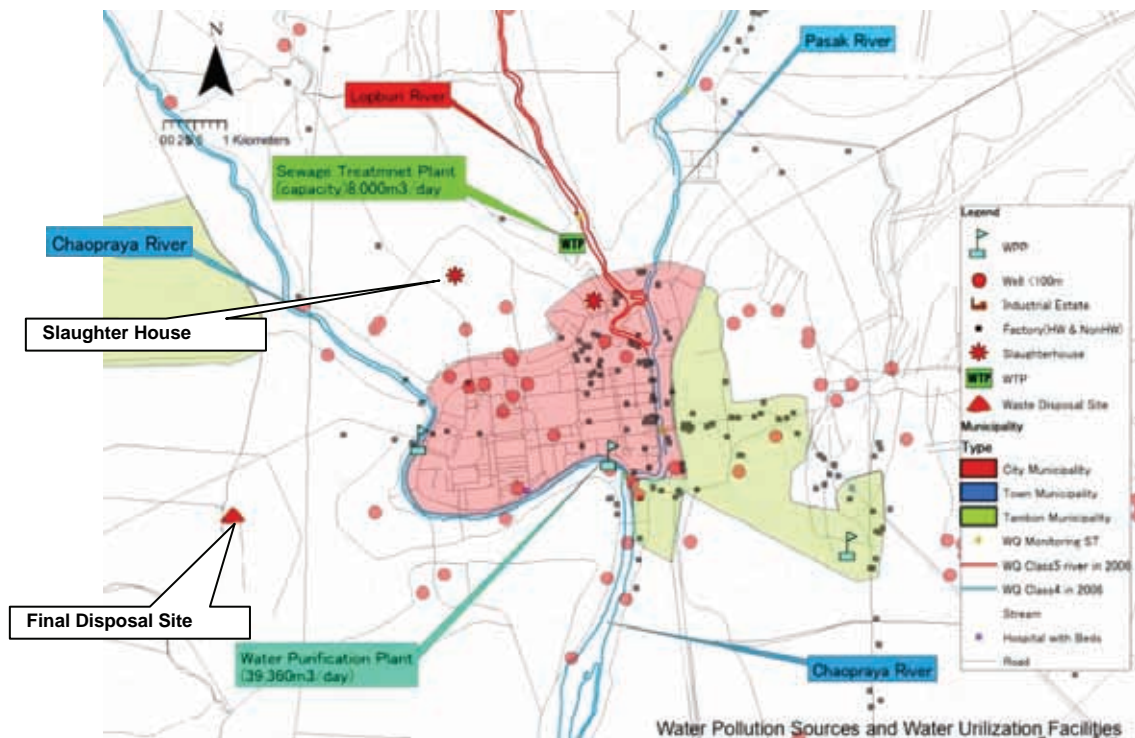


Figure 3-6: Location Map of Major Water Pollution Sources and Water Utilization Facilities in City of Ayutthaya

As shown in the figure, there are various possible pollution sources located upstream of this water purification facility, such as a waste water treatment plant, some slaughterhouses, a waste disposal site and so on. Furthermore, the residential area might be one of the pollution sources given the fact that the treatment of waste water from residential areas is not up to the required level.

Given these conditions, applying ad hoc countermeasures on individual pollution sources would require excessive amounts of money and time to achieve the final target of water quality preservation at public water bodies. In order to improve the water quality at public water bodies, to maintain quality of drinking water and to implement appropriate water quality management, it is important to investigate and plan at the provincial level instead of each Tassaban and Orborator level. Then a plan for reduction of the pollution load at the provincial level shall be formulated.

It is impossible to formulate the plan outlined above without information such as the amount of pollution load, location of discharge into public water bodies, amount of water inflow at the location, amount of upstream river water flow, and so on.

Therefore, the program for water quality preservation in public water bodies shall be implemented.

This program consists of two priority projects. One is a survey of pollution sources, and the other is the formulation of a water quality preservation plan for public water bodies.

1. Pollution Source Survey

Under this survey, first an investigation will be conducted of types of pollution sources, their locations, and the amount of pollution load generated and discharged. Then the ratio of pollution contributed by each pollution source will be examined. The results will be

utilized as basic information to formulate a water quality preservation plan for public water bodies.

2. Water Quality Preservation Plan for Public Water Bodies

A water quality preservation plan for public water bodies consists of a plan for the reduction of pollution load, confirmation of improvement effects, and maintenance of improved water quality.

The plan for reduction of pollution load is made up of the following:

- Set a water quality target at each monitoring point of public water bodies together with a target date for achievement,
- The amount of pollution load that must be reduced from each pollution source will be calculated in order to achieve the target, along with an examination of reduction methods for each type of pollution source,
- Priority to reduce pollution load will be determined based on the pollution contribution ratio and investment effect considering the above results,
- The plan to reduce pollution load will be formulated. Upon the formulation of the plan, activities for raising awareness among stakeholders in order to reduce the pollution load will be implemented.

Under the examination methods to confirm improvement of water quality, the water quality monitoring plan will be formulated in order to confirm whether or not the quality of water has been improved according to the plan.

Methods for revision of the plan will be examined and prepared in case the water quality goals are not reached.

These procedures are presented below.

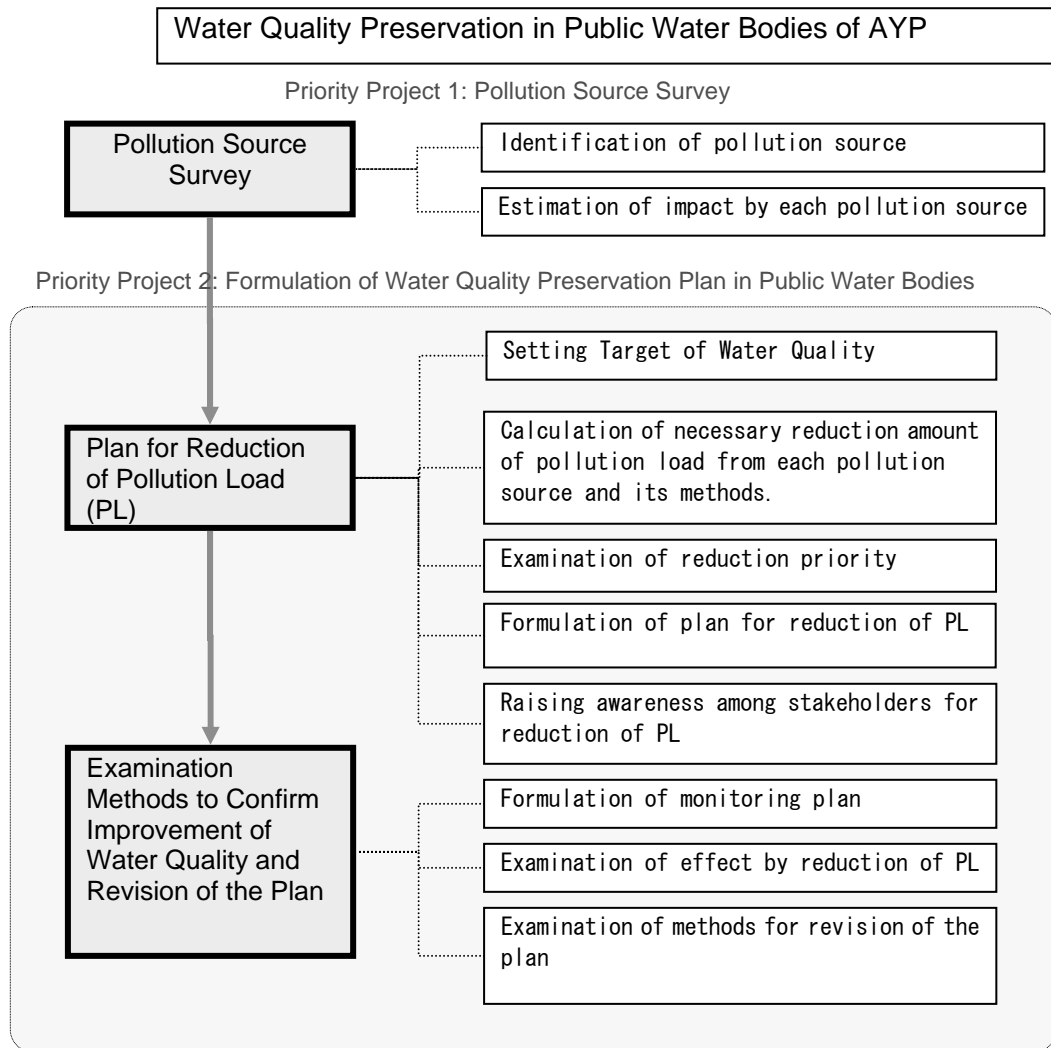


Figure 3-7: Relation between Program for Water Quality Preservation in Public Water Bodies in AYP and Priority Projects

Table 3-15: Project Design Matrix (PDM) for Program for Water Quality Preservation in Public Water Bodies of AYP

Program Name: Water Quality Preservation in Public Water Bodies in Ayutthaya Province (AYP)

Target Area: Ayutthaya Province

Target Group: Beneficiaries of public water bodies Ayutthaya Province (administration, business establishments, and residents)

| Narrative Summary | Objectively Verifiable Indicators | Means of Verification | Important Assumptions |
|---|--|---|---|
| Overall Goal Preserve high water quality in public water bodies of AYP | Water quality monitoring results | Water quality monitoring study | AYP does not change its water quality management policy |
| Program Purpose Formulate an appropriate, province-wide water quality management plan in AYP | Contents of water quality management plan | Water quality management plan | |
| Outputs 1. Identification of pollution source and its contribution to the public water bodies 2. Formulation of water quality preservation plan in public water bodies | 1. Contents of pollution source survey 2. Contents of water quality preservation plan | 1. Pollution source survey report 2. Water quality preservation plan | |
| Individual Priority Projects (Numbers correspond to Output numbers) | Responsible Agency | Supporting Agency | Input (Baht) |
| 1. Pollution source survey | PEO, REO | PCD, PAgO, PFO, PLO, PIO | 3,000,000 |
| 2. Formulation of water quality preservation plan in public water bodies | PEO, REO | PCD, PAgO, PFO, PLO, PIO | 3,500,000 |

PCD: Pollution Control Department/MNRE

PEO: Provincial Environment Office

REO: Regional Environment Office

PIO: Provincial Industrial Office

PAgO: Provincial Agricultural Office

PFO: Provincial Fishery Office

PLO: Provincial Livestock Office

b.4 Program for Safe and Quality Water Supply

River water is utilized not only for water supply but also for agriculture, livestock, industry, transportation and maintenance water for the river bank and bed. Water of rivers in AYP is rich and it is believed that water demand in each sector can be fulfilled without any problem. But it must be examined whether safe and quality water will be supplied to each sector or not especially at dry season when the amount of water flow reduce significantly. Based on the conditions of water flow and quality at dry season, water distribution plan including priority of water supply to the sectors shall be formulated considering the future demand of water in each sector.

As for the domestic water supply, there are several water supply organizations such as Provincial Water Authority (PWA), City of Ayutthaya, and each local administration in different service areas. There is no comprehensive plan to control and manage water supply in order to supply safe and quality water after investigating individual water sources and water demands in whole province.

In fact there are several water purification plants along the Lopburi River (such as three plants in Tessaban Tambon Rong Chang) which changed their water source from the Lopburi River to underground water sources without knowing while picture of water supply in the Province. Since the scale of these plants was small (about 1,000 m³/day capacity on average), changing the source was not difficult.

But in case the large water purification plant such as the plant in City of Ayutthaya, appropriate master plan on domestic water supply, considering water distribution to each sector in whole province, must be formulated first before changing any source or amount of water.

Accordingly, program for safe and quality water supply is proposed together with the program for water quality preservation in public water bodies. This program consists of two priority projects. One is the formulation of water distribution plan considering water quality and water sources and the other is the formulation of master plan on domestic water supply in whole province.

- Water Distribution Plan

There are water demands such as agriculture, livestock, industry, tourism, drinking and so on. In case of river water, besides these water demands, maintenance water of the river and water demands for downstream area should be considered. Upon the consideration of water quality and amount of the water in each sector, water distribution plan will be formulated. This plan includes determination of the water shed of individual River, water balance within the water shed, individual water demand in each sector, and appropriate distribution plan according to the required quality in each sector.

- Master Plan on Domestic Water Supply

At first, the investigation of current condition of water supply will be conducted. Then the future domestic water demand will be estimated. Master plan on domestic water supply will be formulated using these results in order to supply safe and quality water according to the water sources allocated under water distribution plan.

These procedures are presented below.

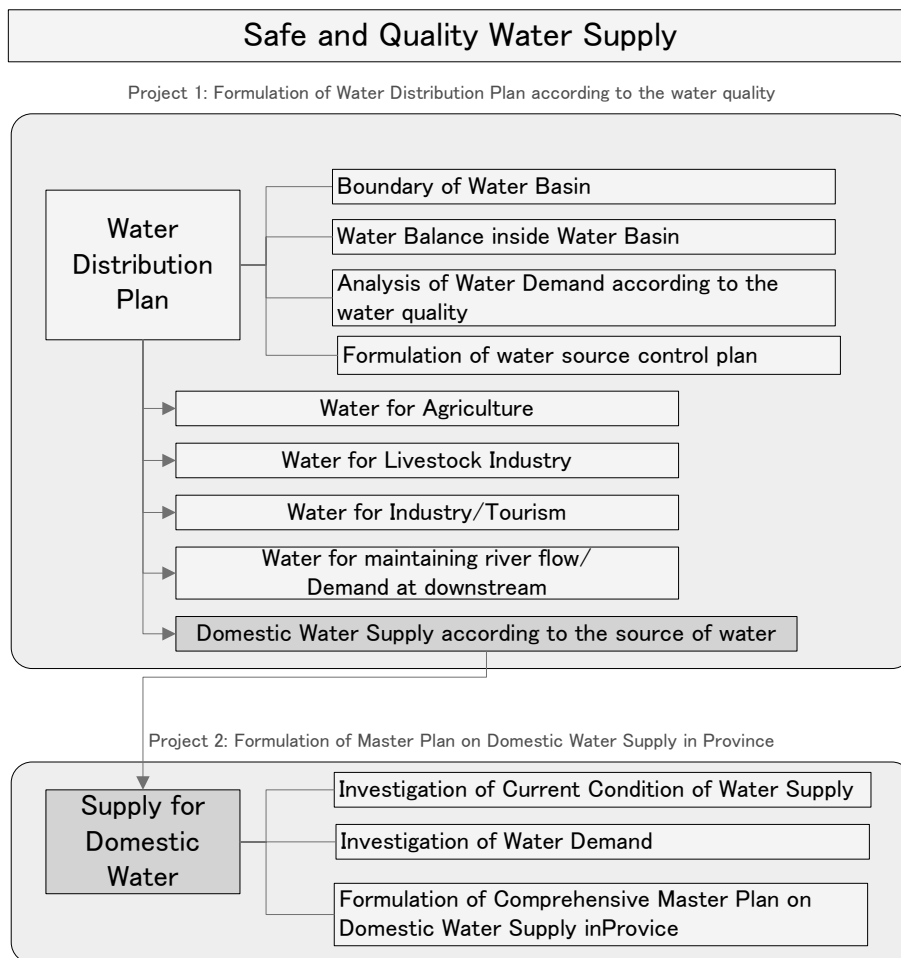


Figure 3-8: Relation between Program for Safe and Quality Water Supply and each Priority Project.

Table 3-16: Project Design Matrix (PDM) for Program for Safe and Quality Water Supply in AYP

Program Name: Safe and Quality Water Supply in Ayutthaya Province (AYP)

Target Area: Ayutthaya Province

Target Group: Residents of Ayutthaya Province

| Narrative Summary | Objectively Verifiable Indicators | Means of Verification | Important Assumptions |
|---|---|---|--|
| Overall Goal Achieve the supply of good quality, safe-to-drink water for all AYP | Water quality, amount, and pressure data | Water quality analysis and interview survey | AYP does not change safe and quality water supply policy |
| Program Purpose Formulate a comprehensive, province-wide Master Plan for water supply | Contents of comprehensive water supply plan | Comprehensive water supply plan | |
| Outputs 1. Volume of water demand in each sector from each source is calculated and water resource distribution plan is formulated 2. Master plan on domestic water supply is formulated | 1. Contents of water distribution plan 2. Contents of master plan on domestic water supply | 1. Water distribution plan 2. Master plan on domestic water supply | |
| Individual Priority Projects (Numbers correspond to Output numbers) | Responsible Agency | Supporting Agency | Input (Baht) |
| 1. Formulation of water distribution plan in Province | PA, Orborjor, Tessaban, Orbortor | PEO, PWA | 2,000,000 |
| 2. Formulation of master plan on domestic water supply | PWA with other water supply organizations | PEO, PO | 3,500,000 |

PWA: Provincial Water Authority

PEO: Provincial Environment Office

PHO: Provincial Public Health Office

PA: Provincial Administration

PO: Provincial Office of Provincial Administration

b.5 Program to Strengthen Linkage between Central, Provincial, and Local Administrations

Many tasks related to NREM have been decentralized and devolved onto Local Administrations (LAs; Orborjor, Tessaban, Orbortor), but the LAs put in charge of these tasks do not realistically have the capacity to execute these tasks. Therefore, for the time being, problem-solving in NREM will be difficult without the strong support of organizations in Central Administration and their agencies in the Province, and various PA (Changwat) offices. Thus the following program is proposed as a priority program:

Table 3-17: Project Design Matrix (PDM) for Program to Strengthen Linkage between Central, Provincial, and Local Administrations in AYP

Program Name: Program to Strengthen Linkage between Central, Provincial, and Local Administrations in Ayutthaya Province (AYP)

Target Area: Central Government and Ayutthaya Province

Target Group: MNRE in Central Administration, PA (Changwat) and LAs in Ayutthaya Province

| Narrative Summary | Objectively Verifiable Indicators | Means of Verification | Important Assumptions |
|--|---|---|--|
| Overall Goal NREM administrative capabilities of LAs in AYP are strengthened | Number of NREM projects started by government agencies in AYP, for example solid waste management or wastewater treatment | Interview survey with government agencies in AYP | The Governor (MOI official) supports such a program |
| Program Purpose Strengthen linkage for NREM between Central Administration organizations, the PA (Changwat) and LAs in AYP | NREM awareness increases among Provincial Administration and LA staff in AYP | Questionnaire survey to PA and LA | Central Government seriously promotes the decentralization of NREM |
| Outputs 1.1 NREM capacities of PEO, a NREM supporting team in PA (Changwat) and the Environmental Division in Orborjor increases 1.2 The link between REO 6 and regional offices still held by the five non-ex-MOSTE departments within MNRE shall be strengthened. 1.3 The existing NREM GIS Database of REO 6 is strengthened, and periodically updated and well maintained. The updated information on NREM is provided to PEOs and other administrative organizations under REO 6. 2.1 The linkages between central/provincial/ and local administrations is strengthened. 2.2 Departments within MNRE grasp the current actual state of NREM in PAs and LAs 3.1 NREM awareness in preserving NRE, increases among administrative officers in LAs. 3.2 NREM awareness, and interest in preserving NRE, increases among residents | 1.1 Number of training for PEO, a NREM supporting team in PA (Changwat) and the Environmental Division in Orborjor 1.2 Number of cooperation activities between REO 6 and 5 Regional Offices 1.3 Number of information on NREM provided to PEOs and other administrative organizations under REO 6. 2.1 Number of inquires to "PA/LA Central Support Center for NREM" 2.2 Number of inquiries dealt with by MNRE departments 3.1 Amount of budget for NREM and number of officers for it in LAs 3.2 Awareness and interest in preserving NRE among residents and number of complaints | 1.1 Annual report of REO 6 1.2 Annual report of REO 6 and 5 Regional Offices 1.3 Annual report of REO 6 and NREM GIS Database Center 2.1 Activity report of "PA/LA Central Support Center for NREM" 2.2 Annual report of various departments of MNRE 3.1 Budget and annual report of LAs 3.2 Interview survey to residents and annual report of PEO | OPS/MNRE actively supports the program |
| Individual Priority Projects (Numbers correspond to Output numbers) | Responsible Agency | Supporting Agency | Input (Baht) |
| 1. Strengthening of the local NREM support capacities of REO 6 | REO 6 | OPS and ONEP of MNRE | 5,600,000 |
| 2. Establishment of "PA/LA Central Support Center for NREM" in MNRE | ONEP/MNRE | OPS, DEQP, PCD, RFD, DNP, DMR, DMCR, DWR, DGR in MNRE | 11,570,000 |

| | | | |
|---|---------------|--|-----------|
| 3. Promotion of awareness regarding NREM among administrator of LAs and resident and publication of environmental information | DEQP, PEO/AYP | ONEP PO Cable TV, local radio stations | 3,480,000 |
|---|---------------|--|-----------|

REO: Regional Environmental Office

PEO: Provincial Environmental Office

PO: Provincial Office

All other agencies: departments within MNRE

b.6 Program to Strengthen NREM Capacities of LAs

There are three kinds of Local Administrations (LAs); the Orborjor, which shares their sphere of governance (i.e. the province) with PA (Changwat); the Tessaban, in charge of cities and municipalities; and the Orbortor, in charge of villages. These are organizations given new power under the Constitution of 1997 and the Decentralization Act of 1999. Many types of authority that have previously belonged to the Central Government have already been handed over to LAs, but the LAs often do not possess enough administrative capacity, including NREM capacities, due to the rapid pace in which decentralization occurred. Thus the following program is proposed as a priority program:

