

# **Community Based Participation in Integrated Water Resources Development: Lessons Learned from case study of Rayong Province, Thailand**

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**ABSTRACT:** Water resources development projects in Thailand are implemented by both central and provincial authorities under the scope of responsibility indicated by the laws. However, due to the limitation of budget constraints, the projects took long time during construction phase and the linkage between central projects and provincial projects were implemented separately. These created some weak joints and caused the problem of water scarcity and water management remained unsolved and each water users still have to solve water problem scatteringly by themselves, e.g., dredging more canals, construction of weir, small pumping project and water truck provision. This research aimed to develop the planning process to collectively develop water resources within the districts to cooperate with provincial and central functions to ensure their cooperation among stakeholders and to minimize the problems during the construction and to create sustainable water management after construction in the future.

The development process for collaboration implemented with the following steps, i.e., (1) to collect problems, data and find solutions for drought, (2) to collect planned projects that already get the agreement from the community of each districts, (3) to estimate the water demand for agriculture and water supply and design alternatives of the water system by using information system, (4) to study the mission and role of each agency involved in water management and find ways to avoid conflicts or complement in the development of shared water resources within the districts, provincial and central functions and (5) to adjust roles/duties/budget of each party in the new format for joint cooperation on the proposed water resources development projects through discussion until final agreement can be reached.

The research was implemented through the water project development in the area of the Na Ta Kwan, Ban Lang and Ta Pong District in Rayong Province (East of Bangkok, Thailand) where drought event occurred almost every dry season due to demand from fruit, orchards, rice fields and village water supply and insecure water sources since the area is located outside the irrigation project area. Up to now, the Royal Irrigation Project had started the pumping station Project called Tha Ka Sao - Ban Huay Mafueng in the fiscal year 2010 to solve water problem in the area and the construction is partially completed but the linkage pipeline to local authorities is still unclear.

The research project took this water pumping development project as a case study to implement this collective water resources development concept. The data, water demand were reviewed and linkage water system was designed together with local authorities with no effect to the main pipeline project. Via the discussion with each district on the pipe linking development plan by using the GIS based information system and the consultation with the provincial and central functions in term of budget allocation to solve water problem in the area, the role/duty/budget among local authorities and central functions were readjusted to cope with construction and water management after the construction and the three year master plan was set and agreed to sign MOU jointly. The benefit areas cover the agricultural land, fruit orchards and rice fields of more than 2,600 rai (about 416 hactres) and water supply to 2,200 people with allocated irrigation water of 7.8 MCM/yr.

From the case study, it is learned that the understanding of the collective development process to ensure the cooperation among stakeholders is still limited and to solve these, the more understandings on the role of each party (both top-down and bottom-up process), process and activities must be shared. It is expected that within three years the collective water resources management and the role of each party in the study area will be clearer and accepted through implementation to meet the mission and objectives of each party under this MOU collaboration. These process and experiences can be extended to other areas of the country/region for collective development between central/provincial/local functions.

**KEYWORDS:** process development, collective water resources development, role management

# 1. INTRODUCTION

In Thailand, The country is developed by the government from top to bottom with the government plan that is divided in 2 parts and is shown in Fig. 1, which was directed by a Board of the development plan and provincial budget. First, the ministry/departments and provinces must plan under the laws for four-year action plan and annual action plan. The other one, the province must plan the provincial development plan, which be directed by the provincial Board of development plan and budgets, which is an annual action plan that included the ministries/departments projects, the provincial development projects, the provincial group development projects, the sub-district administration organization development project, and the community development projects. In the district level, the district plans are directed by the development plan and the district budget board, which collect the planning from the community plans to annual provincial action plans and using the provincial budget. The water development plans, which are in terms of the Infrastructure development strategies and natural resources and environment development strategies, will be included in the provincial development plans.

When the water resources development projects in Thailand are executed by both central government and the provinces within the scope of their responsibilities are defined by law. Normally, the projects are large scales which usually face with the restrictions on construction and budgets. The large scale projects take long time during the constructions, which leads to the water resources problems that could not been systematically resolved.

In Fig.1-2, the implementation of water resources development projects of the community agency is developed from the demand for solving in water demand problem of that specifically area, which causes lack of linkage both local development and central development.