Table 3-18: Project Design Matrix (PDM) for Program to Strengthen NREM capacities of LAs in AYP

Program Name: Program to Strengthen NREM Capacities of Local Administrations (LAs) in Ayutthaya Province (AYP)

Target Area: Ayutthaya Province

Target Group: LAs in Ayutthaya Province

| Narrative Summary | Objectively Verifiable Indicators | Means of Verification | Important Assumptions |
|--|---|---|---|
| Overall Goal NRE in AYP are properly managed | Level of satisfaction towards NRE among local residents | Questionnaire survey to local residents | Decentralization continues |
| Program Purpose NREM capacities of LAs in AYP are strengthened | Awareness among LA staff in AYP | Questionnaire survey to LA staff | Decentralization of NREM is promoted |
| Outputs 1.1 The Environmental Division in Orborjor is strengthened. 1.2 PA supports NREM of Orborjor 1.3 The Environmental Division of the Orborjor conducts NREM activities that are beyond the scope of Tessaban and Orborjor, e.g. implementation of PEQMP Priority Programs 2. Opinions of local residents are reflected in PEQMP formulation and implementation, and NREM status is monitored by local residents 3. NREM information is used effectively by PA (Changwat), LAs, and local residents | 1.1 Number of staff in the Environmental Division in Orborjor and budget of it 1.2 Establishment of a NREM supporting team in PA (Changwat) 1.3 Number of NREM projects at the provincial level started by LAs 2-1 Number of public notices 2-2 Number of resident opinions recorded 2-3 Appointment of local resident representative(s) to monitoring committee 3. Number of inquiries to Environmental Information Center | 1.1 Annual report and budget of Orborjor 1.2 Annual report of PA 1.3 Budgets and annual reports of Orborjor, Tessaban, and Orborjor 2.1 Interviews with PEO and Amphoe 2.2 Interviews with PEO 2.3 Interviews with monitoring committee 3. Annual report of NREM Information Center, or Interviews with PEO | The understanding of DLA (MOI) and the Governor is obtained |
| Individual Priority Projects (Numbers correspond to Output numbers) | Responsible Agency | Supporting Agency | Input (Baht) |
| 1. Strengthening of NREM capacity of Orborjor in AYP | Orborjor of Ayutthaya and Provincial Office of AYP | MOI, PA (Changwat) of AYP and ONEP of MNRE | 10,760,000 |
| 2. Construction of resident participatory system for NREM in AYP | Provincial Office and PEO of AYP | ONEP and Amphoe of AYP | 1,000,000 |
| 3. Strengthening of the Environmental Information Center in PEO/AYP | PEO/AYP | OPS and ONEP of MNRE | 1,900,000 |

DLA: Department of Local Administration, MOI

MOI: Ministry of Interior

PA: Provincial Administration

PO: Provincial Office

All other organizations: departments within MNRE

c. Implementation and Budget Plan of Priority Projects

In accordance with the PEQMP-KPI manual, the corresponding implementation and budget plan for each Priority Program/Project is shown in a single corresponding table below:

Table 3-19: Implementation and Budget Plan of Priority Projects in AYP

| Program/Project | Budget (Baht) | | | | Total Budget (Baht) | Implementation Schedule in Fiscal Year (Baht) | | | | Responsible Agency |
|---|------------------|-------------------|--------------------|-------|---------------------|---|--------------------|--------------------|--------------------|--------------------|
| | Province | LA | DC | Other | | 2008 | 2009 | 2010 | 2011 | |
| 1. Program for Improvement of Solid Waste Management | 6,300,000 | 55,000,000 | 474,646,000 | | 535,946,000 | | 106,100,000 | 102,100,000 | 326,746,000 | |
| 1-1 Construction of two Central Disposal Centers (CDCs) | | | | | | | | | | |
| 1-1-1 Land purchase for CDC | | 25,000,000 | | | 25,000,000 | | 25,000,000 | | | Orborjor |
| 1-1-2 Site preparation for construction | | 4,000,000 | | | 4,000,000 | | 4,000,000 | | | Orborjor |
| 1-1-3 Detail design of CDCs | | 25,000,000 | | | 25,000,000 | | 25,000,000 | | | Orborjor |
| 1-1-4 Construction of CDCs | | | 474,646,000 | | 474,646,000 | | 50,000,000 | 100,000,000 | 324,646,000 | Orborjor |
| 1-2 Development of School Recycling System | 6,300,000 | | | | 6,300,000 | | 2,100,000 | 2,100,000 | 2,100,000 | LAs, PHO, Schools |
| | | | | | | | | | | |
| 2. Program for Flood Prevention and Disaster Mitigation (FP/DM) | 7,000,000 | 6,000,000 | | | 13,000,000 | | 1,500,000 | 7,500,000 | 4,000,000 | |
| 2-1 Formulation of FP/DM plan | 7,000,000 | | | | 7,000,000 | | 1,500,000 | 5,500,000 | | ODPM |
| 2-2 Formulation of action plan on renovation and maintenance of rivers and canals | | 3,000,000 | | | 3,000,000 | | | 1,000,000 | 2,000,000 | LAs |
| 2-3 Formulation of action plan on flood damage mitigation | | 3,000,000 | | | 3,000,000 | | | 1,000,000 | 2,000,000 | LAs |
| | | | | | | | | | | |
| 3. Program for Water Quality Preservation in Public Water Bodies | 6,500,000 | | | | 6,500,000 | | | 3,000,000 | 3,500,000 | |
| 3-1 Pollution Source Survey | 3,000,000 | | | | 3,000,000 | | | 3,000,000 | | PEO, REO |
| 3-2 Formulation of Water Quality | 3,500,000 | | | | 3,500,000 | | | | 3,500,000 | PEO, REO |

| Program/Project | Budget (Baht) | | | | Total Budget (Baht) | Implementation Schedule in Fiscal Year (Baht) | | | | Responsible Agency | |
|--|------------------|-------------------|----|------------|---------------------|---|------|------------------|-------------------|--------------------|--|
| | Province | LA | DC | Other | | 2008 | 2009 | 2010 | 2011 | | |
| Preservation Plan in Public Water Bodies | | | | | | | | | | | |
| 4. Program for Safe and Quality Water Supply in AYP | 2,000,000 | 3,500,000 | | | 5,500,000 | | | 2,000,000 | 3,500,000 | | |
| 4-1 Formulation of Water Distribution Plan in Province | 2,000,000 | | | | 2,000,000 | | | 2,000,000 | | | PA, LAs |
| 4-2 Formulation of Master Plan on Domestic Water Supply | | | | 3,500,000 | 3,500,000 | | | | 3,500,000 | | PWA and other water supply organizations |
| 5. Program to Strengthen Linkage between Central, Provincial and Local administrations in AYP | 3,480,000 | 17,170,000 | | | 20,650,000 | | | 9,250,000 | 13,170,000 | 26,050,000 | |
| 5-1 Strengthening of the local NREM support capacities of REO6 | | | | 5,600,000 | 5,600,000 | | | 2,710,000 | 180,000 | 2,710,000 | REO |
| 5-2 Establishment of "PA/LA Central Support Center for NREM" in MNRE | | | | 11,570,000 | 11,570,000 | | | 5,380,000 | 810,000 | 5,380,000 | ONEP/MNRE |
| 5-3 Promotion of awareness regarding NREM among administrators of LAs and resident and publication of environmental information in AYP | 3,480,000 | | | | 3,480,000 | | | 1,160,000 | 1,160,000 | 1,160,000 | PEO,DEQP |
| 6. Program to Strengthen NREM capacities of LAs | 6,680,000 | 6,980,000 | | | 13,660,000 | | | 6,680,000 | 300,000 | 6,680,000 | |

| Program/Project | Budget (Baht) | | | | Total Budget (Baht) | Implementation Schedule in Fiscal Year (Baht) | | | | Responsible Agency |
|---|---------------|-----------|----|-------|---------------------|---|---------|-----------|-----------|--------------------|
| | Province | LA | DC | Other | | 2008 | 2009 | 2010 | 2011 | |
| 6-1 Strengthening of NREM capacity of Orborjor in AYP | 4,780,000 | 5,980,000 | | | 10,760,000 | | | 5,380,000 | 5,380,000 | PO, Orborjor |
| 6-2 Construction of resident participatory system for NREM | | 1,000,000 | | | 1,000,000 | | | 500,000 | 500,000 | PO, PEO, LA |
| 6-3 Strengthening Environmental Information Center in PEO/AYP | 1,900,000 | | | | 1,900,000 | | 300,000 | 800,000 | 800,000 | PEO |

DC: Decentralization Committee Budget
The amount in budget column is an estimate only

4. PEQMP for SKP

4 PEQMP for SKP

The PEQMP-KPI for Samut Songkhram Province (SKP) has been submitted to MNRE in October and subsequently accepted. Although it was evaluated at the second highest score (Very Good) in a 6-tiered system (Excellent, Very good, Good, Fair, Poor, Fail), the PEQMP-KPI Evaluation Committee also indicated in its comments that some improvements would be required, as described in Chapter 1, Section 1.2.2. This PEQMP has been compiled as a response to comments by the Evaluation Committee, and also reflects the questions and comments of seminar participants voiced at the “Third Seminar for Formulation of PEQMP for Samut Songkhram Province” held on 11th July 2008. This chapter summarizes the contents of the PEQMP of which details is in Main Report Chapter 5.

4.1 Structural Changes and Improvements made to PEQMP-KPI¹

4.1.1 Structure of PEQMP-KPI

The PEQMP-KPI of SKP, submitted in October 2007, was organized into four parts following the *Action Plan Handbook for Natural Resources and Environmental Management at the Provincial Level* (hereinafter called as PEQMP-KPI Manual), published by Ministry of Natural Resources and Environment (MNRE) and Office of Natural Resources and Environment Policy and Planning (ONEP):

Part 1: Introduction

Part 2: Situation and Issues of NREM

Part 3: Details of the PEQMP

Part 4: Annex

4.1.2 Summary of Improvements made to PEQMP-KPI

The Study Team and Counterparts revised the PEQMP-KPI in response to comments made by the PEQMP-KPI Evaluation Committee. The improvements and changes made to PEQMP-KPI, resulting in the PEQMP, are shown below:

¹ The plans already formulated and submitted by the two model provinces prior to October 2007 as PEQMP-KPI, and the new plans formulated by the two model provinces under assistance of the Study Team referred to as PEQMP.

Table 4-1: Improvement to Overall Structure of PEQMP

| PEQMP-KPI | | | Comments by PEQMP-KPI Evaluation Committee | PEQMP | | |
|--|---|--|--|---|--|---|
| Part/Section Title (from PEQMP-KPI Manual) | | Content (submitted by SKP) | | Part/Section Title (Changes in bold) | | Changes and Improvements (by Study Team and counterparts) |
| Part | Section | | | Part | Section | |
| Part 1 Introduction | | Introduction of Formulation Committee members, and the Governor's signature. | None. | Part 1 | None suggested. | |
| Part 2 Situation and Issues of NREM | 1) Basic Data of the Province | Basic data of province, such as population and economy, given in table format following the PEQMP-KPI Manual, and additionally shown as figures. | <ol style="list-style-type: none"> Although current conditions of NREM are described, there is a lack of Area Based Information and thus it is unclear which NREM issues occur in which problem areas. Issues and their problem areas must be clarified, and the linkage between a problem, its current situation, and its impacts on the residents must be described. The relationship between SWOT analysis results and the decision process and procedures behind the formulation of the guidelines for preventive/improvement measures must be clarified. | Part 2 | <ul style="list-style-type: none"> Add more detail, and add area-based information using NREM GIS Database. Add population and economical growth estimates, and analysis of socioeconomic impact from these growths. | |
| | 2) Situation of Natural Resources and Environment in the Province | The current situation of NREM, described through charts and formats given in the PEQMP-KPI Manual, and additionally shown as figures. | | <ol style="list-style-type: none"> <p>Situation and Issues of Natural Resources and Environment in the Province</p> <ul style="list-style-type: none"> Add more detail, and add area-based information using NREM GIS Database. Review each NREM sector through a narrative description in the following order, and also include 'issues' and 'measures to be taken' when describing the situation: <ol style="list-style-type: none"> 1: description/analysis of current situation, 2: description/analysis of likely future situation, when nothing is done to improve current situation, 3: issues that must be solved (considering both current and future problems), and 4: prevention measures and methods to solve issues | | |

| PEQMP-KPI | | Comments by PEQMP-KPI Evaluation Committee | PEQMP | |
|--|---|--|--|--|
| Part/Section Title (from PEQMP-KPI Manual) | Section | | Part/Section Title (Changes in bold) | Section |
| Part | 3) Analysis of Current Issues and the Impact from Socioeconomic Development | | Part | Changes and Improvements (by Study Team and counterparts) |
| | Content (submitted by SKP) | | Section | |
| | 3) Analysis of Current Issues and the Impact from Socioeconomic Development | | 3) Summary of Situation and Issues of NRE of Province | <ul style="list-style-type: none"> Summarize the current issues and the impact of socioeconomic development described in Section 1) and 2) in table form. Use the same table format as the PEQMP-KPI. In the table, refer back to area-based information in Section 2). Acknowledge that not all issues can be resolved by the target year 2011, and organize contents of table into a diagram showing long-term strategy of NREM: 'Vision, Goals, Issues, and Direction of Measures for NREM' |
| | 4) Priority Setting of Issues | | 4) | <ul style="list-style-type: none"> Discuss Priority Issues to be targeted in this PEQMP's time span (2008-2011). Use results from stakeholder opinion surveys when deciding on Priority Issues in addition to the results of priority setting done by the PEQMP-KPI. |
| | 5) Provincial Potential Analysis by SWOT Analysis | | 5) | None suggested. |

² Tables from the PEQMP-KPI Manual

| PEQMP-KPI | | | PEQMP | | |
|--|--|---|---|--|--|
| Part | Section | Content (submitted by SKP) | Part/Section Title (Changes in bold) | | |
| | | | Part | Section | |
| | 6) Prevention Measurement and Solving Problems | Problems and measures to be taken, in the format of Table 25 ² ('Summary of Priority of Problems'), and following the priority ranking from Table 22 ² in Section 4). | | 6) Selection of Priority Programs | |
| Part 3 Details of the PEQMP | | Summary of priority issues identified and ranked in Section 4), in Table 26 ² ('Topic of Problem/ Objective/ Target/ Strategy/ Plan'), Table 27 ² ('Plan/ Project/ Fiscal year/ Activity/ Production and Indicator'), Table 28 ² ('Summary of Plan/ Project/ Budget/ Time Period and Responsible Agency'), and Table 29 ² ('Summary of Plan/ Project and Budget of Central Government to be Implemented in Province'). Support system and monitoring/ evaluation guidelines for the implementation of the plan described. | Part 3 | | |
| | | | | <p>Comments by PEQMP-KPI Evaluation Committee</p> <ul style="list-style-type: none"> Clearly describe the connection between an issue and program/project, and the interrelationship between various programs and projects. <ol style="list-style-type: none"> Create an operational timetable where each program/project finishes within the allotted timeframe. Clearly state the source budgets and/or subsidies for each program /project. PEOs must clearly identify program /projects in which budget allocations and/or subsidies from the province or MNRE are requested. | <p>Changes and Improvements (by Study Team and counterparts)</p> <ul style="list-style-type: none"> Select Priority Programs to be implemented by 2011, based on Section 4). <p>Currently, provincial-level master plans do not exist in most NREM sectors. Thus, proper detailed PEQMP formulation is difficult, especially considering the available time frame and resources. Thus the detailed plans were formulated in the following way:</p> <ul style="list-style-type: none"> Focus on Priority Programs from Section 6). Use the PDM (Project Design Matrix) format to show the details of Priority Programs. A PDM shows the relationship between priority issue and individual projects (i.e. Priority Projects) formulated to solve these issues. Include the details required by the Evaluation Committee in the PDM; specifically, the budget, budget source, responsible and supporting agencies, verifiable indicators, and means of verifications. Show the implementation and budget plan for Priority Programs/ Projects on a modified version of Table 28* ("Summary of Plan/ Project/ Budget/ Time Period and Responsible Agency"). |

| PEQMP-KPI | | | PEQMP | | |
|---|---|--|--|---|---|
| Part/Section Title (from PEQMP-KPI Manual) | Content (submitted by SKP) | | Comments by PEQMP-KPI Evaluation Committee | Part/Section Title (Changes in bold) | |
| | Part | Section | | Part | Section |
| | | | <p>4. Define the support structure needed for actual implementation of program /projects, and include program /projects in the Provincial Development Strategy.</p> <p>5. Provide guidelines on how the program /project could be followed up and evaluated.</p> | | Changes and Improvements (by Study Team and counterparts) |
| Part 4 Annex | Details of Important Projects of Province | 5 Priority Projects and their details, following the instructions and formats in the PEQMP-KPI Manual. | None | Part 4 | Describe each Priority Project listed within Priority Programs in Part 3. |
| | Data or Details related to PEQMP | Data sources related to PEQMP-KPI formulation, as instructed in the PEQMP-KPI Manual. | None | | |

4.2 Summary of PEQMP for SKP

This chapter summarizes the contents of the PEQMP, but it should be noted that the following parts are excluded from this summary. Refer to Main Report, Chapter 5 for the parts and sections below:

Part 1: Introduction

Part 2: Situation and Issues of NREM

- 1) Basic Data of the Province
- 2) Situation and Issues of Natural Resources and Environment (NRE) in the Province
- 5) Provincial Potential Analysis by SWOT Analysis

Part 4: Annex

4.2.1 Key Indicators for Current Situation of NRE in SKP

Key indicators which present current situation of NRE are summarized as follows.

Table 4-2: Key Indicators for Current Situation of NRE in SKP

| Sector of NREM | Key Indicators which indicate Current Situation |
|----------------------------|---|
| Water Quality ³ | <ul style="list-style-type: none"> • Mae Klong River: Class 3 in MK1,2,4 Class 4 in MK3 |
| Air Quality ⁴ | <ul style="list-style-type: none"> • At Station No.1: PM-10 0.042 – 0.100 mg/m³ • At Station No.2: PM-10 0.032 – 0.078 mg/m³ |
| Municipal Solid Waste | Generation Rate ⁵ in 2005 <ul style="list-style-type: none"> • Tessaban: 0.956 kg/day/person • Orbotor: 0.500 kg/day/person |
| Hazardous Waste | <ul style="list-style-type: none"> • Medical Waste⁶: 0.154 tons/day • Domestic Hazardous Waste: 0.08 tons/day • Hazardous Industrial Waste⁷: 3.3 tons /day |

³ Water quality monitoring results in 2006 by PCD, class definitions of water quality standards are shown in Chapter 5 of Main Report., MK1,2,3 and 4 is the location of sampling point.

⁴ There is no continuously operating monitoring station in SKP. PM-10 was measured in 2006 to 2007 by moveable monitoring equipment.

⁵ Data source: REO 8 environmental report in 2006

⁶ Unit generation amount by REO 8.

⁷ Details are shown in Chapter 5 of Main Report.

4.2.2 Situations and Issues in Natural Resources and Environment

This section corresponds to Part 2 Situation and Issues on NREM, 3) Summary of Situation and Issues of Natural Resources and Environment of the PEQMP.

a. Situations and issues of Natural Resources and Environment

Following the table format given in the PEQMP-KPI Manual, the current situation and issues resulting from socioeconomic development has been summarized for each NREM sector.