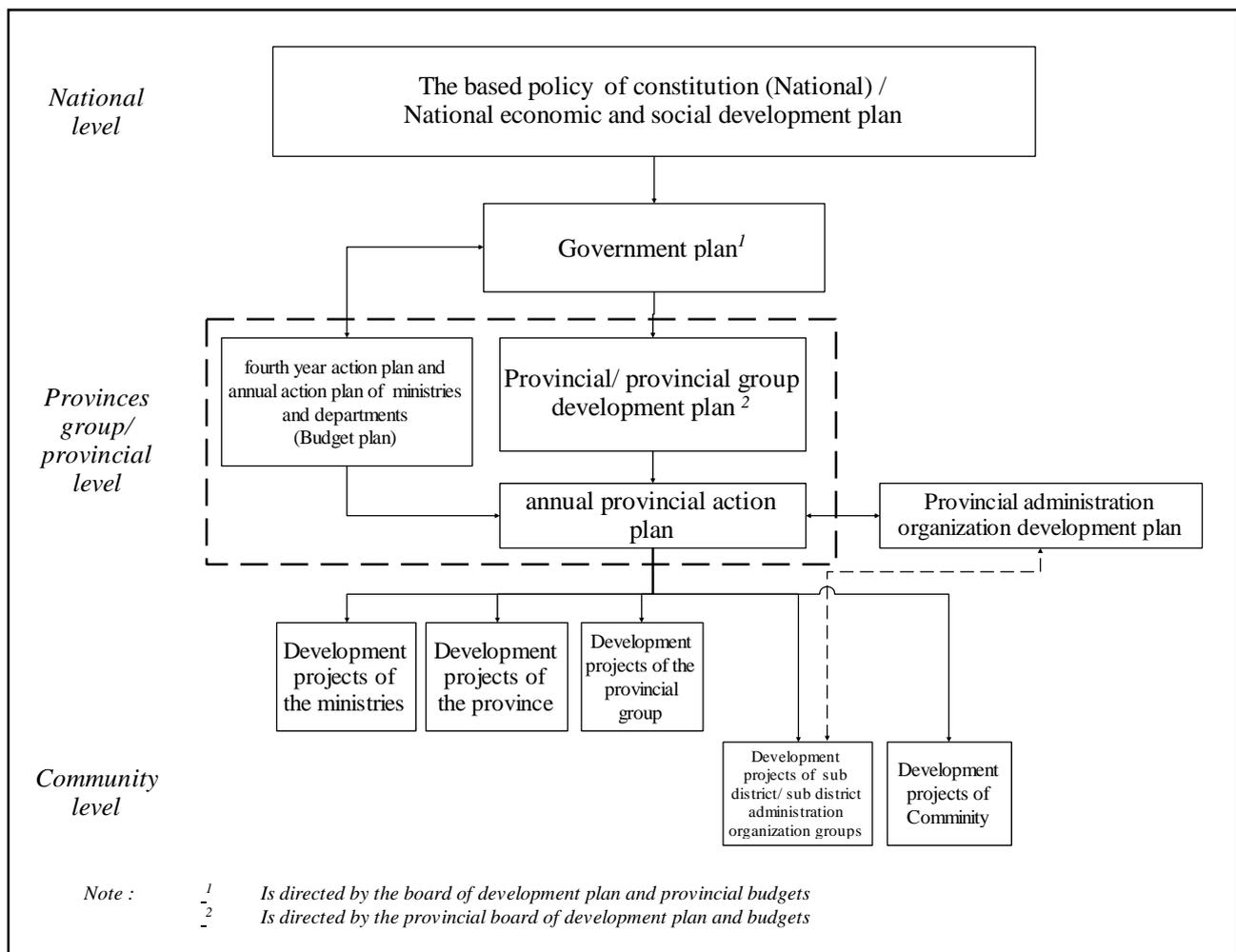


Fig.1-1 The structural of the Thailand development direction directed by a Board of the development plan and provincial budget

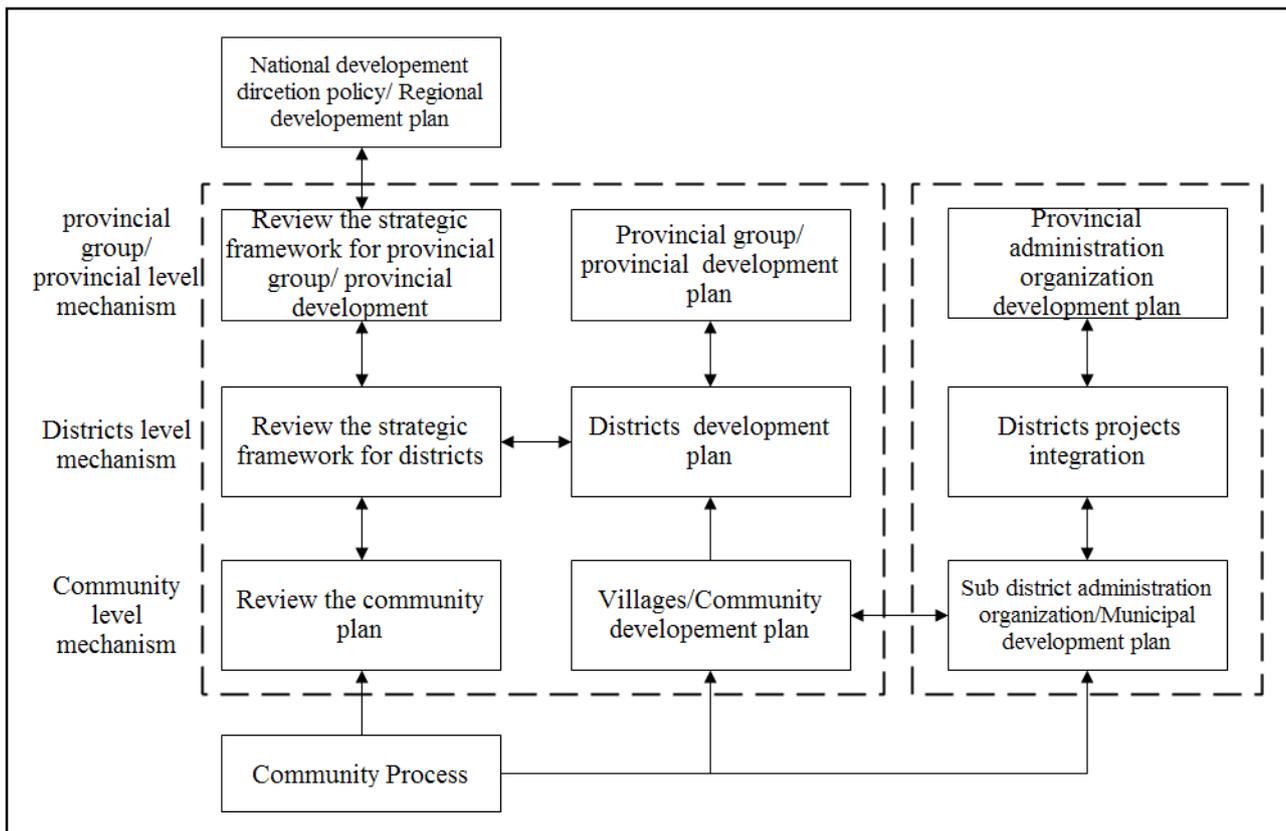


Fig.1-2 Community process for solving water demand problem developed from the demand side.

All of above are caused in the process of administration and laws at each level by weak joints. There are many constructed water resources development projects that could not solve existing of water scarcity problem and water management systematically. Consequently, each water users still solve water scarcity problem by themselves such as reserving water trucks, dredging canals and constricting weirs and pumping stations. This research aims to develop a process that jointly develops the water resources within the sub-districts group, which links the community water resources development plans to both provincial and central government budgets. Cooperation ensuring among of each stakeholder and minimize problems during constructions is the first project that systematic plans water management from the water requirements side. This project is an example of sustainable water management after construction in the future.

## 2. OBJECTIVES

This research studied the process of community water resources development plan,

which contains finally in the water resources development plan at the provincial level. The main objectives of the study are (1) to study in the structure of process plan at local level that links with provincial level, (2) to collect development plan data of sub-district/ sub-district groups, which involves in the water resources and alternative solutions in the past that uses as alternatives to solve the current problem, (3) to analyze water resources status and offer the solution project that is example project of the planning process and 4) to establish the connection of plan from the local demand side by the project, which is intermediary to link community plan with the provincial water resources management plan under the initial agreement of shared water resources management.