Table 4-3: Summary of Issues, Causes, Impact and Measures for Solving Issues of Natural Resources

| Natural Resources | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|---------------------------------|--|--|--|--|---|--|
| 1. Soil and Land Resource | Decrease of mangrove forest | <ul style="list-style-type: none"> See Figure 5-7 in Main Report (Land Use) See Figure 5-9 in Main Report (Mangrove Forests) | Converting mangrove forest to aquaculture fields | May cause coastal erosion and decrease of marine products | Campaigns and planting activities to rehabilitate mangrove forest | <ul style="list-style-type: none"> Protect and rehabilitate mangrove forest with community participation Advertise the importance of mangrove forest to stakeholders |
| | Improper land use | Whole SKP | Due to economic reasons, land is sold to developers some of whom use the land improperly | Industries in areas where they are not wanted, e.g. metal factories | Relevant organizations/authorities temporarily stop or withdraw permission for development of lands | Develop and advocate appropriate land use plan |
| | Deterioration of soil | Agricultural land within Muang, Amphawa, Bang Khonthi District, i.e. Moo 1-8 of Don Manora Subdistrict | <ul style="list-style-type: none"> Use of chemical substances/ pesticide to get rid of insects/ weeds Surface soil erosion | <ul style="list-style-type: none"> Decrease of agricultural products and aquatic animals Toxic residues in animals/ plants | <ul style="list-style-type: none"> Promote organic fertilizers Reduce the use of chemical substances Promote the growing of Vetiver grass to prevent erosion | Encourage farmers to use organic fertilizers instead of chemical fertilizers |
| 2. Forest Resource and Wildlife | Decrease of mangrove forest | See "1. Soil and Land Resource" | | | | |
| | Damage to livestock and farmed aquatic resources by water monitors | Prawn and fish farms in Nang Takhian Subdistrict | Overpopulation of water monitors due to protected status | Decrease of agricultural and aquaculture products | Catch and release at appropriate place | Propose a change in regulation to relevant organizations, to allow commercial use and population control of water monitors, to relevant |

| Natural Resources | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|--------------------------------|--|---|--|--|---|---|
| 3. Water Resource | Insufficient water for consumption and agriculture | Yisan, Nang Takhian, Lat Yai, Plai Phongphang, Phraek Nam Daeang subdistricts | <ul style="list-style-type: none"> No irrigation system Saline water intrusion | <ul style="list-style-type: none"> Insufficient water for consumption Damage to agriculture | <ul style="list-style-type: none"> Provide wells, water towers, strainers Dredge canals | Completion of water supply system and irrigation network |
| | Flooding due to sediment in canal | Tambon Phraek Namdaean | Not enough capacity of canal due to sediments | Damage to land and property | Periodical dredging | <ul style="list-style-type: none"> Regularly dredge bed of water canals Formulation of compulsory master plan for flood prevention and mitigation |
| 4. Mineral Resource | There are no notable mineral resources | | | | | |
| 5. Marine and Coastal Resource | Number of aquatic animals is decreasing | Marine and coastal areas i.e. Bang Chakrang, Laem Yai, Klong Khon subdistrict | <ul style="list-style-type: none"> Inappropriate fishing methods i.e. inappropriate tools/ substances Large amount of wastewater discharge | <ul style="list-style-type: none"> Decrease in the population of aquatic animals Damage to coastal farming | <ul style="list-style-type: none"> Release aquatic animals back to nature on special occasions Inform fish farmers to sell only mature fishes; warn fishermen about illegal fishing methods through Orbortor, local cable TV, Fishery network | <ul style="list-style-type: none"> Conduct research, development and guidance in proper fishing methods in order to prevent over-fishing Enforcement of law by LAs for illegal fishing Support the development of voluntary network among fishermen and encourage them to be |

| Natural Resources | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|-------------------|---|--|---|---------------------------|-----------------------------------|--|
| | | | | | | involved in marine and costal resources conservation <ul style="list-style-type: none"> Educate local residents about the role and importance of mangrove forests in overall environmental conservation |
| | Tidal erosion of seashore | Tambon Bang Kaeo | Tidal force and inappropriate land use | Loss of land and property | Coastal protection | Mangrove afforestation and study on coastal erosion mechanisms |
| 6. Biodiversity | Lack of preservation of wildlife habitats and breeding environments, and care for sustaining biological diversity | Whole SKP, and especially in mangrove forest | Lack of awareness of importance of biodiversity | Loss of biodiversity | Afforestation of mangrove forests | <ul style="list-style-type: none"> Formulate conservation plan Educate residents on importance of biodiversity Monitor and restrict phenomena that affect biodiversity |

Table 4-4: Summary of Issues, Causes, Impact and Measures for Solving Issues of Environment

| Environment | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|------------------|---|---|---|--|----------------|---|
| 1. Water Quality | Safe and quality water supply is not assured | Water supply facilities which use water that is affected by water pollution sources as shown in Figure 5-24 in Main Report (Location Map of Major Water Utilization Facilities) | Inappropriate treatment and/or lack of treatment of wastewater from various sources | <ul style="list-style-type: none"> • Increase in water purification costs • Deterioration of quality of purified water | - | <ul style="list-style-type: none"> • Formulation of master plan on domestic water supply • Research of current conditions of domestic water supply • Investigation of domestic water demand • Formulation of domestic water supply plan |
| | Water quality of public water bodies is not preserved | Various public water bodies affected by water pollution sources as shown in Figure 5-23 in Main Report (Location Map of Water Pollution) | Inappropriate treatment and/or lack of treatment of wastewater from various sources | <ul style="list-style-type: none"> • Increase in water purification costs • Deterioration of purified water quality | - | <ul style="list-style-type: none"> • Pollution source survey • Formulation of Water Quality Preservation Plan in Public Bodies |

| Environment | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|------------------|--|---|---|---|---|---|
| 2. Air Quality | No regular monitoring station for air quality (except PM10 measurements) | Whole SKP, especially urban areas | Air quality has low priority in terms of environmental management | Actual condition of air quality is not well understood | Several instances of PM10 measurement | <ul style="list-style-type: none"> Mobile Air Monitoring Unit shall be used to grasp condition of air pollution Monitor air quality indicators established by environmental standards |
| 3. Noise Quality | Level of noise emitted by outboard engines on boats over limit | Eco-tourism sites, Mae Klong River, Amphawa Canal | Outboard motors on boats | Conflict with residents near eco-tourism sites | - | <ul style="list-style-type: none"> Set up regulation of outboard engines on boats Promote the use of low-noise outboard motors for eco-tourism boat and provide support through subsidies |
| 4. Solid Waste | Improper municipal SWM | Most LAs in SKP | Lack of knowledge of proper and sustainable SWM | <ul style="list-style-type: none"> Unsanitary conditions in LAs e.g. heaps of waste Inactive 3Rs (Reduce, Reuse and Recycle) activities Illegal dumping of waste | <ul style="list-style-type: none"> Hire private company Promote waste sorting Purchase more garbage trucks Employ more staff Provide collection more often | Formulate comprehensive master plan of SWM, and implement the plan |
| | Lack of a final disposal site in SKP | Whole SKP | Closure of the Ladjai disposal site due to opposition | If the landfills in the neighboring provinces refuse to accept | - | <ul style="list-style-type: none"> Selection of a disposal site |

| Environment | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|--|---|--------------------------------|--|--|---------------------------------------|---|
| 5. Hazardous waste and toxic substance | The amount of hazardous wastes generated from factories (HIW) is estimated at 3.3 tons/day in 2005 and information on their disposal is not available | Whole SKP | Lack of studies to assess the current situation | Significant negative impact on environment of SKP by improper HIW management | - | <ul style="list-style-type: none"> Formulate comprehensive master plan of SWM Carry out investigation on industrial wastes, especially hazardous wastes, with cooperation from Provincial DIW Prioritize HIW treatment among industrial waste issues |
| | Information on medical waste disposal is not available; but the amount of medical waste generated is limited to less than 0.2 ton/day in 2005 | Whole SKP | Lack of studies to assess the current situation | <ul style="list-style-type: none"> Significant negative impact on environment of SKP by improper medical waste management | - | <ul style="list-style-type: none"> Intensive education activities for the promotion of proper disposal, aimed at sources of medical waste generation |
| 6. Urban Environment | Disorderly advertising signs/ billboards | Main streets and intersections | <ul style="list-style-type: none"> No control No permit system | <ul style="list-style-type: none"> Cause accidents Hideous scenery | Zoning control e.g. in Muang District | Investigate the situation of unregulated city area billboards and find a solution |
| | Failing canals | Whole SKP | Sediments and illegal dumping | Loss of value for whole SKP | - | Formulate plan and allocate budget for development of provincial water |

| Environment | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|------------------------------------|--|---|---|--|----------------|--|
| | Lack of green zones in congested urban areas | Urban areas of SKP | Lack of awareness | Loss of value for whole SKP | - | Government and private sectors make a joint effort to create urban amenities e.g. planting trees along roads, neighborhood parks |
| 7. Natural Environment and Culture | Natural and cultural assets are not sufficiently maintained | See Table 5-67 and Figure 5-35 in Main Report (Locations of Natural and Cultural Heritage Sites in SKP) | Lack of resident awareness about natural and cultural assets | Deterioration of natural and cultural assets | - | Public education, administrative support, and budget allocation for the conservation of natural and cultural assets |
| | Natural and cultural assets are not fully utilized | See Table 5-67 and Figure 5-35 in Main Report (Locations of Natural and Cultural Heritage Sites in SKP) | Lack of resident awareness about richness of natural and cultural assets in SKP | Loss of potential income from tourism | - | Conduct a publicity campaign so that natural and cultural assets in SKP will attract tourism, in order to increase income from tourism |
| 8. Global Warming | The countermeasures set up in the National Strategy on Climate Change (NSOCC) are not implemented well | Whole SKP | Lack of knowledge in global warming issues | Deterioration of environment | - | Implement countermeasures which are set up in NSOCC, especially the following: |

| Environment | Summary of Issue | Area in which Issue Occurs | Causes | Impact | Measures Taken | Measures to be Taken |
|-------------|---|----------------------------|--------|--------|----------------|---|
| | <p>Final disposal sites in neighboring provinces are operated using open dumping methods despite significant GHG emissions from waste, and 3Rs (Reduce, Reuse and Recycle) activities are hardly taking place</p> | | | | | <ul style="list-style-type: none"> • Further recover mangrove forest area by afforestation • Implement sanitary landfill operation measures and promote 3Rs through public relations and educational activities in cooperation with REO 8 |

b. Vision, Goals and Issues, and Direction of Measures

It is impossible to implement all of the issues and measures discussed in the section above by the PEQMP target year of 2011. Therefore, the ideal state of NREM that the Province should aspire to in the long term was expressed through Vision and Goals, and the Issues and Direction of Measures were sorted accordingly. Vision and Goals must reflect the opinions of as many stakeholders as possible, and it is only presented here to stimulate discussion. In this summary version, Visions, Goals, and Strategies are presented below.

b.1 Vision and Strategy

b.1.1. Vision

The vision is to realize a favorable environment for society and life to exist in symbiosis with fertile natural resources with a rich water environment at its nexus, and attain social and economic development which is in harmony with the environment.

b.1.2. Goals

1. Social and economic development in harmony with the conservation of a rich water environment.

The following issues should be resolved to realize this:

- Decrease the outflow of registered population.
- Breakaway from stagnation in sales of the fishery sector.
- Development is promoted in harmony with conservation of natural resources and environment.
- Prevent environmental deterioration due to an increase in tourism.
- Industry is promoted using local wisdom and property efficiently.

2. Conservation of fertile natural resources in harmony with provincial development.

The following issues should be resolved to realize this:

- Soil and land resources are used effectively and conserved according to local features.
- Forest resources (mangrove forest) are conserved where marine resources are preserved and biodiversity is protected.
- Biodiversity is conserved and rehabilitated.
- Abundant water resources are conserved and managed efficiently and used effectively.
- Deterioration of marine/coastal resources is stopped and they are rehabilitated.

3. The conservation of an abundant social and living environment in symbiosis with a rich natural environment.

The following issues should be resolved to realize this:

- Safe and good water is provided to all people in the province.
- Safe and good quality water is secured.
- Proper and sustainable system of solid waste management is established.
- Good air quality is preserved.

- Adverse impact by noise and vibration is prevented.
- Appropriate system for hazardous waste management is developed.
- Favorable urban environment is developed.
- Natural and Cultural Heritage is maintained properly and used effectively.
- The system for confronting global warming problems is established.

b.1.3. Strategies

The following six strategies were established based on National EQMP in order to reach the goals shown above.

Strategy 1: Allow joint ownership of environmental data, public access to information and knowledge of NREM, and encourage public participation in NREM.

Basic information of NREM is disseminated to residents in the province, residents' awareness is developed and they are encouraged to participate in NREM. Especially facts on adverse impact on health and living by degradation of environmental quality are clarified so that residents may monitor and protect local natural resources and environment by themselves. In order to realize this, the opening of information on natural resources and environment to the public is promoted. Moreover, a monitoring committee is set up including representatives of local residents and business establishments so that they can join the meeting for evaluation of the progress of PEQMP implementation.

Strategy 2: Improve the efficiency of NREM and develop stakeholder capacity.

Jurisdiction of the organizations related to NREM is made clear and duplication of activities can be avoided in addition to strengthening the linkage between each organization. Information of NREM is unified and commonly owned and the capacity of the organizations and their staff is developed.

Strategy 3: Support local administrations to manage NREM.

The organization for NREM in local administration is strengthened and its administrative capacity is developed. Local administrations are given support to establish their regulations to strengthen the organization for NREM. Moreover, in order to support and strengthen weak local administrations, joint investment and cooperative management are driven forward for NREM with Orborjor at its nexus.

Strategy 4: Reduce poverty through the fair utilization of natural resources so that they reach grassroots society.

Win-Win measures by which all stakeholders can gain profit are introduced by promoting empowerment to local residents based on the principle that beneficiaries should pay part of cost.

Strategy 5: Promote efficient and sustainable use of natural resources with consideration to environmental conservation.

The mechanism of cost burden is developed to rehabilitate natural resources and environment (NRE), in cooperation with local residents and relevant organizations, by setting up rules and regulations prescribing the provision for payment to an agency to manage NRE.

Through a variety of study processes, whether official or unofficial, education is conducted for all members of the younger generation and knowledge of natural resources and environment is disseminated. In order to set up the production target taking a serious view of natural balance, research and development are actively conducted regarding sustainable and effective use of natural resources.

Strategy 6: Conduct balanced and sustainable environmental development through conservation, monitoring and the rehabilitation of nature.

Based on Social Measurement, which applies the Polluter Pays Principle (PPP) and Beneficiary Pays Principle (BPP) and published information of impact on natural resources and environment, etc., conservation, monitoring and rehabilitation of the natural environment are conducted. Protected areas are managed according to the principle of biodiversity, and wildlife habitats are managed according to forest classifications.

b.2 Ideal State of NREM, Issues, and Direction of Measures

All of the above suggestions are represented in the following figure, which depicts the ideal state of NREM that SKP should aspire to over the long term, including current issues and the direction of measures:

Vision: The environment for favorable society and life living in symbiosis with fertile natural resources is realized with a nucleus given to rich water environment, and social and economic development is attained in harmony with the environment.

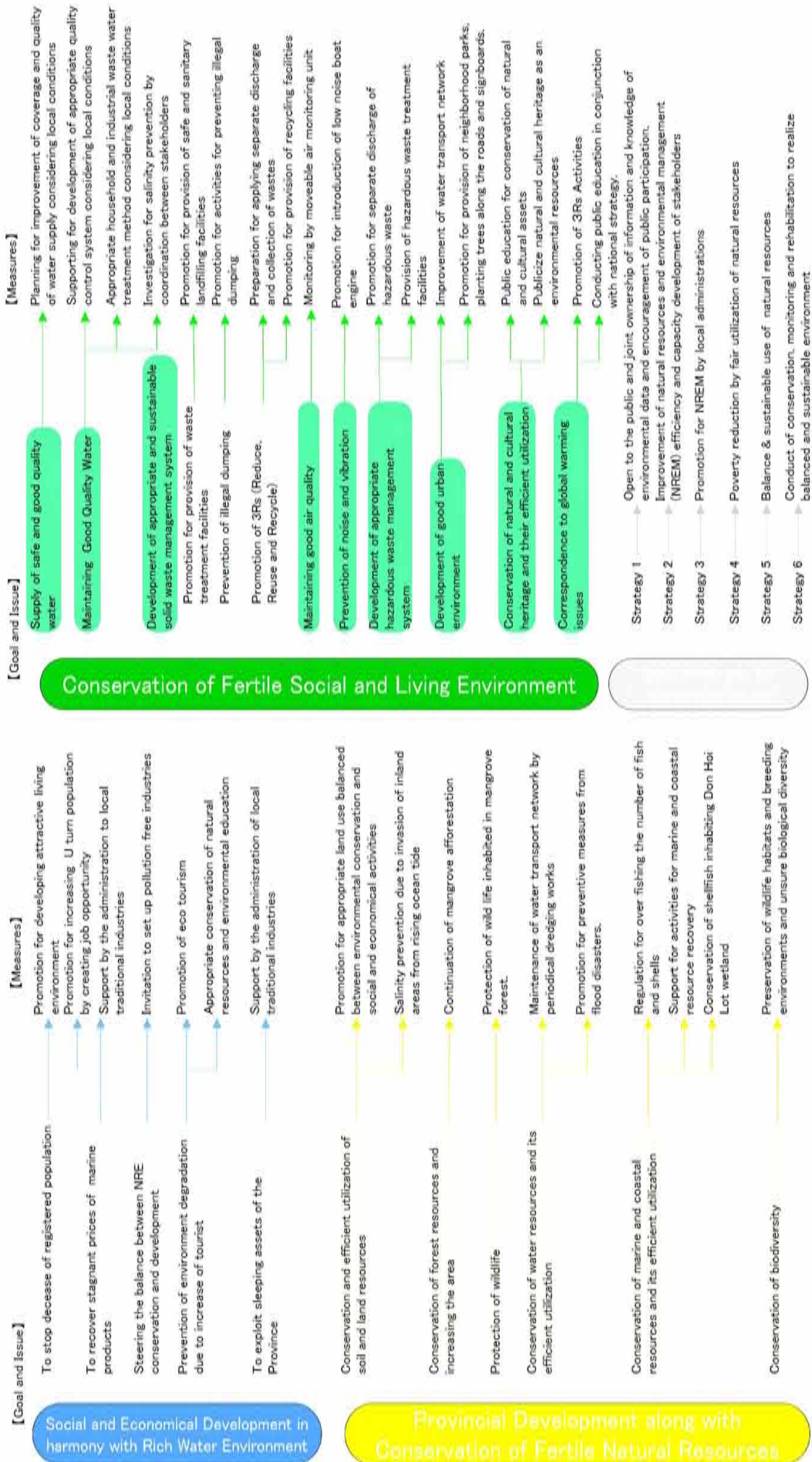


Figure 4-1: Vision, Goals, Issues and Direction of Measures for NREM in SKP

4.2.3 Priority Setting of Issues

This section corresponds to Part 2 Situation and Issues on NREM of the Province, 4) Priority Setting of Issues of the PEQMP.

As mentioned above, there are many issues to be resolved in NREM in SKP. However, there are limited financial and human resources available. In this section, we examine the priority issues to be resolved by the target year 2011 in PEQMP (2008-2011) for SKP.

a. Opinion Survey of Stakeholders

a.1 Target Groups

An opinion survey was conducted among the following four stakeholder groups. Their answers were collected, added and analyzed according to target group.

Table 4-5: Target Group for Opinion Survey

| Target Group | Abbreviation | Number |
|------------------------|--------------|--------|
| Local Administration | OP-LA-SKP | 36 LA |
| Resident | OP-RE-SKP | 64 |
| Business Establishment | OP-BE-SKP | 47 |
| NGO | OP-NGO-SKP | 5 NGO |

a.2 Problems within Local Administration (LA)

The most serious problems within LAs were indicated as follows:

Table 4-6: Problem in LA

| Target Group | Most Serious Problem | Reply Rate (%) | Second Most Serious Problem | Reply Rate (%) |
|------------------------|---|----------------|-----------------------------|----------------|
| LA | Deterioration of NRE | 41.7 | Stagnation of Economy | 33.3 |
| Resident | Deterioration of NRE | 65.6 | Stagnation of Economy | 20.3 |
| Business Establishment | Deterioration of NRE | 48.9 | Deterioration of NRE | 40.4 |
| NGO | • Deterioration of NRE | 40.0 | Stagnation of Economy | 20.0 |
| | • Development Plan by Government does not take local knowledge into account | 40.0 | | |

a.3 Problems of NREM

Serious problems of NREM according to each target group are listed in the following table. The percentage value shown in the table is the ratio of respondents who selected “4 Very Serious” among six possible choices (1 Not serious at all, 2 Not very serious, 3 Somewhat serious, 4 Very serious, 5 Can’t choose, 6 No response).

Table 4-7: Problem of NREM

| Target Group | Most Serious Problem | Reply Rate (%) | Second Most Serious Problem | Reply Rate (%) |
|------------------------|----------------------------------|----------------|---|----------------|
| LA | Marine/Coastal/Fishery Resources | 38.9 | Solid Waste Management | 27.8 |
| Resident | Marine/Coastal/Fishery Resources | 25.0 | Global Warming | 23.4 |
| Business Establishment | Marine/Coastal/Fishery Resources | 25.5 | Global Warming | 17.0 |
| NGO | Marine/Coastal/Fishery Resources | 100.0 | <ul style="list-style-type: none"> • Solid Waste Management • Water Quality | 60.0 60.0 |

The respondents indicated the following reason for their choice of which item was the most serious problem, as follows:

Table 4-8: Reason for Selecting Most Serious Problem

| Most Serious Problem | Specific issue | Reason for choice |
|------------------------------------|---|---|
| Marine /Coastal /Fishery Resources | <ul style="list-style-type: none"> • Disordered and illegal fishing methods • Decrease of fishery resources • Over harvesting of Razor clams • Coastal erosion • Too many tourists | <ul style="list-style-type: none"> • Extreme decrease of fishery resources and less income for fishermen • Extreme reduction of razor clam population • Loss of land • Deterioration of natural environment |

The respondents indicated the following reason for their choice of which item was the second most serious problem, as follows:

Table 4-9: The Reason for Selecting the Second Most Serious Problem

| Second Serious Problem | Specific issue | Reason for choice |
|------------------------|--|---|
| Solid Waste Management | <ul style="list-style-type: none"> • Improper treatment of huge amount of solid waste • Improper management of transfer station by private company • Dumping waste into waterways | <ul style="list-style-type: none"> • Occurrence of serious environmental problem • Obstacles to fishery |
| Global Warming | <ul style="list-style-type: none"> • Rise in temperature | <ul style="list-style-type: none"> • Adverse impact on agriculture • Decrease of fishery resources • Change of season • Influence on health |
| Water Quality | <ul style="list-style-type: none"> • Polluted water flowing from neighbouring | <ul style="list-style-type: none"> • Decrease of fishery resources |

| | | |
|--|--|---|
| | provinces <ul style="list-style-type: none"> • Polluted water flowing from fishery ponds | <ul style="list-style-type: none"> • Adverse impact on agricultural land |
|--|--|---|

a.4 Resident Request to LA

There are 34 LAs to which residents require improvement of the local area (94.4% of all LAs). The request for “Construction of infrastructure like roads and bridges” is the most common request (requested in 85.3% of LAs) and “Water supply infrastructure” is the second (35.3% of all LAs), with “Lighting of public areas” as the third (29.4% of all LAs).

b. Priority examined in SWOT Analysis

The PEQMP-KPI Formulation Committee was held at the Ban Tai Had resort hotel in SKP on 2nd July 2007 chaired by the Governor, and a SWOT Analysis of provincial potential was conducted with 50 relevant participants directed by a moderator from a university. SWOT Analysis analyzes the Strengths (S), Weaknesses (W), Opportunities (O) and Threats (T) of SKP to resolve the problem of NREM.