At the end, this research aims to make community successful understand the process of water demand estimation in accordance with the water resources allocation in any time period and the process of systematic water resources plan whole upstream, middle and downstream in order to reduce the conflicts of water usage from shared water resources

### 3. METHODS

This study selected an issue of water resources problem in the selected area to be used to establish the supported planning process systematically for water resources management plan in the sub-district level. This sub-district water resources management plan can be pushed on development plan of provincial administration organization with the cooperation of relevant agencies. There are consisting of water demand agencies; sub-district administration organization, water allocation agencies; Rayong irrigation project and budgets agencies; provincial administration organization. Finally, there are indispensable components of the collaboration that are the member and the department of the natural resources and environment of the provincial administration organization.

The development process supports sub-district water resources management plan for collaboration implemented with the following steps, i.e., (1) to collect problems data and drought solutions in the past of sub-districts and used as alternative of systematic solution together in the present (2) to collect water resources development project plan that already get the agreement from the community of each sub-districts administration organization, (3) to estimate the water demand and water supply of the agricultural and domestic by using map data system to assess the potential of development and propose alternatives to design of water resources management system, (4) to learn the rule and mission each agency that involved in water management both planning process and budgets and find the ways to avoid conflicts or make the water resources development completely within the sub-districts, provincial and central function agencies and (5) to adjust roles/duties/budget of each agencies in the new format for joint cooperation on the proposed water resources development projects through discussion until final agreement can be reached and do not conflicted

### 4. RESULTS

The results of the water resources management of the pilot area in Rayong province; Na Ta Kwan, Ban Lang and Ta Pong sub-district is processed by participations and connections with each agency that the water resource development project sets have been included in the provincial water resources plan. The detailed of the results are below.

Rayong Province is a province in the eastern part of Thailand. The pilot area is an agricultural area that located in Rayong province and outside the irrigation area, covers some of Na Ta Kwan, Ban Lang and Ta Pong sub-district, is shown in Fig 4-1. The average temperature is about 28 degrees Celsius and rainfall is 1352 mm per year. The average runoff of water resources in the pilot area; Tha Ka Sao swamp, is about 9.76 MCM per year. The average runoff at the downstream of Ban Kai Irrigation Project's the left main canal is about 15.77 MCM per year (Royal Irrigation Department, 2009). However, this area suffers a drought every year because the most of area is orchards that depend on rain and scattered shallow wells. When the dry season comes, some area has a little water and dry and it is not sufficient to support water demand until the harvest. In the initial solution, farmers have to buy water and ask sub-district administration organization for help by water trucks to relieve suffering.

This pilot area has ever been solved drought with some water resources development projects in the past. One of some is Nong Tha Ka Sao- Baan Huay Ma-Pheung and dredging in Ban Lang and Ta Pong sub-district with delivery systems where Group of Project Consideration, Department of Engineering Management, Royal Irrigation Office No.9, is an agency functions, studying in the feasibility and construction of it. The length of delivery systems in this project is 15.85 kilometers, covering an orchards area of 2,200 rais and 5 village water supply systems. The amount of water is added approximately 5.57 million cubic meters per year for the benefit area and its fruit yield increased about 12.72 million baht per year (Royal Irrigation Department, 2009)