In addition to SWOT Analysis of provincial potential, the priority among issues to be resolved for NREM was examined in the PEQMP-KPI Formulation Committee.

The results of the latter discussion are as shown below:

Table 4-10: Priority Issues on Natural Resource Management in SKP Discussed in SWOT Analysis Meeting

| Priority | NREM Problems | Suggestion for Preventive Measures and/or Solution |
|----------|---|--|
| 1. | Amount of aquatic animals is decreasing | <ul style="list-style-type: none"> • Build habitat for marine animals (artificial coral) • Release fresh water aquatic animals into natural water source • Publicize warnings to fishermen to stop illegal fishery • Encourage people and fishermen to participate in protection e.g. support creation of voluntary fishermen’s network in the entire area |
| 2. | Deteriorated soil | <ul style="list-style-type: none"> • Reduce the use of chemical fertilizers • Promote the use of biological/ organic fertilizers • Promote planting of Vetiver Grass • Provide knowledge on soil conservation |
| 3. | Water Monitor lizards eat villagers’ pets/ livestock | <ul style="list-style-type: none"> • Decide upon a responsible agency for catching and releasing water monitors in a controlled area • Propose to relevant organizations to reconsider law on water monitors as a protected animal |
| 4. | Lack of water for domestic use/ consumption and agriculture | <ul style="list-style-type: none"> • Expand water supply to cover whole area • Repair/ maintenance of water supply system • Dredge canals • Build saline water prevention block i.e. water control facility, collect opinions from all sectors in order to meet requirement of area and thus operate properly |
| 5. | Lands are sold to investors | <ul style="list-style-type: none"> • Campaign to create awareness for love of hometown • Promote “sufficiency economy” philosophy |

Source: PEQMP-KPI (2008-2011), SKP

Table 4-11: Priority Issues on Environmental Management in SKP Discussed in SWOT Analysis Meeting

| Priority | Prioritized Problem | Suggestion for Measurement and Solution |
|----------|--|---|
| 1 | Uncollected waste | <ul style="list-style-type: none"> Promote waste separation Reduce waste generation Increase capacity of collection and disposal |
| 2 | Wastewater | <ul style="list-style-type: none"> Construct proper wastewater treatment system for the area Create awareness among residents to stop discharging waste and night soil into natural water sources |
| 3 | No waste disposal site | <ul style="list-style-type: none"> Build acceptance among local residents Provide quality management by government |
| 4 | Household hazardous wastes | <ul style="list-style-type: none"> Promote waste separation Provide guidelines in integrated disposal system |
| 5 | Disorderly advertising billboards | <ul style="list-style-type: none"> Strict and serious enforcement of law Survey on advertising billboards in the Province |
| 6 | Noise level is above standard | <ul style="list-style-type: none"> Set measures for tourism boats to have standard engine noise levels Changing tourism boat engines to models within noise standard |
| 7 | Infectious waste from hospital/clinics | <ul style="list-style-type: none"> Collect and dispose of medical waste using proper technology |

Source: PEQMP-KPI (2008-2011), SKP

c. Examination of Priorities

Since NREM encompasses such a wide-ranging variety of sectors, it is quite difficult to decide the priority ranking among projects from differing sectors. Additionally, individual NREM projects routinely require a huge sum of money to implement. Thus it becomes important to conduct sufficient survey, research, and planning activities and to exhaustively consider the feasibility of each project, in order to make each individual NREM project cost-effective. Specifically, priority among projects should be determined only after extensive comparative analyses between sector *master* plans. SKP lacks these basic master plans in various NREM sectors. Therefore, the Study Team suggested the following regarding priorities:

- First of all, top priority should be given to the formulation of master plans for each NREM sector.
- For master plan formulation, the priority ranking is as follows, based on the result of the opinion survey among stakeholders and examination of priority issues conducted during SWOT analysis.
 - Conservation and rehabilitation of marine/coastal/ fishery resources
 - Establishment of proper solid waste management system
 - Tackling global warming
 - Preservation of water quality
 - Conservation of soil/land resources

- Finally, strengthening the NREM administrative capacities of LAs has equal priority with any urgent individual issue, as they hold responsibility over NREM in their respective localities.

Based on the suggestions mentioned-above, the Study Team and C/P examined the priority on the issues of NREM in SKP.

4.2.4 Selection of Priority Programs

This section corresponds to Part 2 Situation and Issues on NREM, 6) Selection of Priority Programs of the PEQMP.

a. Selection Procedure

Through the examination of priorities (see previous section), the Study Team and their counterparts (C/P) selected priority issues based on the following thought process:

- The priority issues for PEQMP (2008-2011) are issues in NREM on the provincial scale, and issues that should be dealt with by 2011.
- Since available finance for the investment on NREM by 2011 is limited, it is difficult to improve all NREM issues identified in the above section by the year.
- To solve the issues by 2011, several Priority Projects must be implemented. The Priority Projects with a common goal (i.e. solving the same priority issue) were combined as a Priority Program.
- Priority Programs can be divided into two major categories:
 1. Improvement in individual NREM sectors
 2. Strengthening of NREM administrative capacities in SKP

d. Selection of Priority Programs

Through the selection procedure described above, and discussions with counterparts, the following Priority Programs were selected for implementation by 2011:

1. Improvement in individual NREM sectors
 - Program for Conservation and Rehabilitation of Aquatic Resources
 - Program for Appropriate and Sustainable Solid Waste Management
 - Program for Water Quality Preservation in Public Water Bodies
 - Program for Safe and Quality Water Supply
2. Strengthening NREM administration capabilities in SKP
 - Program to Strengthen Linkage between Central, Provincial, and Local Administrations
 - Program to Strengthen NREM capacities of LAs

4.2.5 Provincial Environmental Quality Management Plan (PEQMP)

This section corresponds to Part 3 Details of the PEQMP of the PEQMP.

a. PDM (Project Design Matrix)

In response to the comments of the PEQMP-KPI Evaluation Committee, a Project Design Matrix (PDM) was made for each Priority Program:

- A PDM was made for each Priority Program, which is a common-goal cluster of individual projects for solving priority NREM issues by 2011.
- A PDM shows the relationship between priority issue and individual projects (i.e. Priority Projects) formulated to solve these issues.
- A PDM shows indicators to monitor and evaluate each individual project (i.e. Priority Project).
- A PDM shows the responsible and supporting agencies for each individual project (i.e. Priority Project).

b. Priority Programs and Priority Projects

b.1 Program for conservation and rehabilitation of aquatic resources

Although the GPP for the whole Province is on the increase, the GPP for the fishery sector in 2005 (356 million Baht) has decreased to half of the 2001 figures (658 million Baht).

All of four opinion survey target groups pointed out that the most serious problem of NREM in SKP is “Marine and coastal resources”. The reasons why the respondents regarded this as the most serious problem are given in Table 4-7 above.

Investigation revealed that there is a moderate amount of erosion, at a rate of 1 to 5 meters per year, at the northeast coast of the SKP⁸.

The following figure indicates the area where the width of mangrove forest is enough to protect the sea shore, and where the width is not enough and thus the risk for erosion exists.

⁸ Source: Biweekly Meeting No. 9 on 26th November 2007, PEO of SKP

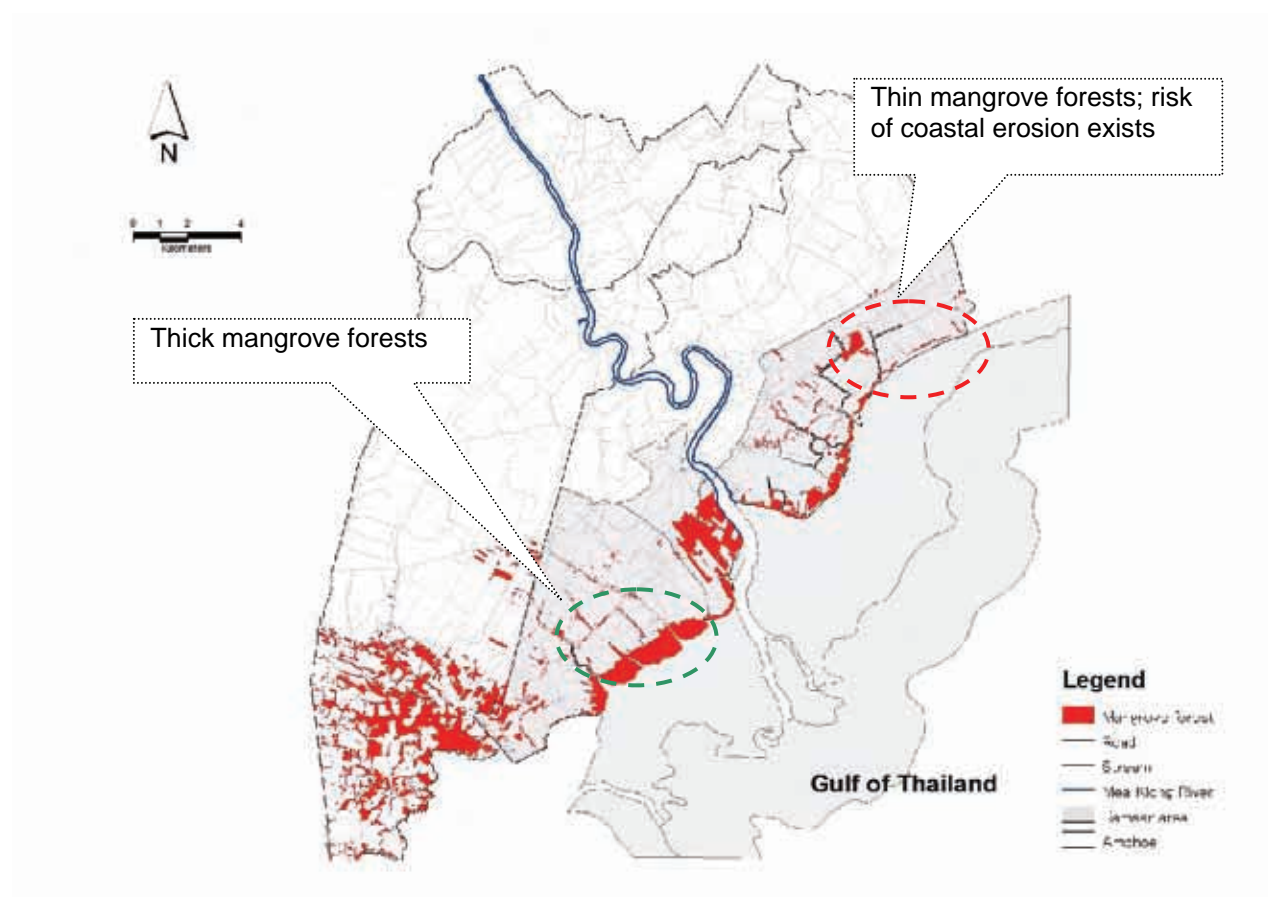


Figure 4-2: Mangrove Forests by SPOT-5 Satellite Image on March 30, 2007

Table 4-12: Project Design Matrix (PDM) for Program for Conservation and Rehabilitation of Aquatic Resources in SKP

Program Name: Program for Conservation and Rehabilitation of Aquatic Resources in Samut Songkhram Province (SKP)

Target Area: Coastal Areas in SKP and the Mae Klong River Basin

Target Group: Fishermen and residents in SKP who make a living off aquatic resources

| Narrative Summary | Objectively Verifiable Indicators | Means of Verification | Important Assumptions |
|---|---|--|---|
| Overall Goal Marine and coastal resources of coastal areas in SKP and the Mae Klong River Basin are conserved and rehabilitated. | Catch per Unit Effort will increase. | Interview Survey | |
| Program Purpose Establish a sustainable form of aquatic resource usage in SKP | Awareness improves among residents who make a living off aquatic resources | Questionnaire | Registration of foreigners is actively promoted |
| Outputs 1. A conservation and rehabilitation plan suited to SKP is formulated 2. A sustainable form of fishing is established 3. Habitats for aquatic resources are established through afforestation of mangrove forests | 1.1 Fishery statistics by species/type and location 1.2. Detailed plan for conservation and rehabilitation 2.1. Number of warnings and arrests over illegal fishing practices 2.2. Number of workshops and other educational events, number of participants of the same 3. Afforestation area statistics and total area statistics of mangrove forest | 1.1. Study report 1.2. Conservation and Rehabilitation of Aquatic Resources Master Plan 2.1. Interviews 2.2. Interviews 3. Survey and satellite imagery analysis | |
| Individual Priority Projects (Numbers correspond to Output numbers) | Responsible Agency | Supporting Agency | Input (Baht) |
| 1. Formulation of a conservation and rehabilitation plan | PFO, Orborjor | PEO MFDS7 FFKU MSRDC | 1,000,000 |
| 2. Control of illegal fishing practices and dissemination of sustainable fishing practices | PFO, LA, | PEO, PO | 750,000 |
| 3. Conservation of natural habitats for fish, i.e. coastal mangrove forests, and increase of safe habitats through afforestation | MFDS7 PEO LA | PFO | 1,000,000 |

PFO: Provincial Fishery Office,

PEO: Provincial Environment Office,

MFDS7: Mangrove Forest Development Station No7

PO: Provincial Office

FFKU: Fishery Faculty, Kasetsart University

MSRDC: Marine Shrimp Research and Development Center of SKP

b.2 Program for appropriate and sustainable solid waste management

There is no final disposal site located within Samut Songkhram Province (SKP) but there is one transfer station. All collected wastes from the transfer station are transported to disposal sites in neighboring Ratchaburi and Samut Sakhon Provinces as shown in the following figure. If the neighboring Provinces refuse to accept the waste collected in SKP, SKP could end up with many waste heaps in every urban area. This kind of “Waste War” has occurred in many cities in the world, including Tokyo, Japan.

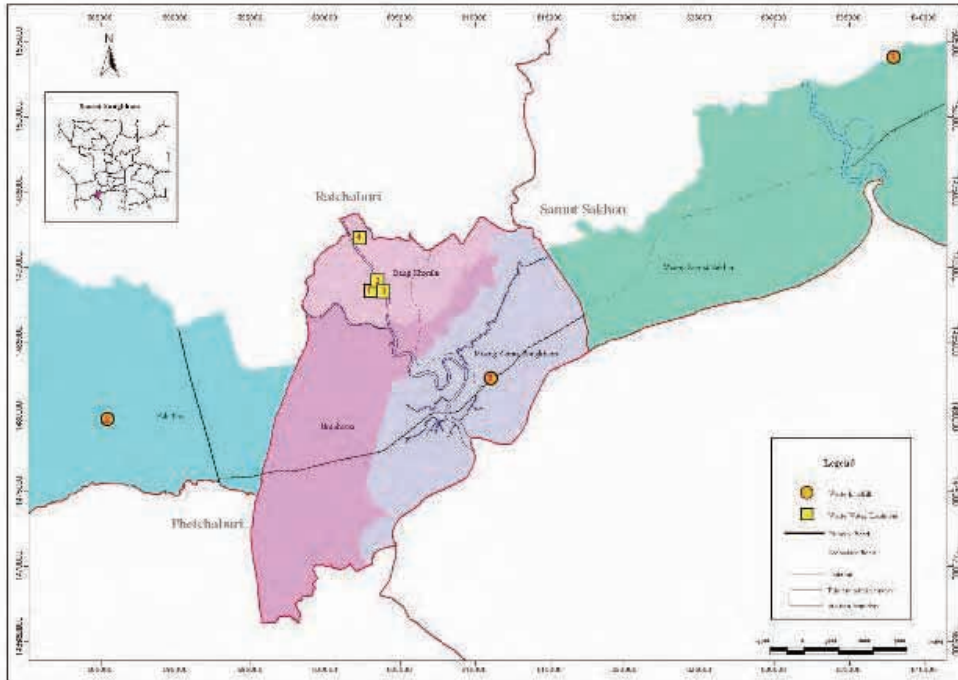


Figure 4-3: Location of Transfer Station and 2 Disposal Sites in Neighboring Provinces

The final disposal site in Ratchaburi province is located around 20 km west from the center of SKP. A large borrow pit left after excavating soil was used as the disposal site. The disposal site is having serious adverse impacts to the surrounding environment due to open dumping as shown in the photos below.



Ratchaburi Disposal Site in Rainy Season



Ratchaburi Disposal Site in Dry Season

Table 4-13: Project Design Matrix (PDM) for Program for Appropriate and Sustainable Solid Waste Management in SKP

Program Name: Program for Appropriate and Sustainable Solid Waste Management in Samut Songkhram Province (SKP)

Target Area: SKP

Target Group: Solid Waste Management-related administrations, private companies, and all residents of SKP

| Narrative Summary | Objectively Verifiable Indicators | Means of Verification | Important Assumptions |
|--|--|---|--|
| Overall Goal The establishment of sustainable waste management that is appropriate to the environment of SKP, | Extermination of illegal dumping practices and the implementation of hygienic waste treatment and disposal | Questionnaire | The waste management policy of SKP stays the same |
| Program Purpose 1. Waste generation is reduced in SKP, 2. waste generated is finally disposed in sanitary manner within SKP | 1. Waste generation rate per capita 2. Conditions of final disposal site and environment | Questionnaire | |
| Outputs 1. Site for final disposal site is selected and sustainable SWM Master Plan in Provincial level is formulated. 2. Final disposal site is constructed within the Province. 3. Awareness on appropriate SWM is raised. | 1. Contents of SWM Master Plan in Provincial level 2. Contents of Construction Record 3-1 Waste generation rate per capita 3-2 Volume of separate discharge and collection, number of LAs 3-3. Number of schools which implemented school composting 3-4. Number of seminars for administration staff | 1. SWM Master Plan in Provincial level 2. Construction Record 3. Interviews, Survey | Stakeholders agree to construct a final disposal site in SKP |
| Individual Priority Projects (Numbers correspond to Output numbers) | Responsible Agency | Supporting Agency | Input (Baht) |
| 1. Formulation of SWM Master Plan in Provincial Level 1-1 Site Selection for Final Disposal Site 1-2 Formulation of Sustainable SWM Master Plan in Provincial Level | Orborjor in collaboration with all LAs | Provincial Committee (PC), Pollution Control Department (PCD) PEO, REO | 1,000,000 3,000,000 |
| 2. Construction of Final Disposal Site 2-1. Detailed Design 2-2. Construction of Final Disposal Site | Orborjor in collaboration with all LAs | PC, PCD, Decentralization Committee | 5,000,000 90,000,000 |

| | | | | |
|-----|--|---------|---------------------------|---------|
| 3. | Raising awareness on an appropriate SWM | | | |
| 3-1 | Public education in order to reduce waste generation rate. | LA | PEO, REO, PA , Schools | 950,000 |
| 3-2 | Promotion of separate collection among LAs by organizing a competition between LAs and initiating a campaign program | LA | PEO, REO, DEQP | 492,000 |
| 3-3 | Dissemination of school composting among schools that do not currently implement such a program | Schools | PEO, REO, LA | 900,000 |
| 3-4 | Training seminars for administration staff on appropriate and environmentally friendly waste management | LA, PEO | REO, PCD, DEQP | 80,000 |

PC: Provincial Committee

PCD: Pollution Control Department/MNRE

PEO: Provincial Environment Office

REO Regional Environment Office

DEQP: Department of Environmental Quality and Promotion/MNRE

b.3 Program for water quality preservation in public water bodies

There are four water quality monitoring points in SKP along the Mae Klong River. According to the water quality class of PCD, the quality of water falls between class 3 and class 4.

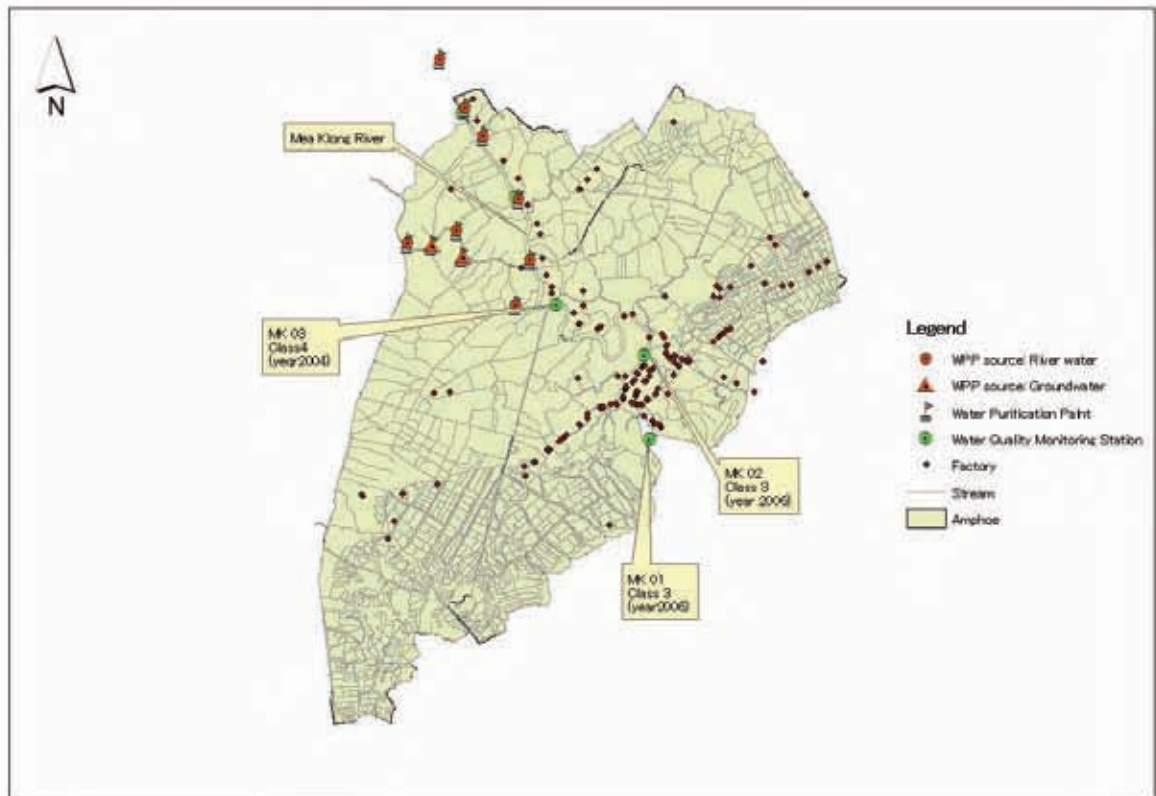


Figure 4-4: River Water Quality Monitoring Stations in SKP and Water Quality Class

According to past monitoring results, water quality trends towards small but worsening conditions at all monitoring points. On the assumption that the same conditions (amount of pollutant, treatment, etc.) continue in the future, the water quality of the Mae Klong River will worsen compared to the current situation.

Water pollution of public water bodies can seriously affect human health through water utilization facilities, in particular water supply facilities such as water purification plants and wells. If water pollution becomes serious, it raises the cost of purification or makes the water unsuitable for consumption and use.

The river water quality in SKP is still holding at Class 3 or 4; not Class 5 in which water becomes unsuitable for consumption and use. However, it is feared that the water source for water purification plants will have to be changed from the Mae Klong River to underground water sources, if water quality continues to deteriorate. Since the scale of these water purification plants are small (about 1,000 m³/day capacity on average), it is not difficult to change the water source. However, the water source will be very difficult to change for a large scale plant with a capacity of more than several ten thousand m³/day.

The following figures present major water pollution sources and water utilization facilities in SKP and in the upper reaches of Mae Klong River, where the main water purification plants are located:

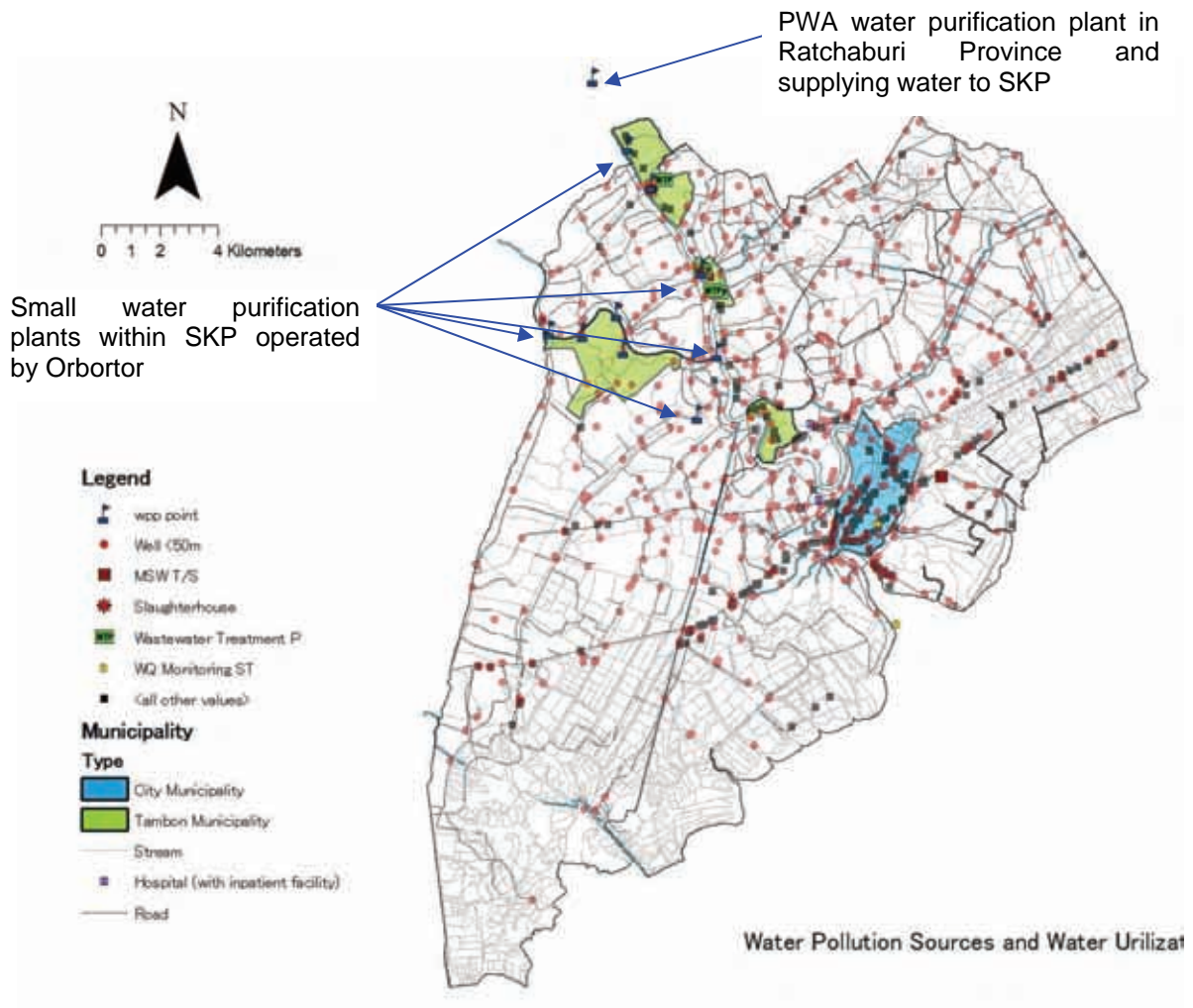


Figure 4-5: Location Map of Major Water Pollution Sources and Water Utilization Facilities in SKP

Domestic water to the Tessaban in SKP is supplied by the Provincial Water Authority (PWA) in Ratchaburi Province, located upstream of SKP, and its purification capacity is 24,000m³/day. The source of water is surface water from the Mae Klong River. There are also small purification plants operated by Orbortor within SKP. Priority must be given to the preservation of water quality especially upstream of these water purification plants.

In order to formulate a water quality preservation plan, information will be required such as the amount of pollution load, location of discharge into public water bodies, amount of water inflow at the location, amount of river water flow from upstream (special consideration must be given to river water flow during the dry season due to the critical effect of pollutants). Nevertheless, there is no such information in the existing database.

The following figure shows an enlarged view of part of SKP as a sample highlighting the relationship between small water purification facilities and various possible pollution sources.

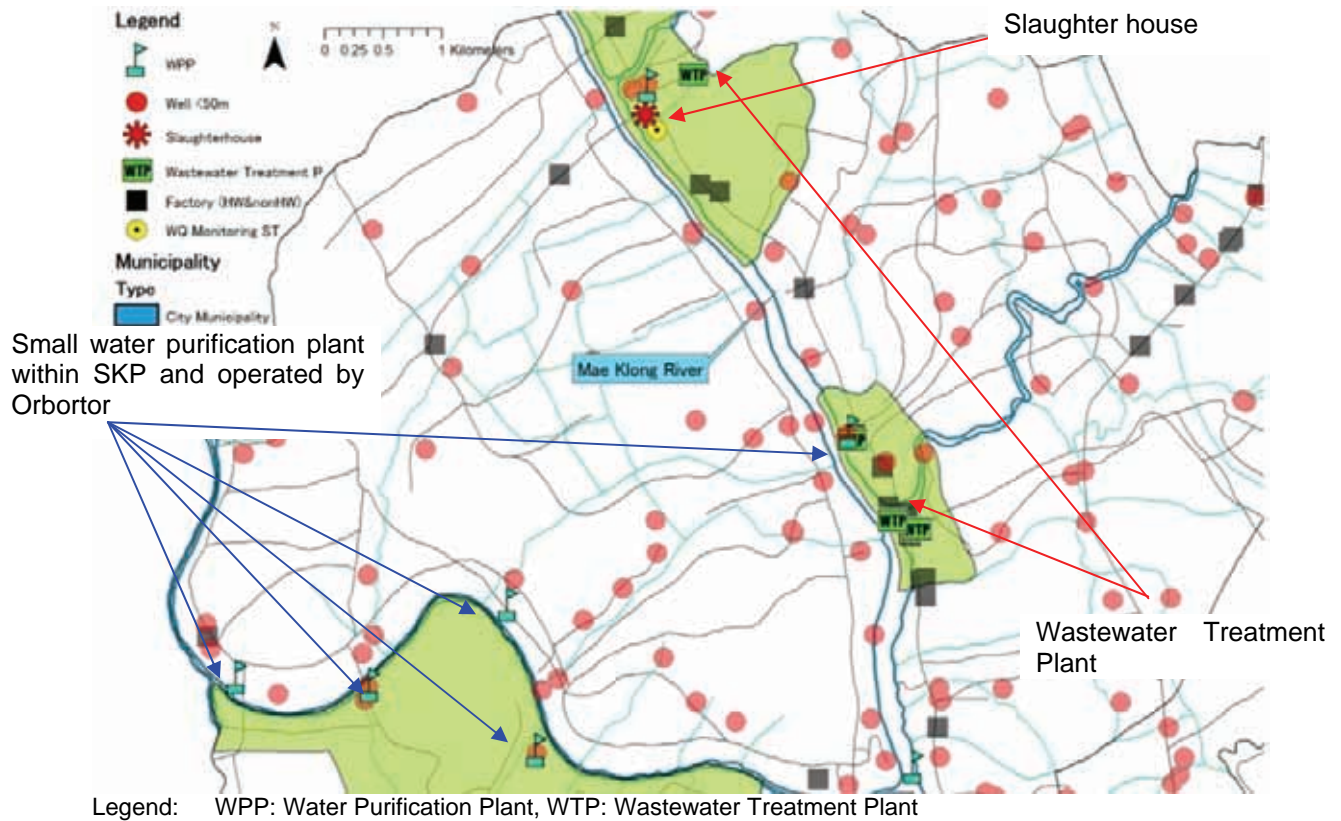


Figure 4-6: Location Map of Major Water Pollution Sources and Water Utilization Facilities in Upper Stream of Mae Klong River

As shown in the figure, there are various possible pollution sources located upstream of the water purification facilities, such as a waste water treatment plant, some slaughterhouses, and so on. Furthermore, the residential area might be one of the pollution sources given the fact that the treatment of waste water from residential areas is not up to the required level.

Given these conditions, applying ad hoc countermeasures on individual pollution sources would require excessive amounts of money and time to achieve the final target of water quality preservation at public water bodies. In order to improve the water quality at public water bodies, to maintain quality of drinking water and to implement appropriate water quality management, it is important to investigate and plan at the regional level including upstream of the Mae Klong River instead of each Tassaban and Orbortor level. Then a plan for reduction of the pollution load at the provincial level shall be formulated.

It is impossible to formulate the plan outlined above without information such as the amount of pollution load, location of discharge into public water bodies, amount of water inflow at the location, amount of upstream river water flow, and so on.

Therefore, the program for water quality preservation in public water bodies shall be implemented.

This program consists of two priority projects. One is a survey of pollution sources, and the other is the formulation of a water quality preservation plan for public water bodies.

1. Pollution Source Survey

Under this survey, first an investigation will be conducted of types of pollution sources, their locations, and the amount of pollution load generated and discharged. Then the ratio of pollution contributed by each pollution source will be examined. The results will be

utilized as basic information to formulate a water quality preservation plan for public water bodies.

2. Water Quality Preservation Plan for Public Water Bodies

A water quality preservation plan for public water bodies consists of a plan for the reduction of pollution load, confirmation of improvement effects, and maintenance of improved water quality.

The plan for reduction of pollution load is made up of the following:

- Set a water quality target at each monitoring point of public water bodies together with a target date for achievement,
- The amount of pollution load that must be reduced from each pollution source will be calculated in order to achieve the target, along with an examination of reduction methods for each type of pollution source,
- Priority to reduce pollution load will be determined based on the pollution contribution ratio and investment effect considering the above results,
- The plan to reduce pollution load will be formulated. Upon the formulation of the plan, activities for raising awareness among stakeholders in order to reduce the pollution load will be implemented.

Under the examination methods to confirm improvement of water quality, the water quality monitoring plan will be formulated in order to confirm whether or not the quality of water has been improved according to the plan.

Methods for revision of the plan will be examined and prepared in case the water quality goals are not reached.

These procedures are presented below.

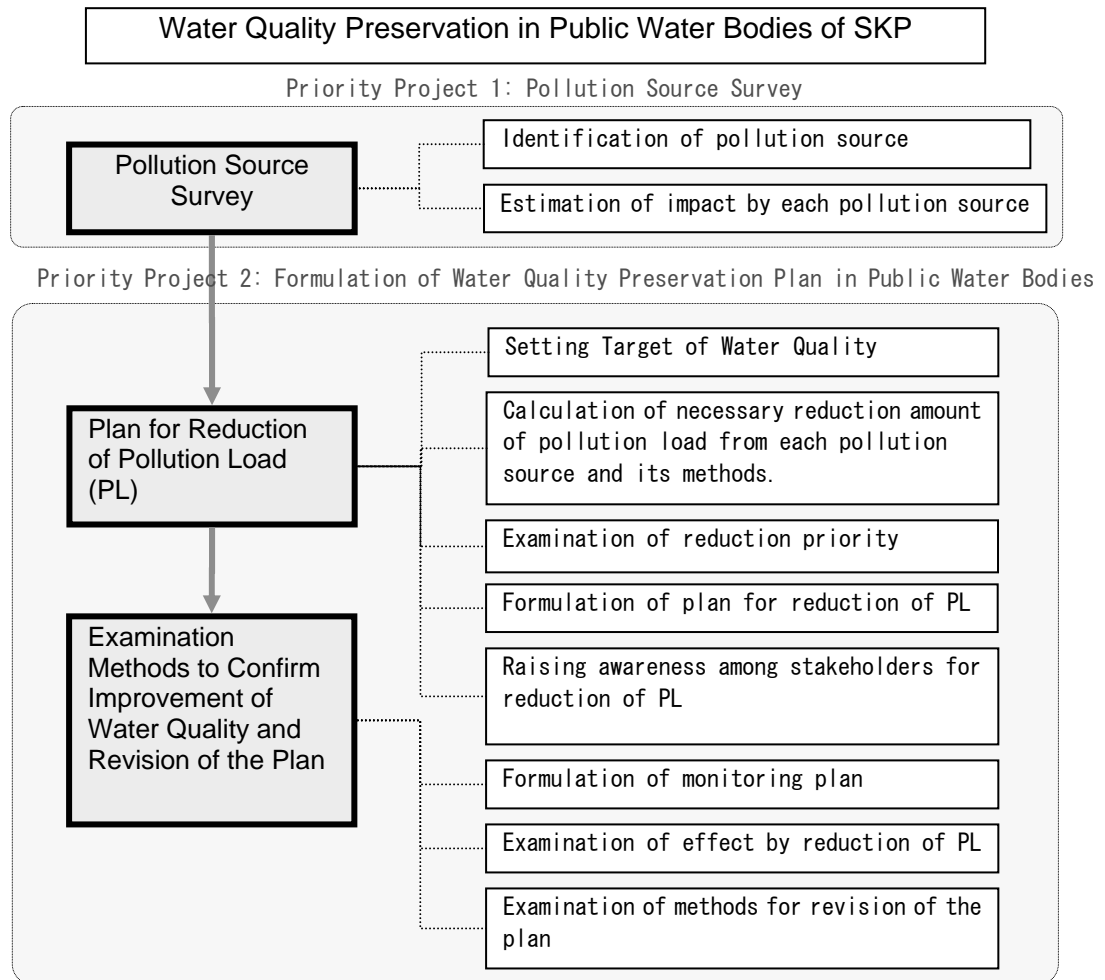


Figure 4-7: Relation between Program for Water Quality Preservation in Public Water Bodies in SKP and Priority Projects

Table 4-14: Project Design Matrix (PDM) for Program for Water Quality Preservation in Public Water Bodies of SKP

Program Title: Program for Water Quality Preservation in Public Water Bodies of Samut Songkhram Province (SKP)

Target Area: Samut Songkhram Province

Target Group: Beneficiaries of public water bodies Samut Songkhram Province (administration, business establishments, and residents)

| Narrative Summary | Objectively Verifiable Indicators | Means of Verification | Important Assumption |
|---|--|---|---|
| Overall Goal Preserve high water quality in public water bodies of SKP | Water quality monitoring results | Water quality monitoring study | SKP does not change its water quality management policy |
| Program Purpose Formulate an appropriate, province-wide water quality management plan in SKP | water quality management plan | Water quality management plan report | |
| Outputs 1. Pollution contribution from each pollution source is determined 2. Water quality preservation plan in province is formulated. | 1. Contents of pollution source survey report. 2. Contents of water quality preservation plan | 1. Pollution source survey report 2. Water quality preservation plan | |
| Individual Priority Projects (Numbers correspond to Output numbers) | Responsible Agency | Supporting Agency | Input (Baht) |
| 1. Pollution source survey | PEO REO PCD | PAGO, PFO, PLO, PIO, LA | 1,000,000 |
| 2. Formulation of Water Quality Preservation Plan in Public Bodies | PEO REO PCD | PAGO, PFO, PLO, PIO, LA | 2,000,000 |

PCD: Pollution Control Department/MNRE

PEO: Provincial Environment Office

REO Regional Environment Office

PIO: Provincial Industrial Office

PAGO: Provincial Agricultural Office

PLO: Provincial Livestock Office

PFO: Provincial Fishery Office

b.4 Program for Safe and Quality Water Supply

As for the domestic water supply, there are several water supply organizations such as Provincial Water Authority (PWA), and each local administration in different service areas. There is no comprehensive plan to control and manage water supply in order to supply safe and quality water after investigating individual water sources and water demands in the whole province.

Domestic water to most of parts of SKP is supplied by PWA and its water intake is located in Ratchaburi Province, which is upstream of SKP. Some Orbortors are operating small water purification facilities by themselves. Operation of those facilities may be below standard and the quality of the water they supply is unknown.

Hence, the water purification plant of PWA is operated appropriately and the plant's capacity is fairly large. Therefore, clean and safe water is supplied.

Currently, domestic water in SKP is supplied either from PWA or small, Orbortor operated purification plants. The following alternatives must be considered:

- Current water supply system shall be maintained, or
- Service area of PWA will be extended and PWA will supply the whole Province..

First, investigation shall be carried out under a comprehensive point of view such as examining water sources, water demand, and economic conditions. The most appropriate domestic water supply plan shall then be formulated based on these results. Finally, concrete projects will be implemented according to the plan and a safe and quality water supply will be achieved.

These procedures are presented below.