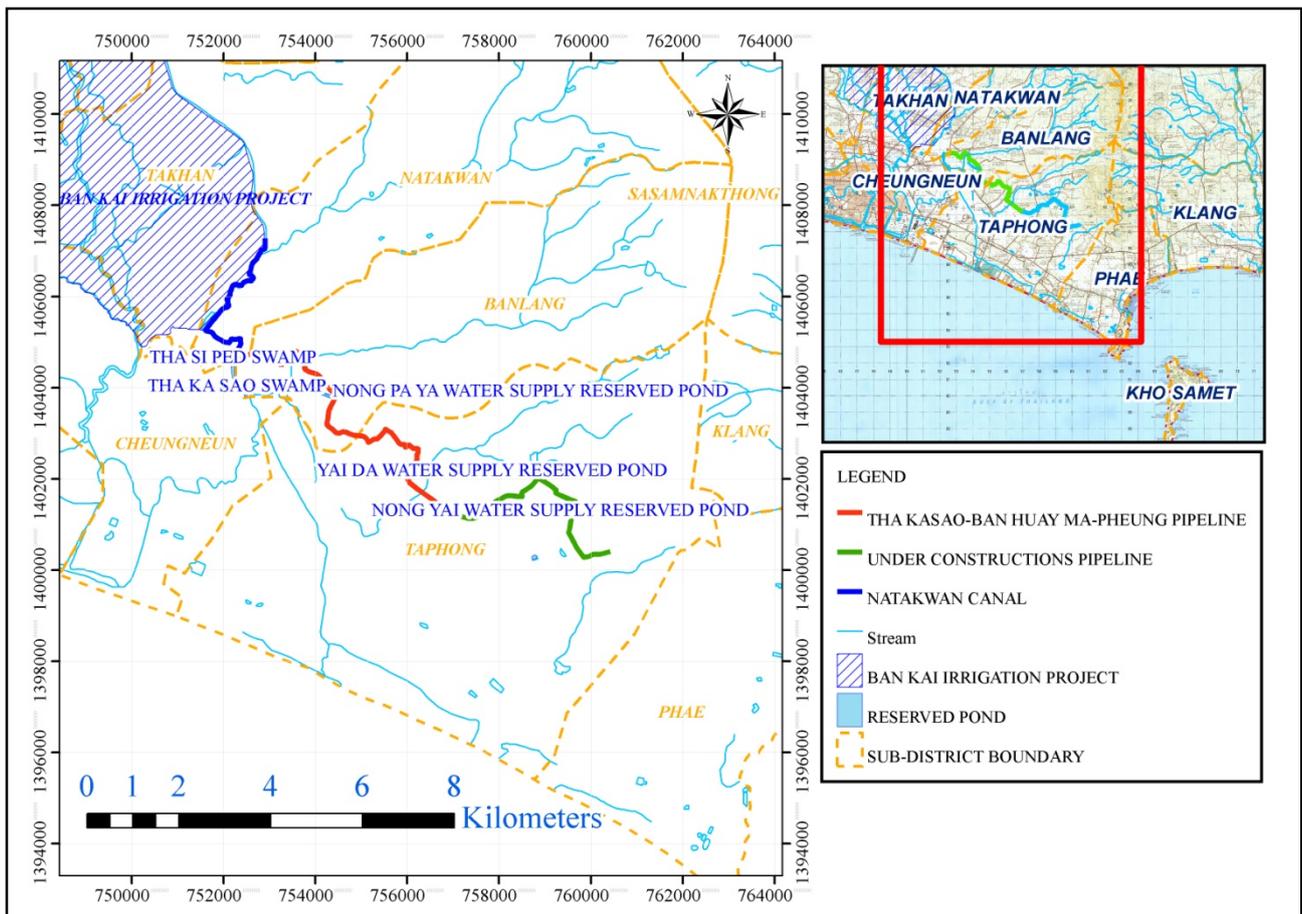


Fig.4-1 the pilot area of planning process in Rayong province, Thailand

At present, Royal Irrigation Department has approved the budgets for the construction and it is completed approximately 8.4 kilometers and the rest is still waiting for construction budget for the construction of approximately 7.45 kilometers which that area has not been solved water resources problems.

Our research team has reviewed the project and discussed with the sub-district administration organization to solved water resources problems in the area where this pumping project are finished. For implement the pumping project in some part by

reducing the water resources problem that may is occurred after the construction is going on.

Development projects of local development plans are reviewed that had been approved through water user communities from the community of each sub-district administration organization. It is found that the water resources are involves with, i.e., 1) weirs construction at Na Ta Kwan canal for storing amount of water that can be utilized for villages water supply systems and rice fields areas of Na Ta Kwan sub-district, 2) weir construction at Tha Ka Sao swamp for storing amount of water that can be utilized for orchards area of Ban Lang sub-district. It is shown in Fig.4-2.