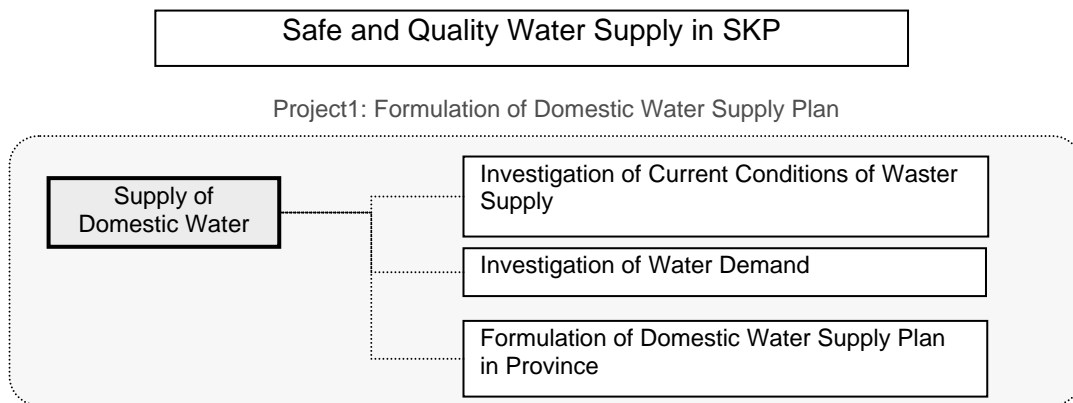


Figure 4-8: Safe and Quality Water Supply in SKP

Table 4-15: Project Design Matrix (PDM) for Program for Safe and Quality Water Supply in SKP PDM

Program Title: Program for Safe and Quality Water Supply in Samut Songkhram Province (SKP)

Target Area: Samut Songkhram Province (SKP)

Target Group: Residents of Samut Songkhram Province

| Narrative Summary | Objectively Verifiable Indicators | Means of Verification | Important Assumption |
|---|--|--|--|
| Overall Goal Safe and quality water will be supplied for all SKP | Water quality, amount, and pressure data | Samut Songkhram Water Authority Office records | SKP does not change its safe and quality water supply policy |
| Program Purpose Necessary actions by each stakeholder will be determined | Contents of domestic water supply plan | Examination of the plan | |
| Outputs A domestic water supply plan is formulated | Contents of domestic water supply plan | Domestic water supply plan | |
| Individual Priority Projects (Numbers correspond to Output numbers) | Responsible Agency | Supporting Agency | Inputs (Baht) |
| 1. Formulation of master plan on domestic water supply <ul style="list-style-type: none"> • Research of current conditions of domestic water supply • Investigation of domestic water demand • Formulation of domestic water supply plan | PWA and other water supply organizations | PHO PEO PO | 1,500,000 |

PWA: Provincial Water Authority

PEO: Provincial Environment Office

PHO: Provincial Public Health Office

PO: Provincial Office in Provincial Administration

b.5 Program to Strengthen Linkage between Central, Provincial, and Local Administrations

Many Tasks related to NREM have been decentralized and devolved onto Local Administrations (LAs), but the LAs put in charge of these tasks do not realistically have the capacity to execute these tasks. Therefore, for the time being, problem-solving in NREM will be difficult without the strong support of Central Government organizations and Provincial Administrations (PAs). Thus the following program is proposed as a priority program:

Table 4-16: Project Design Matrix (PDM) for Program to Strengthen Linkage between Central Government Organizations, Provincial Administration and LAs in SKP

| | |
|---------------|---|
| Program Name: | Program to Strengthen Linkage between Central Government Organizations, Provincial Administration and LAs in Samut Songkhram Province (SKP) |
| Target Area: | Central Government and Samut Songkhram Province |
| Target Group: | MNRE in Central Government, Provincial Administration and LAs in Samut Songkhram Province |

| Narrative Summary | Objectively Verifiable Indicators | Means of Verification | Important Assumptions |
|--|--|---|--|
| Overall Goal NREM administrative capabilities of LAs in SKP are strengthened | Number of NREM projects started by government organizations in SKP, for example solid waste management or wastewater treatment | Interview survey with government organizations in SKP | The Governor (MOI official) supports such a program |
| Program Purpose Strengthen linkage for NREM between central government Organizations, Provincial Administration and LAs in SKP | NREM awareness increases among Provincial Administration and LA staff in SKP | Questionnaire survey to PA and LA | Central Government seriously promotes the decentralization of NREM |
| Outputs 1.1 NREM capacities of PEO, a NREM supporting team in PA (Changwat) and the Environmental Division in Orborjor increases 1.2 The link between REO 8 and regional offices still held by the five non-ex-MOSTE departments within MNRE shall be strengthened. 1.3 The existing NREM GIS Database of REO 8 is strengthened, and periodically updated and well maintained. The updated information on NREM is provided to PEOs and other administrative organizations under REO 8. 2.1 The linkages between central/provincial/ and local administrations is strengthened. 2.2 Departments within MNRE grasp the current actual state of NREM in PAs and LAs 3.1 NREM awareness in preserving NRE, increases among administrative officers in LAs. 3.2 NREM awareness, and interest in | 1.1 Number of training for PEO, a NREM supporting team in PA (Changwat) and the Environmental Division in Orborjor 1.2 Number of cooperation activities between REO 8 and 5 Regional Offices 1.3 Number of information on NREM provided to PEOs and other administrative organizations under REO 8. 2.1 Number of inquires to "PA/LA Central Support Center for NREM" 2.2 Number of inquiries dealt with by MNRE departments 3.1 Amount of budget for NREM and number of officers for it in LAs 3.2 Awareness and interest in preserving NRE among | 1.1 Annual report of REO 8 1.2 Annual report of REO 8 and 5 Regional Offices 1.3 Annual report of REO 8 and NREM GIS Database Center 2.1 Activity report of "PA/LA Central Support Center for NREM" 2.2 Annual report of various departments of MNRE 3.1 Budget and annual report of LAs 3.2 Interview survey to residents and annual report of PEO | OPS/MNRE actively supports the program |

| Individual Priority Projects (Numbers correspond to Output numbers) | Responsible Agency | Supporting Agency | Input (Baht) |
|---|--------------------|---|--------------|
| 1. Strengthening of the local NREM support capacities of REO 8 | REO 8 | OPS and ONEP of MNRE | 5,600,000 |
| 2. Establishment of "PA/LA Central Support Center for NREM" in MNRE | ONEP/MNRE | OPS, DEQP, PCD, RFD, DNP, DMR, DMCR, DWR, DGR in MNRE | 11,570,000 |
| 3. Promotion of awareness regarding NREM among administrator of LAs and resident and publication of environmental information | DEQP/MNRE, PEO/SKP | ONEP/MNRE PO Cable TV, local radio stations | 3,480,000 |

REO: Regional Environmental Office

PEO: Provincial Environmental Office

PO: Provincial Office

All other organizations: departments within MNRE

b.6 Program to Strengthen NREM Capacities of LAs

There are three kinds of Local Administrations (LAs); the Orborjor, which shares their sphere of governance (i.e. the province) with Provincial Administration (PA: Changwat); the Tessaban, in charge of cities and municipalities; and the Orbortor, in charge of villages. These are organizations given new power under the Constitution of 1997 and the Decentralization Act of 1999. Many types of authority that have previously belonged to the Central Government have already been handed over to LAs, but the LAs often do not possess enough administrative capacity, including NREM capacities, due to the rapid pace in which decentralization occurred. Thus the following program is proposed as a priority program:

Table 4-17: Project Design Matrix (PDM) for Program to Strengthen NREM capacities of LAs in SKP

Program Name: Program to Strengthen NREM Capacities of Local Administrations (LAs) in Samut Songkhram Province (SKP)
Target Area: Samut Songkhram Province
Target Group: LAs in Samut Songkhram

| Narrative Summary | Objectively Verifiable Indicators | Means of Verification | Important Assumptions |
|---|---|---|---|
| Overall Goal NRE in SKP are properly managed | Level of satisfaction towards NRE among local residents | Questionnaire survey to local residents | Decentralization continues |
| Program Purpose NREM capacities of LAs in SKP are strengthened | Awareness among LA staff in SKP | Questionnaire survey to LA staff | Decentralization of NREM is promoted |
| Outputs 1.1 The Environmental Division in Orborjor is strengthened. 1.2 PA supports NREM of Orborjor 1.3 The Environmental Division of the Orborjor conducts NREM activities that are beyond the scope of Tessaban and Orborjor Orborjor, e.g. implementation of PEQMP Priority Programs 2. Opinions of local residents are reflected in PEQMP formulation and implementation, and NREM status is monitored by local residents 3. NREM information is used effectively by PA (Changwat), LAs, and local residents | 1.1 Number of staff in the Environmental Division in Orborjor and budget of it 1.2 Establishment of a NREM supporting team in PA (Changwat) 1.3 Number of NREM projects at the provincial level started by LAs 2-1 Number of public notices 2-2 Number of resident opinions recorded 2-3 Appointment of local resident representative(s) to monitoring committee 3. Number of inquiries to Environmental Information Center | 1.1 Annual report and budget of Orborjor 1.2 Annual report of PA 1.3 Budgets and annual reports of Orborjor, Tessaban, and Orborjor 2.1 Interviews with PEO and Amphoe 2.2 Interviews with PEO 2.3 Interviews with monitoring committee 3. Annual report of NREM Information Center, or Interviews with PEO | The understanding of DLA (MOI) and the Governor is obtained |
| Individual Priority Projects (Numbers correspond to Output numbers) | Responsible Agency | Supporting Agency | Input (Baht) |
| 1. Strengthening of NREM capacity of Orborjor in SKP | Orborjor of Samut Songkhram and Provincial Office of SKP | MOI, PA (Changwat) of SKP and ONEP of MNRE | 10,760,000 |
| 2. Construction of resident participatory system for NREM in SKP | Provincial Office, PEO and LAs of SKP | ONEP and Amphoe of SKP | 1,000,000 |
| 3. Establishment of Environmental Information Center in PEO/ SKP | PEO/ SKP | OPS and ONEP of MNRE | 1,900,000 |

DLA: Department of Local Administration, MOI

MOI: Ministry of Interior

PA: Provincial Administration

PO: Provincial Office

All other organizations: departments within MNRE

c. Implementation and Budget Plan of Priority Projects

In accordance with the PEQMP-KPI manual, the corresponding implementation and budget plan for each Priority Program/Project is shown in a single corresponding table below:

Table 4-18: Implementation and Budget Plan of Priority Projects in SKP

| Program/Project | Budget (Baht) | | | | Total Budget (Baht) | Implementation Schedule in Fiscal Year (Baht) | | | | Responsible Agency |
|---|------------------|------------------|-------------------|---------------|---------------------|---|------------------|------------------|-------------------|--------------------|
| | Province | LA | DC | Other | | 2008 | 2009 | 2010 | 2011 | |
| 1. Conservation and Rehabilitation of Aquatic Resources | 2,750,000 | | | | 2,750,000 | 1,500,000 | 800,000 | 400,000 | | |
| 1-1 Investigation of current conditions and past catch of aquatic animals | 500,000 | | | | 500,000 | 500,000 | | | | PFO, Orborjor |
| 1-2 Formulation of a conservation and rehabilitation plan based on study results | 500,000 | | | | 500,000 | 250,000 | 250,000 | | | PFO, Orborjor |
| 2-1 Control of illegal fishing practices and dissemination of sustainable fishing practices | 500,000 | | | | 500,000 | 250,000 | 250,000 | | | PFO, LA |
| 2-2 Education of fishermen in the importance of conservation | 250,000 | | | | 250,000 | 250,000 | | | | PFO, LA |
| 3 Conservation of natural habitats for aquatic resources, and afforestation | 1,000,000 | | | | 1,000,000 | 300,000 | 300,000 | 400,000 | | MFDS7, PEO, LA |
| 2 Appropriate and Sustainable Solid Waste Management | 900,000 | 8,392,000 | 60,000,000 | 80,000 | 69,372,000 | 860,000 | 4,292,000 | 2,175,000 | 32,095,000 | |
| 2-1 Formulation of SVM master plan un SKP | | | | | | | | | | |
| 2-1-1 Site selection for final disposal site | | 1,000,000 | | | 1,000,000 | | 1,000,000 | | | Orborjor |
| 2-1-2 Formulation of master plan | | 3,000,000 | | | 3,000,000 | | 1,500,000 | 1,500,000 | | Orborjor |
| 2-2 Construction of Final Disposal Site | | | | | | | | | | |

| Program/Project | Budget (Baht) | | | | Total Budget (Baht) | Implementation Schedule in Fiscal Year (Baht) | | | | Responsible Agency |
|---|------------------|-----------|------------|-------------------|---------------------|---|------|-------------------|------------------|--|
| | Province | LA | DC | Other | | 2008 | 2009 | 2010 | 2011 | |
| 2-2-1 Detailed Design | | 5,000,000 | | | 5,000,000 | | | 5,000,000 | | Orborjor |
| 2-2-2 Tender and Construction | | | 90,000,000 | | 90,000,000 | | | | 90,000,000 | Orborjor |
| 2-3 Raising Awareness on an appropriate SWM | | | | | | | | | | |
| 2-3-1 Public education | | 950,000 | | | 950,000 | | | 230,000 | 150,000 | LA |
| 2-3-2 Promotion for separate collection | | 492,000 | | | 492,000 | | | 182,000 | 145,000 | LA |
| 2-3-3 Dissemination of school composting | 900,000 | | | | 900,000 | | | 300,000 | 300,000 | Schools |
| 2-3-4 Capacity development of SWM for LA staff | | | | 80,000 | 80,000 | | | 80,000 | | PEO,LA |
| 3. Program for Water Quality Preservation in Public Water Bodies | 3,000,000 | | | | 3,000,000 | | | 1,000,000 | 2,000,000 | |
| 3-1 Pollution source survey | 1,000,000 | | | | 1,000,000 | | | 1,000,000 | | PEO,REO,PCD |
| 3-2 Formulation of water quality preservation plan in public water bodies | 2,000,000 | | | | 2,000,000 | | | 2,000,000 | | PEO, REO,PCD |
| 4. Program for Safe and Quality Water Supply in SKP | 1,500,000 | | | | 1,500,000 | | | 750,000 | 750,000 | |
| 4.1 Formulation of comprehensive domestic water supply plan | 1,500,000 | | | | 1,500,000 | | | 750,000 | 750,000 | PWA and other water supply organizations |
| 5. Program to Strengthen Linkage between Central, Provincial, and Local Administrations in SKP | 3,480,000 | | | 17,170,000 | 20,650,000 | | | 13,170,000 | 9,250,000 | 26,050,000 |
| 5-1 Strengthening of the local NREM supporting capacities | | | | 5,600,000 | 5,600,000 | | | 180,000 | 2,710,000 | 2,710,000 |

| Program/Project | Budget (Baht) | | | | Total Budget (Baht) | Implementation Schedule in Fiscal Year (Baht) | | | | Responsible Agency |
|---|------------------|------------------|----|------------|---------------------|---|----------------|------------------|------------------|--------------------|
| | Province | LA | DC | Other | | 2008 | 2009 | 2010 | 2011 | |
| of REO 8 | | | | | | | | | | |
| 5-2 Establishment of "PA/LA Central Support Center for NREM" in MNRE | | | | 11,570,000 | 11,570,000 | | 810,000 | 5,380,000 | 5,380,000 | ONEP/MNRE |
| 5-3 Promotion of awareness regarding NREM among administrators of LAs and resident and publication of environmental information | 3,480,000 | | | | 3,480,000 | | 1,160,000 | 1,160,000 | 1,160,000 | PEO,DEQP |
| 6. Program for Strengthen NREM capacities of LAs | 6,680,000 | 6,980,000 | | | 13,660,000 | | 300,000 | 6,680,000 | 6,680,000 | |
| 6-1 Strengthening of NREM capacities of Orborjor | 4,780,000 | 5,980,000 | | | 10,760,000 | | | 5,380,000 | 5,380,000 | PO, Orborjor |
| 6-2 Construction of resident participatory system for NREM | | 1,000,000 | | | 1,000,000 | | | 500,000 | 500,000 | PO, PEO, LA |
| 6-3 Improvement of the NREM Information Center in PEO | 1,900,000 | | | | 1,900,000 | | 300,000 | 800,000 | 800,000 | PEO |

DC: Decentralization Committee Budget

The amount in budget column is an estimate only

5. Conclusions and Recommendations

5 Conclusions and Recommendations

5.1 Improvement of the Provincial Environmental Quality Management Plan (PEQMP)

In this section, the plan submitted by each Province in 2007 will be referred to as PEQMP-KPI, and the revised versions to be submitted in 2008 will be referred to as PEQMP.

a. Issues in the Existing Plan (PEQMP-KPI)

The Ministry of Natural Resources and Environment (MNRE) and Office of Natural Resources and Environment Policy and Planning (ONEP) published the *Action Plan Handbook for Natural Resources and Environmental Management at the Provincial Level* (hereinafter called as PEQMP-KPI Manual) in 2007, in order to facilitate the formulation of the PEQMP-KPI¹ by each Province. Using this PEQMP-KPI Manual, all 75 Provinces in Thailand formulated, and submitted, their PEQMP-KPI to MNRE by October 2007.

Each submitted PEQMP-KPI was evaluated by the PEQMP-KPI Evaluation Committee, chaired by the Deputy Permanent Secretary of MNRE. According to the Evaluation committee, the PEQMP-KPI had the following general inadequacies:

1. Although the PEQMP-KPI adequately described the current conditions in each MNRE-administered Natural Resources and Environmental Management (NREM) sector, the lack of spatial information (area-based information²) in these plans hindered the understanding of *what* issue is present in *which* area, and thus hindered the understanding of plans and solutions suggested in the PEQMP-KPI.
2. The PEQMP-KPI showed that insufficient measures were taken to reflect stakeholder opinion in the plan formulation process, although this was one of the important improvements of the National EQMP (2007-2011) over its predecessor (Environmental Quality Management Plan 2002-2006), and similar consideration was recommended for provincial-level planning.
3. MNRE/ONEP prepared the PEQMP-KPI Manual in the hopes that the resulting PEQMP-KPI would have a) a multi-year scope, and b) long-term planning aligned to the National EQMP, in contrast to the single-year Provincial Action Plan for Environmental Quality Management; however, they were disappointed by the results. The PEQMP-KPI dealt only with problems solvable within a single Local Administration (LA) instead of addressing provincial-level issues, and there was lack of coordination between plans. As a result, associated budget plans were also kept to LA budgetary limits, instead of providing comprehensive budgetary planning with local, provincial, and national-level assets in sight.

¹ PEQMP-KPI stands for 'Provincial Environmental Quality Management Plan for Key Performance Indicator for Evaluation of Administrative Performance'. This plan is also known as the 'Action Plan for Natural Resources and Environmental Management at the Provincial Level'

² The Evaluation Committee decreed that the MNRE should assist the Provinces in their preparation and maintenance of NREM GIS databases, so that the Provinces can obtain and utilize area-based information.

b. Identified Factors behind Issues in the Existing Plan (PEQMP-KPI)

The PEQMP-KPI in the two Model Provinces, Phra Nakhon Si Ayutthaya Province (AYP) and Samut Songkhram Province (SKP), were revised jointly by the Study Team and their counterparts in an effort to answer the Evaluation Committee's main points of criticism. By taking part in the revision process, the Study Team now understands that the following background factors contributed to the inadequacies pointed out in the PEQMP-KPI:

Factor 1: Inadequate plan formulation structure

A 'Committee to Formulate PEQMP-KPI' was formed in the Model Province following the instructions in the PEQMP-KPI Manual. The Committee duly convened and discussed the plans. However, most of the actual, practical processes of PEQMP-KPI formulation were conducted by a few staff members of PEO. The few staff members were understandably unable to put sufficient time or effort into detailed consideration and planning of each NREM sector.

Factor 2: Lack of area-based information

MNRE created a NREM GIS Database for natural resources and environmental management in 2002, and distributed this GIS database to 16 REO and some (but not all) PEO, including the PEO of AYP. The REO periodically updates this GIS database. The following issues had to be resolved, however, before the NREM GIS Database could be utilized as a source of area-based information for PEQMP:

- The NREM GIS Database contained only basic/standard NREM information which proved insufficient to clarify *what* issues exist in *which* location. Some examples of information missing from the standard NREM GIS Database are information on urban sanitary facilities (e.g. solid waste disposal sites and wastewater treatment facilities) and information on changes in land use over time; the latter is crucial for NREM.
- Using the NREM GIS Database for PEQMP planning requires both GIS utilization skills and a thorough knowledge of the plan formulation process. To expect PEO staff to be proficient at both was probably too large an expectation.
- There was a GIS utilization manual, but instructions on how to use GIS for plan formulation, including PEQMP formulation, was not given.

In other words, the Study Team found it extremely difficult to create sufficient area-based information addressing NREM issues at the Provincial level from the information given to the REO and PEO of the Model Province.

Factor 3: Insufficient stakeholder participation in plan formulation

The Regulation of the Office of Prime Minister on Public Consultation by Public Hearing (B.E. 2548) stipulates that stakeholder opinion should be reflected in plan formulation. However, stakeholder participation for PEQMP-KPI was limited to a) participation of NGO and residents as representatives in the 'Committee to Formulate PEQMP-KPI', and b) participation in a brainstorming session on NREM issues which accompanied the SWOT analysis to evaluate the capacities of the Province. Both of these events were specifically given as examples of participatory occasions in the PEQMP-KPI Manual.

In other words, the relatively brief PEQMP-KPI formulation period (six months) and the lack of additional examples of stakeholder participation methods in the PEQMP-KPI Manual resulted in less-than-desired levels stakeholder participation.

Factor 4: Lack of Provincial-level Priority Projects

A PEQMP should be an analytical summary of Provincial-level master plans from various NREM sectors, where the relationship and priority ranking among sector plans are discussed, and the provincial-level priority projects on NREM in the Province are selected. To have such a PEQMP, however, sector-based Provincial-level master plans must exist in the first place. Satisfying the expectations (to present the provincial-level priority projects) of the PEQMP-KPI Evaluation Committee in the absence of these sector-based Provincial-level master plans require a vast input of time, cost, and labor. In the two Model Provinces, the only sector-based Provincial-level master plan was a solid waste management improvement plan (Solid Waste and Night Soil Disposal Plant Project, Ayutthaya Province).

Under current conditions, it is difficult for the PEO to present the provincial-level priority projects (including implementation plan, budget and budgetary source, project goals, supporting tools, monitoring and evaluation methods, etc.) for NREM improvement in the province, as is required in Part 3 of the PEQMP-KPI Manual.

The comment by the PEQMP-KPI Evaluation Committee that “the PEQMP-KPI dealt only with problems solvable within a single Local Administration (LA) instead of addressing provincial-level issues, and there was lack of coordination between plans” stems from the fundamental lack of sector-based Provincial-level master plans.

Factor 5: Insufficient understanding of the PEQMP-KPI Manual

The PEQMP-KPI Manual is a well-made document organized into two chapters and an Annex. Chapter 1 describes the goals and formulation methods of PEQMP-KPI, and Chapter 2 gives forms and formats, and the Annex gives examples of PEQMP-KPI evaluation criteria, NREM indicators, and ways to use the SWOT analysis.

In the Model Provinces, however, time constraints resulted in the following practical application of the PEQMP-KPI Manual by PEO staff:

- The staff simply followed and filled in the series of sample formats given in Chapter 2, instead of closely following the instructions in Chapter 1. Thus, Part 2-2) of the PEQMP-KPI (‘Situation and issues of NRE of Province’) should have included a detailed description of the current situation, issues, causes, impact, preventative measures, and methods used to solve issues in the past (according to Chapter 1), but instead, the submitted versions concentrated on describing the current situation, on which the topic of sample formats given in Chapter 2 of the PEQMP-KPI Manual concentrated upon.
- The discussion of issues, causes, impact, preventative measures etc. were thus limited to a table format summary in Part 2-3), following formats given in Chapter 2 of the PEQMP-KPI Manual (ref. Table 20 and Table 21). This limited discussion severely hinders the understanding of Provincial-level issues, causes, impact, preventative measures etc., as pointed out by the PEQMP-KPI Evaluation Committee.
- Priority issues for Provincial NREM have been discussed in the brainstorming session (which accompanied the SWOT analysis to evaluate the capacities of the Province), but the discussion did not proceed to the point where selection of Provincial-level Priority Projects to be implemented by 2011 was made. Therefore, the detailed projects given in the PEQMP-KPI are simply listings of LA-level

projects brought to the attention of the PEO, categorized by the priority issues from the brainstorming session. As a result, for example, most of the 58 natural resource management-related projects and 77 environmental management-related projects listed in PEQMP-KPI of SKP could not be described as Provincial-level plans, and the relationship between the projects were neither analyzed nor discussed.

c. Recommendations for the Upcoming Plan Formulation Process

The Study Team, along with their counterparts in the Model Provinces, have worked out many improvements to deal with the abovementioned issues. We recommend that other Provinces take advantage of our lessons learned, and follow the recommendations listed below, in order to formulate a revised PEQMP that gives a satisfactory answer to the PEQMP-KPI Evaluation Committee’s comments.

Recommendation 1. Assemble a multi-organizational structure for plan formulation

The NREM capacity of the Orborjor (PAO), who holds jurisdiction over provincial-level NREM, is currently extremely weak. Additionally, not all sectors of NREM have been devolved onto Local Administrations (LAs). Thus the formulation of PEQMP, which is concerned with all fields of NREM, necessarily falls under the responsibility of the PEO. However, it is impossible to expect the few PEO staff members to formulate a plan with an all-encompassing vision covering all NREM sectors. With consideration to the current situation surrounding the PEO, we recommend the utilization of existing organizational resources as shown below:

Table 5-1: Recommended Organizational Structure for PEQMP Formulation

| Organization | | Tasks |
|---------------------------|-------------------------------|--|
| Central Administration | MNRE | Technical and policy assistance. |
| | REO | Technical assistance and provision of data, e.g. area-based information from REO. |
| Provincial Administration | PEO | Overall coordination of PEQMP formulation and coordination of related organizations. |
| | Various PA (Changwat) offices | Offices that are represented in the Committee for Plan Formulation should provide a description of current situation and issues, and formulate an improvement plan, in each NREM sector in which they hold jurisdiction. |
| Local Administration | Orborjor | Overall coordination of plan formulation in cooperation with the PEO. |
| | Tessaban, Orbortor | Cooperation in NREM opinion surveys etc. among residents. |

If such an organizational structure cannot be arranged, it is recommended to clarify the necessary tasks and outsource to consultants, to supplement the PEO in areas where organizational support would be lacking.

Recommendation 2. Utilize the NREM GIS Database

The existing NREM GIS Database can be a valuable asset in providing area-based information to clarify provincial-level issues in NREM. To utilize the existing GIS database to its full extent, the following measures are recommended:

Table 5-2: Recommended Measures for NREM GIS Database Utilization

| Step | Procedures |
|---|---|
| Preparing to utilize the NREM GIS Database | <p>First of all, identify NREM issues where area-based information could be necessary when planning countermeasures, and NREM sectors where area-based information would be helpful in illustrating the current situation and/or issue.</p> <p>Then, if the NREM GIS Database provides insufficient information (e.g. no data on changes in land use), obtain the additional necessary data in the following manner.</p> <ol style="list-style-type: none"> 1. Identify data necessary to present the NREM issue (e.g. changes in land use, location of urban sanitary facilities, past flood inundation areas) 2. Identify possible source(s) of the data (e.g. satellite imagery, registration information in individual LAs). 3. Obtain data from source(s). |
| GIS data entry, GIS data update, output of area-based information | <p>Data entry, data update, and obtaining outputs of area-based information through GIS require specialists, equipment, and their maintenance fees. These services should be provided by REO, as they already have the necessary specialists and equipment.</p> <ol style="list-style-type: none"> 1. PEO should hand over newly obtained information (see above) to REO for entry and updating. 2. PEO should indicate the issue/topic to be addressed by area-based information, suggest what kind of data is suitable, describe the expected output (e.g. simple location map, distance information, analysis) and request the GIS specialist at REO to provide them with such area-based information. 3. PEO should receive their area-based information as PDF files, JPG files, etc., ArcReader files, or print-outs, and utilize such outputs in the formulation of PEQMP, and as Figures to clarify issues within the PEQMP. |
| Utilization of area-based information in PEQMP | <p>Refer to examples in the Reference section of <i>Supporting Report, Manual 1: Suggestions for Improvement of PEQMP-KPI Manual</i>, and <i>Manual 2: Utilization Plan for Natural Resources and Environmental Management GIS Database (NREM_GIS_DB)</i> for ways to utilize area-based information in PEQMP.</p> |

If time constraints etc. prevent the above measures to be taken, it is recommended to clarify the necessary tasks and outsource to specialist consultants, in order to ensure some form of utilization of area-based information.

Recommendation 3. Organize public participation opportunities in ways suitable for each Province

The implementation of PEQMP will be dependent on individuals and organizations who affect the natural resources and environment, i.e. the Provincial residents and organizations within the Province including factories, business enterprises, services, government offices, schools, fishery unions, etc. Therefore, the planning and implementation of a realistic plan would necessarily require the participation of as many stakeholders as possible in the plan formulation stage, in order that they are aware of the contents of the plan, and will be more willing to cooperate in its implementation.

In this Study, the Study Team first conducted an opinion survey among stakeholders; then formulated the PEQMP (1st draft) based on the results of the survey; then conducted the 1st

Seminar and asked for stakeholder opinions; then the opinions and requests voiced at the 1st Seminar was worked into the PEQMP (2nd draft); then the process was repeated to the 3rd Seminar before finalizing the PEQMP.

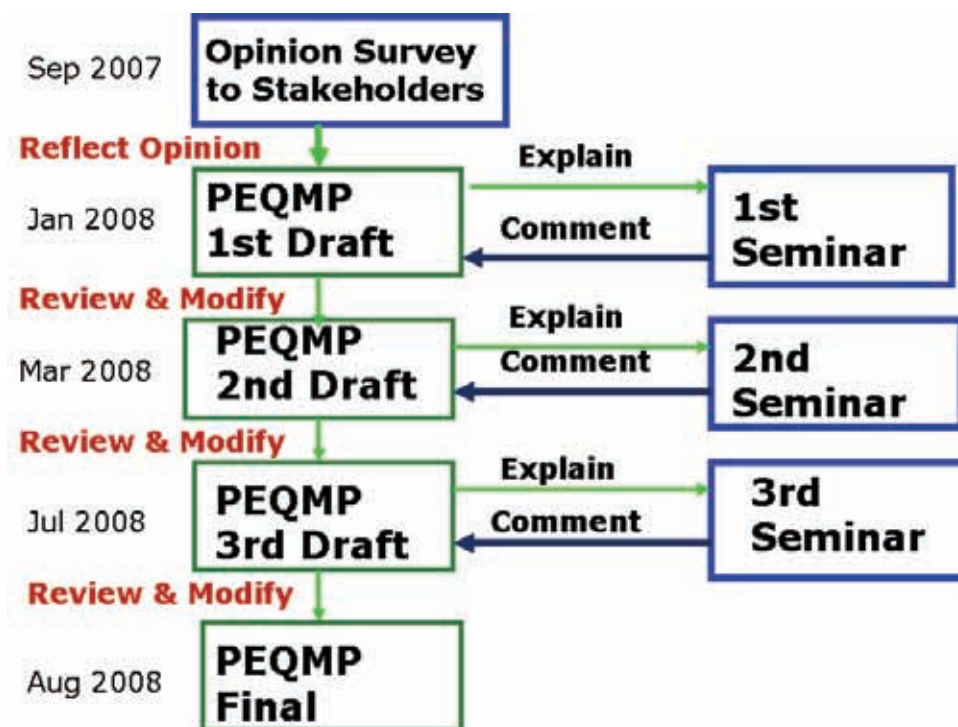


Figure 5-1: Process of Public Participation Followed in this Study

To follow such a procedure, a certain amount of time and advanced planning plus some expenditure for conducting an opinion survey and holding seminars will become necessary. Other methods of public participation are outlined in *Supporting Report, Manual 3: Suggestions for Selecting Suitable Public Participation Methods for NREM*.

It is recommended that each Province find the method most suited to their Province through the perusal of *Manual 3*, to ensure public participation in the PEQMP formulation process.

Recommendation 4. Selection of Province-level Priority Project in NREM

NREM inherently deals with broad sectors. Therefore, it is difficult to place priority on individual projects in various sectors. Furthermore, it generally requires a large investment to implement individual projects in each sector. In order to implement individual projects efficiently, first, a master plan for each sector should be formulated, then the feasibility of individual projects should be examined, and finally, priority projects should be identified before proceeding towards implementation.

In the PEQMP-KPI at model provinces, priorities were set for solving the problems dealing with NREM. However, master plans exist only in a very limited number of select sectors, such as SWM in AYP and so on. Therefore, the PEQMP-KPI submitted contains the individual projects as proposed by each municipality which were earmarked as priority projects in the provinces.

The PEQMP-KPI Evaluation Committee has pointed out a lack in addressing provincial-level issues for improvement of NREM. At several PEQMP seminars, some local administrations raised the opinion that flooding occurred due to poor down-stream river conditions instead of

maintaining his own area. Such problems as these arise due to a lack of provincial-level management and/or cross-boundary management between each local administration for NREM.

Given the conditions stipulated above, the following procedures will be proposed for selection of priority projects at the provincial-level.

1. First, set the priorities to be solved for provincial-level issues as conducted in the submitted PEQMO-KPI. It will then be recommended to conduct opinion surveys on stakeholders to reflect their opinions.
2. The first priority will be to formulate any master plans of selected sectors where one does not already exist. Then priority projects proposed under the master plan will be implemented accordingly.
3. Master plans at the provincial level will be formulated by utilizing master plans in individual sectors in national, regional and watershed levels. It is recommended that when doing so, due consideration is given to reference 8 of Manual 1 in the Supporting Report (Master Plans for NREM in State Level).
4. In case a provincial-level master plan already exists in a certain sector, first confirm that the sector has a priority on NREM in the province. Then, priority projects in the master plan should be implemented according to the plan.

Recommendation 5. Improve the PEQMP-KPI Manual

The Study Team recommended the following improvements (see Figure 5-2) to the PEQMP-KPI Manual based on lessons learned through the revision of PEQMP in the Model Provinces with their counterparts. These recommendations were discussed, and the need for further clarification and/or changes identified, in a three-day Trainers Training Workshop conducted from June 18th – 20th, 2008. Participants were from 9 PEO offices under REO 6 and REO 8, all of whom had experience in formulating the PEQMP-KPI. Figure 5-2 and *Supporting Report, Manuals 1, 2, and 3* reflects the discussion results of the Workshop. The recommendations can be summarized as follows:

1. Describe the issues, causes, impact, preventative measures, and methods used to solve issues in the past, *together with the current situation*, in each NREM sector. Utilize the NREM GIS Database to illustrate the points using area-based information.
2. Select Priority Programs, composed of multiple Priority Projects, in Part 2-4), 5) and 6).
3. Describe the Priority Programs in Part 3.
4. Describe the contents of Priority Projects within the Priority Programs, in Part 4.

ONEP/MNRE will instruct the revision of the PEQMP-KPI in all Provinces based on the above suggestions for improvement to the PEQMP-KPI Manual, so that the directives of the National EQMP can be carried out and implemented at the Provincial level.

| | Requirement of PEQMP-KPI Manual | Summary of Suggestions |
|-------------------------------------|---|---|
| Part 1 | Part 1 Introduction => No Change Introduction signed by the governor, appointment of committee to formulate PEQMP-KPI, etc. | |
| Part 2 Situation and Issues of NREM | 1) Basic Data of Province Socio-economic information, etc. | Basic Data of Province To provide <i>Future Population & Economic Forecast</i> for the analysis of impact from socio-economic development for the analysis of the next section |
| | 2) Situation of NRE of Province To present situation, issues, causes, impact, prevention measures, and methods used to solve issues in the past | Situation & Issues of NRE in the Province <i>To provide a complete analysis</i> for each sector by describing situation, issues, impact, measures to be taken <i>sector by sector with area-based content</i> |
| | 3) Analysis of Current Issues & Impacts from Socio-economic Development | Summary of Situation & Issues of NRE To summarize the above section according to the table format in the manual and <i>summarize the table itself with a diagram called 'Vision, Goals, Issues, and Direction of Measures for NREM in [province]'</i> |
| | 4) Priority Setting of Issues | Priority Setting of Issues To discuss the process of priority ranking among the issues raised in the previous sections, and specifically present the priority ranking of <i>issues that should be solved by the target year of PEQMP-KPI year 2011.</i> |
| | 5) Provincial Potential Analysis by SWOT Analysis => No Change | |
| | 6) Preventive Measures and Solution for Problems | Selection of Priority Programs To limit the discussion to priority issues discussed in 4) <i>Prioritizing the Issues</i> |
| Part 3 Details of the PEQMP | Details of the PEQMP To provide the following 10 aspects: 1. Objective, 2. Target, 3. Strategy 4. Work plans, projects and activities 5. Funding and funding source 6. Organization and resources 7. Output of project 8. Indicator of the success of the project 9. Supporting tools for implementation 10. Monitoring and evaluation plan | Details of the PEQMP It will be difficult for a province to fulfill all the requirements listed in the manual. Main suggestions are as follows: 1. To provide details of <i>the priority programs</i> 2. To use a <i>a PDM (Project Design Matrix) format</i> 3. A PDM format show the relationship of individual Priority Project plans and how they may be grouped under a larger Priority Program in a sector. 4. PDM format provide the other requirements (e.g. Funding and Funding Source, Organization in Charge, Indicator of the Success, and Supporting Tools for Implementation) |
| Part 4 Annex | 1) Details of Important Projects of Province To list and explain priority number 1 – 5 projects according to the form | Details of Priority Projects To explain details of each priority projects listed in the Part 3 according to the form |
| | 2) Data or Details related to the PEQMP => No Change | |

Figure 5-2: Recommended Changes to the PEQMP-KPI Manual

5.2 Proposal for a Supporting Plan for the Improvement of Administrative Capacities of Organizations and Agencies Relating to NREM in Central/Provincial/Local Administrations

The main goal of this Study is to strengthen the capacities of agencies and organizations responsible for NREM in central, provincial, and local administrations and at the same time strengthen the linkage between the levels through the formulation of PEQMP. The Study Team recommends the following methods, as learned through the revision process in the Model Provinces, to achieve this aim:

1. Strengthening linkages between organizations relating to NREM in central/provincial/ local administrations
2. Raising awareness among LAs and residents
3. Establishment of a NREM administration structure at the provincial level
4. Utilization of the NREM GIS Database in NREM

5.2.1 Strengthening Linkages between Organizations Relating to NREM in Central/Provincial/Local Administrations

a. Issues

Tasks related to NREM have been comprehensively decentralized and devolved onto Local Administrations (LAs), but the LAs put in charge of these tasks do not realistically have the capacity to execute these tasks. Therefore, for the time being, problem-solving in NREM will be difficult without the strong support of Central Administration organizations and their agencies, as well as various PA (Changwat) offices. Having said that, the various PA (Changwat) offices are themselves unable to support LAs in the field of NREM on a technical/specialist level, and the organizational structure necessary to support localized administration of NREM also have not been sufficiently built up in MNRE, which is the relevant Central Administration organization for NREM.

The administration of a Province, including NREM administration, is organized into three lines or layers, constituting of Central Administration organizations, the PA (Changwat), and the LAs (Orborjor, Tessaban, and Orbortor). Each organization cannot be said to hold sufficient knowledge on what other organizations are doing, or the issues they are facing, on a daily basis.

In this situation, strengthening linkages between NREM-related organizations in Central/Provincial/ and Local Administrations becomes an urgent issue.

b. Recommendations

The following measures are recommended to be taken by relevant organizations, in order to strengthen the linkages between NREM-related organizations in central/ provincial/ and local administrations:

1. Strengthen the local NREM support capacities of REO so that it provides technical assistance and information for the improvement of NREM among PA (Changwat) and LAs within its region, or in other words, so that REO functions as a 'PA/LA Regional Support Center for NREM'. Specifically, the REO's capacity to provide information and conduct public relations activities through its GIS Database Center should be strengthened. The following are the main recommended measures:

- Necessary training opportunities should be provided for PEO, an NREM supporting team in PA (Changwat), and Environmental Division in Orborjor.
 - The linkage shall be strengthened between REO and regional offices still held by the five non-ex MOSTE departments within MNRE.
 - The GIS Database Center in REO should be strengthened by upgrading PCs, GIS software, X-Y plotters, and color printers, etc. so that it can provide Provincial NREM information to PEO and other administrative organizations under each REO.
 - The GIS Database Center should update the NREM GIS Database periodically, using the information provided by PEO, PA (Changwat), 'PA/LA Central Support Center for NREM' in MNRE, and other agencies under each REO.
 - NREM awareness in preserving NRE should be raised among administrative officers in LAs in cooperation with the PA/LA central support center/MNRE and PEOs in each province. Furthermore, NREM awareness in preserving NRE should be raised among residents in cooperation with DEQP/MNRE and PEOs in each province.
2. Create a 'PA/LA Central Support Center for NREM' within MNRE, in order to support PA (Changwat) and LAs in the field of NREM. The Central Support Center should have the following functions:
- The Central Support Center becomes a focal point of inquires regarding NREM from PA (Changwat) and LA.
 - The Central Support Center will relay, on demand, assistance requests from PA (Changwat) and LA to departments in MNRE. Various departments of MNRE will assist PA (Changwat) and LAs through e.g. provision of the latest scientific theories and technical information, technical instruction, sector-based training, dispatch of and instruction by experts, assistance of formulating plans in their various fields of responsibility.