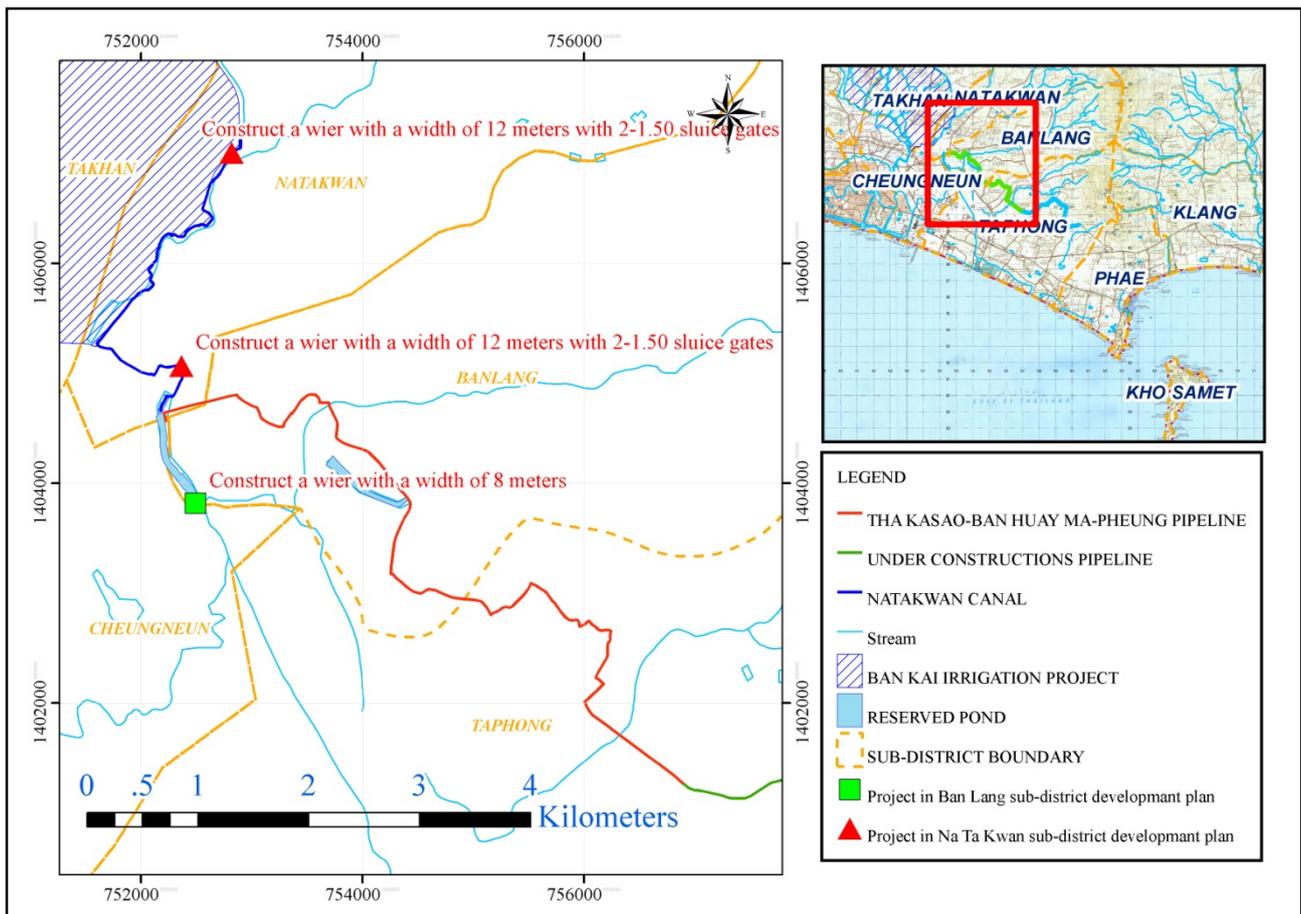


Fig.4-2 the development project approved through water users communities of each sub-district.

These construction projects are listed in the water development plans that are proposed to Rayong provincial administration organization to request the budgets for operation in year 2011. It is indicated that this area has a preliminary solution by offering the development plan for that area but it do not have be considered together with systematic development plan for using of same water resources. Our researcher team has created the process to achieve the exchange of information and water resources problem of the area.

The process starts with water demand and water supply estimation for agriculture and consumption. The water demand of the each sub-district has the relation that is indicated by using maps data systems. The water demand situation in sub-district level in Rayong province can be estimated

When the deficit water is found and by assessing the potential of the existing water resources development in the area, the water

resources problem can be solved. The basis of the solution in these three sub-districts is using of water resources from the same stream for drought solution in the past. The research team has proposed an alternative design that is solved systematically water resources problem by the same water resource development project sets which is shown in Fig.4-3.