The above recommendations can be summarized as the below Figure:

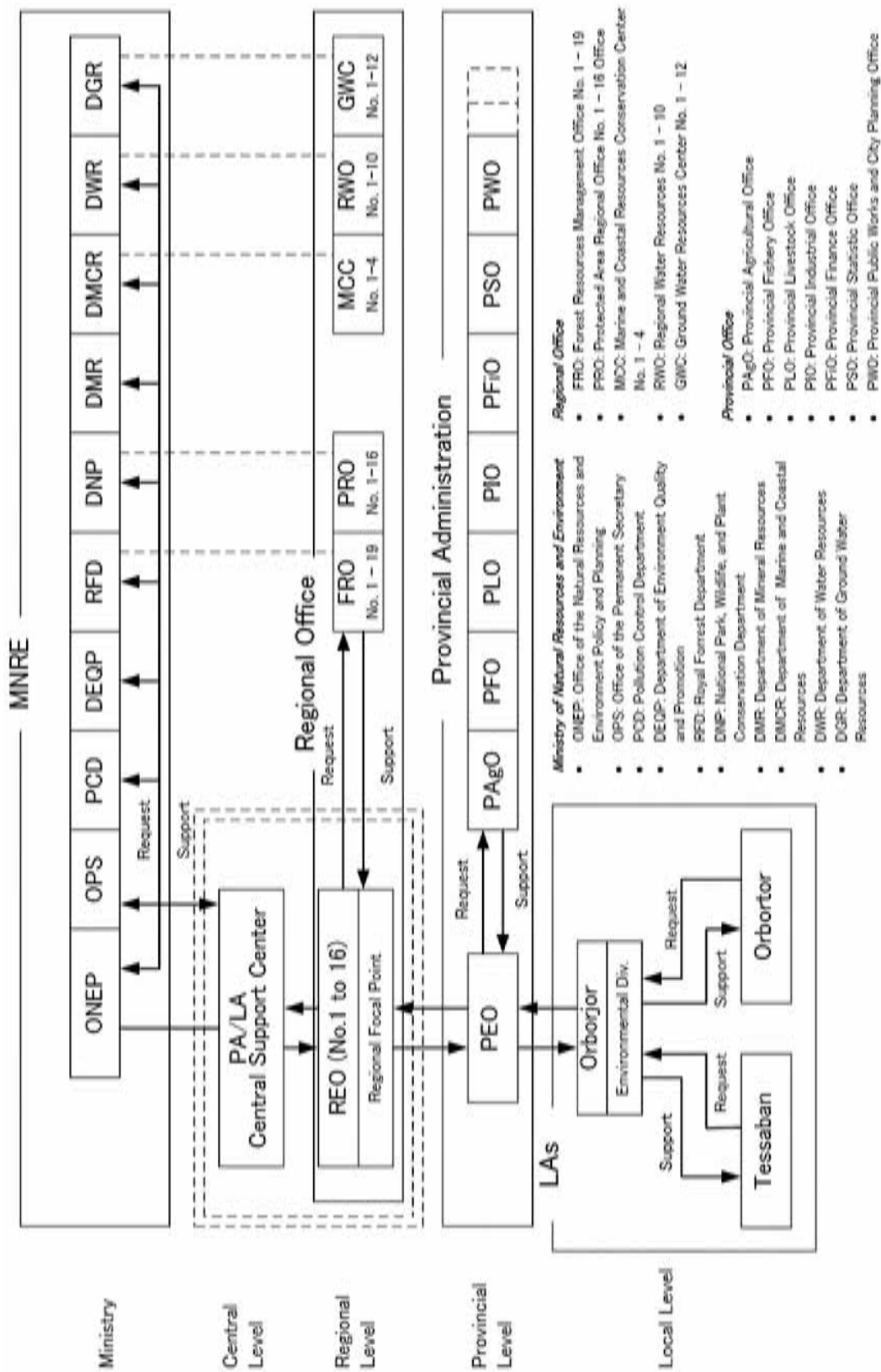


Figure 5-3: Strengthening Linkage between Organizations Relating to NREM in Central/ Provincial/ Local Administrations

5.2.2 Raising awareness among LAs and residents

a. Issues

A provincial-level viewpoint is necessary to solve issues in NREM sectors that have been placed under the jurisdiction of Local Administrations (LAs), particularly in pollution control issues such as solid waste management and wastewater treatment. To such end the Orborjor (PAO) will play an important role, and thus the number of NREM-related staff and the amount of NREM budget in Orborjor should be increased in order to solve such environmental problems.

MNRE has, through its National EQMP, instructed LAs to commit 10 % of their total budget to NREM, but according to opinion survey conducted in this Study, the Orborjor in AYP committed only 0.2% of the total budget to NREM in FY2006, and likewise the Orborjor in SKP committed only 0.1%³. According to the same survey, the NREM budget in organizations in Tessaban and Orbortor (the organizations currently taking charge of solid waste management and wastewater treatment and providing some form of these vital services to residents) are slightly higher: 4.3% in Tessaban and 4.8% in Orbortor in AYP; 4.5% in Tessaban and 9.5% in Orbortor in SKP. Aside from Orbortor in SKP, they are all under the target proportion indicated in the National EQMP.

The following tables explain the national statistics on solid waste management expenditure of LAs in Japan and the NREM budget in proportion to the total budget of LA in AYP and SKP. It is said that the amounts allocated for NREM out of the total budget in AYP and SKP are significantly less than that compared to even only the SWM budget in Japan.

Table 5-3: National Statistics on Solid Waste Management Expenditure of LA in Japan

Unit: Billion Yen

| Local Administration | Items | 2005 | 2004 | 2003 | 2002 |
|--|-------------|-------|-------|-------|-------|
| Prefecture (Orborjor and/ or Changwat) | Expenditure | 1,484 | 1,513 | 1,551 | 1,587 |
| | % of Budget | 3.1 | 3.1 | 3.2 | 3.1 |
| City/ Town/ Village (Tessaban/ Orbortor) | Expenditure | 4,355 | 4,428 | 4,507 | 5,031 |
| | % of Budget | 8.9 | 9.0 | 9.1 | 10.0 |

(Source) Ministry of Internal Affairs and Communication in Japan

Table 5-4: Portion of NREM Budget to Total Budget of LA in AYP and SKP

Unit: 1,000 Baht

| Province | LA | A. Total Budget | B. NREM Budget | Portion (B/A x 100) |
|----------|------------------------|-----------------|----------------|---------------------------|
| AYP | Orborjor | 840,024 | 1,668 | 0.2% (3.1%) ^{*5} |
| | Tessaban ^{*1} | 51,872 | 2,242 | 4.3% (8.9%) |
| | Orbortor ^{*2} | 15,124 | 724 | 4.8% (8.9%) |
| SKP | Orborjor | 191,703 | 160 | 0.1 (3.1%) |
| | Tessaban ^{*3} | 64,578 | 2,899 | 4.5% (8.9%) |
| | Orbortor ^{*4} | 12,450 | 1,180 | 9.5% (8.9%) |

³ This despite the fact that, following the enforcement of the Decentralization Act in 1999, the proportion of expenditure by Local Administrations within the national expenditure increased from under 8% (prior to 1997 Constitution) to over 25% (2007). Source: "Result of the implementation of the decentralization plan" by F. Nagai, Japanese Chamber of Commerce Bangkok, *Shoho* 11:2007.

- (Note) *1: Average of all 34 Tessaban
*2: Average of 19 Orbortor surveyed
*3: Average of all 5 Tessaban
*4: Average of all 30 Orbortor
*5: Average SWM expenditure in LA in Japan

Table 5-5: Expenditure for SWM, Wastewater Treatment and Water Supply in City A
(Area: 354.71 Sq. km, Population: 478,681 Persons)

| 2007 Budget Amount | (1,000 JPY) | Proportion |
|---|-------------|------------|
| Total (incl. general and special budgets) | 360,244,836 | 100.0% |
| Solid waste management | 18,435,738 | 5.1% |
| Wastewater treatment | 29,586,462 | 8.2% |
| Water supply | 7,613,430 | 2.1% |

In Thailand, administration in a single province is organized into three lines: Central Administration, Provincial Administration (Changwat), and Local Administration (LA). In SKP, the number of staff for each line is 2,410, 1,974, and 132, respectively. Here, it is apparent that the number of employees in a Local Administration (Orborjor) is much less compared to those in the Central and Provincial administrations, and in the case of SKP, the Orborjor has less than one tenth the employees compared to those in the Central and Provincial administrations. The following table indicates the budget allocated per employee for MNRE and Orborjor in AYP and SKP, which reveals that there are much fewer employees for Orborjor.

Table 5-6: Budget per Employee for MNRE and Orborjor in AYP and SKP

| MNRE or Orborjor | Budget (mill. Baht) | No. of Employees | Budget per Employee (1,000 Baht) |
|------------------------|---------------------|------------------|----------------------------------|
| MNRE (2005) | 16,150 | 42,784 | 377 |
| Orborjor in AYP (2007) | 840 | 322 | 2,609 |
| Orborjor in SKP (2007) | 191 | 132 | 1,447 |

Brown issues, such as solid waste management and waste water treatment, need to be solved at the provincial level or from a wide-area point-of-view instead of handled by individual local administrations such as Tessaban and Orbortor. One reason why those measures are not taken is that Orborjor has not allocated sufficient resources and manpower to solve issues on NREM.

The main reasons behind the current low allocation of staff and budget to NREM, and also the lack of a provincial-level approach, are the lack of awareness of the importance of NREM and the lack of understanding of methods to solve NREM issues among staff members in LAs.

At the same time, residents, who are directly affected by NREM have voiced the following requests regarding NREM in the PEQMP Seminars, which were held 3 times in each Model Province in this Study:

- Methods for local residents to participate in the formulation and implementation of PEQMP should be devised.

- NREM information should be made public, and educational and public relation activities about NREM should be conducted.
- The NREM GIS Database should be improved and made easily accessible to the public.

Thus, it is clear that awareness-raising is required, not only among LA staff, but also among residents.

b. Recommendations

The Study Team recommends that relevant organizations consider the following activities for raising awareness among LAs and residents:

1. The 'PA/LA Central Support Center' in MNRE, REO, and PEO should conduct the following activities to raise awareness about NREM among administrative staff of LAs:
 - Holding seminars and workshops about solid waste management and wastewater treatment, and other issues that directly affect on the quality of life of residents. Specifically the seminars and workshops should address the current issues in these sectors, importance of building a proper management system, and methods of building such proper management systems.
 - Holding seminars about educating the public about NREM, so that the LAs could gain cooperation from residents during the operation of proper solid waste management systems and wastewater treatment systems, etc.
2. DEQP/MNRE, REO, and PEO should collaboratively promote environmental awareness education and the dissemination of environmental information among local residents through the following activities:
 - Holding educational events and seminars.
 - Actively using existing teaching aids and TV programs created by DEQP within MNRE for environmental awareness education, through upgrades and localization.
 - Publishing the results of PEQMP monitoring information, and other information, on NREM in bulletins and/or through cable TV, radio stations, and websites.
3. The PEO should work towards the establishment of public participation in NREM through the following methods:
 - The draft PEQMP formulated by the formulation committee should be posted and made available to the public in branch government offices (for example, Amphoe offices) for 45 days, the same way zoning regulation changes are handled. At the same time, the posting period of the draft PEQMP should be publicized through cable TV, radio stations, and websites, with the purpose of attracting as wide a range of local resident opinions as possible, in order to reflect such opinions on the plan itself.
 - The PEQMP monitoring committee should include environmental experts, representatives of NGOs, and representatives of local residents, so that various stakeholders can jointly monitor the implementation of NREM.

5.2.3 Establishment of a NREM Administration Structure at the Provincial Level

a. Issues

Tasks related to NREM have been mostly decentralized and devolved onto LAs such as the Orborjor, Tessaban, and Orbortor, but the LAs put in charge of these tasks do not realistically have the administrative capacity to execute these tasks. The administrative size of the Tessaban and Orbortor are especially small, and cannot implement daily management tasks required by its local residents (such as wastewater treatment and solid waste treatment) in an appropriate manner. The reality of NREM improvement should also be considered: most NREM sectors require spatially and financially large solutions which cannot be appropriately managed by a single local administration unit or even by small groups of units across administrative boundaries (wastewater treatment and solid waste treatment are good examples). Many NREM issues simply require Provincial-level solutions.

In spite of these issues, the administration of a Province is organized into three lines or layers, constituting of Central Administration, the PA (Changwat), and LA (Orborjor, Tessaban, Orbortor). The Orborjor (PAO), which is in charge of Provincial-level NREM, is very weak in terms of both human resources and technical expertise.

Thus the strengthening of LAs, especially strengthening of the Orborjor which is in charge of Provincial-level NREM, becomes an urgent issue.

b. Recommendations

To strengthen the LAs, especially the Orborjor which is in charge of Provincial-level NREM, related agencies and organizations are recommended to take the following measures:

1. The Provincial Office in the PA (Changwat) should lead efforts to strengthen the NREM capacities of Orborjor in the following manner:
 - The environmental division in Orborjor should be established or strengthened in order to strengthen of NREM capacity of Orborjor in cooperation with MNRE/REO/PEO.
 - A NREM supporting team, recruited from staff of various PA (Changwat) offices, with cooperation from PA (Changwat), should be established within the PA (Changwat) to support the Environmental Division of the Orborjor.
 - The Environmental Division of the Orborjor should promote NREM activities that are beyond the scope of Tessaban and Orbortor, e.g. implementation of PEQMP Priority Programs.
2. The Environmental Information Center, which already exists in some PEO, should be strengthened or in some cases newly established. The Environmental Information Center should conduct the following activities:
 - The Environmental Information Center in PEO should be established or strengthened by upgrading PCs, copy machines, color printers, etc. to provide Provincial NREM information to local residents, LAs, developers and organizations in general.
 - The Environmental Information Center in each PEO should collect Provincial NREM information from local residents, LAs, developers and organizations in general, and the Environmental Information Center should send the information to the GIS Database Center in REO.

- The relation between Database Center in REO and Environmental Information Center in PEO is explained in following figure.

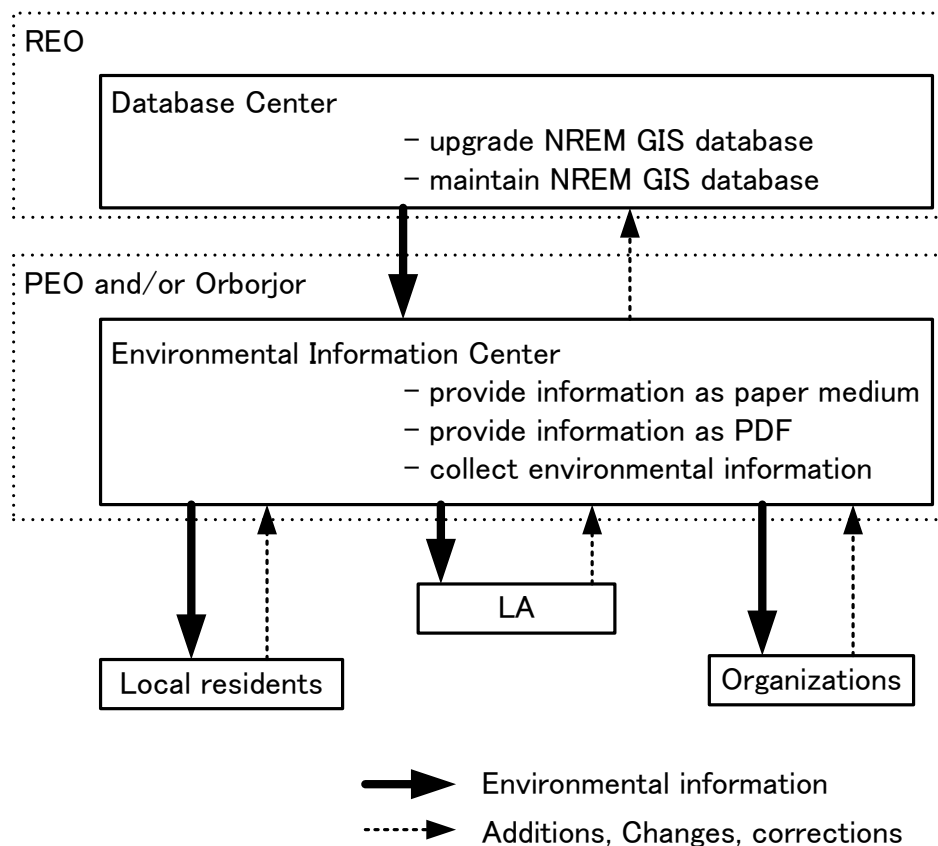


Figure 5-4: Management and Distribution System of Information on NREM

3. Considerable funds will be required in order for LA to establish an appropriate treatment system for solid waste management and wastewater treatment. Therefore, to acquire the necessary funds, MNRE, REO, and PEO are recommended to implement the following measures.
 - MNRE/REO/PEO should support LAs to formulate master plans and feasibility studies that determine the facilities and equipment needed to establish the appropriate treatment system in order to acquire the necessary funds from the Decentralized Committee and/or Environment Funds
 - Permanent annual costs will be required for operation and maintenance of newly constructed facilities and newly purchased equipment using the above funds. LAs at times face obstacles to establish those budgets from the current LA's general budget. Therefore, MNRE/REO/PEO should assist and support LAs to introduce a new fee system which covers all or part of the cost to operate and maintain those facilities and equipment based on the principle that beneficiaries should pay for a project.⁴

⁴ In Japan, most of the operation and maintenance costs for water supply and waste water treatment were borne by the beneficiaries except for depreciation costs of the facilities and equipment. In many

- MNRE will support and assist the target to increase the expenditure of local administrations from 25% to 35% of the total expenditure of the Thai Government on the condition that local administrations would allocate more on NREM.

5.2.4 Utilization of the NREM GIS Database in NREM

a. NREM and GIS

NREM necessarily deals with a very wide range of topics that affect the daily lives of the public, including the natural environment, living environment, and social environment. The first important task of NREM is to collect information about these wide-ranging topics.

NREM projects affect the daily lives of the public, so most NREM projects need the consent and understanding of local residents to implement. Therefore, information sharing among as large a portion of the public as possible becomes the next important task.

GIS allows the wide range of NREM information to be compiled into a database linked to spatial information. GIS is a tool that could provide the public with easy-to-understand information, in addition to being a tool for administrative plan formulation.

However, GIS analysis, the updating of GIS information, and creating a GIS output with layered information requires specialized and technical knowledge. The utilization of GIS databases should not be attempted without careful consideration of organization size and utilization purpose. For organizations in Provincial/Local Administrations, building a system which residents can access without specialized and/or expensive software is an important consideration in terms of public information sharing.

b. Advantages/Disadvantages of the existing NREM GIS Database

The advantages/disadvantages of GIS in general and the existing NREM GIS Database in particular can be summarized as follows:

Table 5-7: Pros and Cons of GIS and the Existing NREM GIS Database

| Purpose | Advantages | Disadvantages |
|----------------------|---|---|
| Formulation of PEQMP | <ul style="list-style-type: none"> • Generally speaking, GIS can be used to grasp current conditions and changes over time of various NREM sectors in the Province. • The NREM GIS Database can provide NREM information (e.g. protection Hot Spots) to land use planners and administrators. | <ul style="list-style-type: none"> • Generally speaking, information that can be displayed on a computer screen is limited, and plan formulation will usually require print-outs on specialized printers, e.g. X-Y plotters. • Provincial-level sector-based plan formulation could require GIS data in a finer scale (e.g. currently 1/50,000 scale; Provincial-level planning could require 1/5,000 scale) than provided in the NREM GIS Database, and upgrading the GIS Database will require considerable monetary input. |
| NREM information | <ul style="list-style-type: none"> • Generally speaking, GIS can help unify NREM information. | <ul style="list-style-type: none"> • Generally speaking, maintaining a GIS database, such as |

LAs, operation and maintenance costs for solid waste management, formally covered by the LAs general budget, are also going to be borne by the beneficiaries for up to one third of the total cost.

| | | |
|--------------------------|--|---|
| management | <ul style="list-style-type: none"> • Generally speaking, spatial (area-based) information provided by GIS is easy to understand for everyone. | obtaining, entering, updating, and output of data into less specialized formats requires a considerable number of specialists and monetary input. |
| Daily activities of NREM | <ul style="list-style-type: none"> • Generally speaking, GIS is useful in creating visual information for public education, e.g. past and current conditions of a certain natural resource. • Generally speaking, GIS can provide quick and easy individual-level customization (e.g. zoom-in to certain areas). | <ul style="list-style-type: none"> • Updating and maintenance of the NREM GIS Database will probably require considerable effort, and it is likely that the organizations involved will not make the effort to use GIS in their daily activities. • GIS software is expensive. A free viewing system must be constructed. |

c. Recommendations for the utilization of the NREM GIS Database

The Study Team recommends the following measures to be taken for the utilization of the NREM GIS Database:

- As maintaining the NREM GIS database (obtaining, entering, updating, and output of data into less specialized formats) requires specialists and monetary input, it is difficult for the PEO to hold this function. The managerial functions should be concentrated onto the REO which becomes the GIS Database Center for the region. The PEO will keep to the role of user of the NREM GIS Database and rely on the REO to make updates and changes.
- Information that can be displayed on a computer screen is limited, so information for plan formulation should be provided, and used, in large-format hard copy from X-Y plotters.
- The persuasiveness of visual information, e.g. from satellite and aerial photographs, is greater than any data tables and written explanations. The NREM GIS Database should be utilized as a tool for building consensus among stakeholders and other relevant personnel.
- GIS use should be promoted with the understanding that it is an expensive and complicated tool, although it provides great visual and easy-to-understand output. Effort should be spent considering methods to process the data available for inspection by using free software such as ArcReader, and making the information in the NREM GIS Database accessible to a large number of people.
- A GIS database center in REO will be necessary to formulate concrete action plans on GIS database utilization which contain the following:
 - Breakdown of daily administrative activities which require use of the GIS database
 - Lists and methods of acquiring necessary data to update the GIS database
 - Type of data, including analog or digital
 - Who will prepare what kind of data and in what format.

- Advantage and disadvantage to using a GIS database shall be examined based on the three points-of-view: “Advancement of the Works”, “Improved Efficiency of the Works” and “Dissemination of the Information”. Workflows in each organization and department which deal with NREM shall be developed and reflect the above action plans.
- In order to implement PEQMP and establish appropriate NREM systems in a province, PEQMP shall be coordinated with a provincial development plan and existing land use plan (zoning). Area based information which is obtained from the environmental GIS database shall be supplied to relevant organizations and departments in charge of the development plan and land use plan. In particular, environmental hot spots, such as the relation between large scale water intake and surface water qualities, location of disposal sites and flood risk areas, thickness of mangrove forest and coastal erosions, etc., shall be illustrated and explained to the relevant organizations and departments.