The assessment of water supply, which is water budget for the water development project sets, from the potential of catchment area is a runoff that occurs from rainfall in a volume of about 9.76 million cubic meters per year. The amount of water that flows down from the end of Ban Kai irrigation projects is approximately 15.77 million cubic meters per year. Although amount of total runoff are about 25.53 million cubic meters per year but the water demand is only about 7.32 million cubic meters per year. When considering development in the areas for agriculture and consumption, this project sets will not been caused surely water shortages, which is shown in Table 4-1

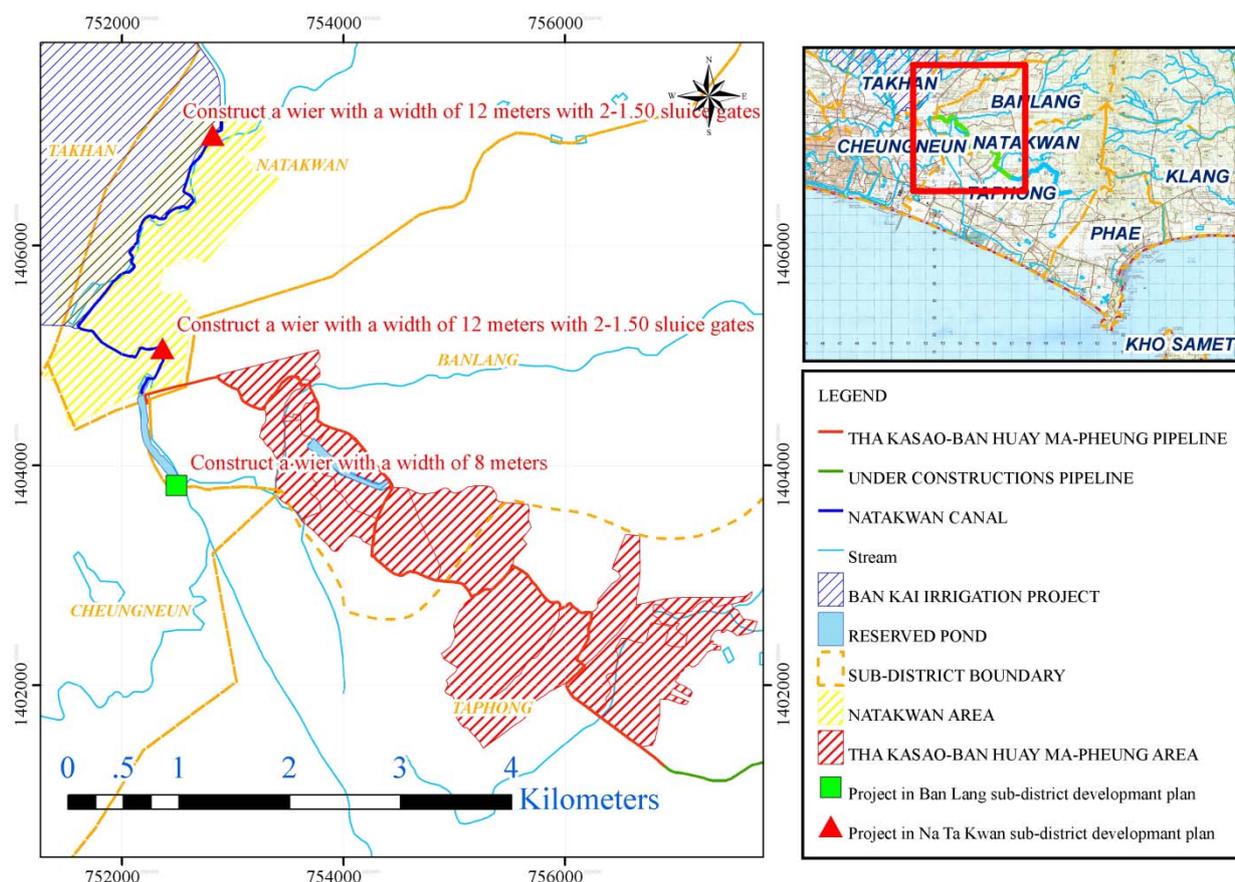


Fig.4-3 the water resource development project sets is solved systematically water resources problem.

Table 4-1 Estimation of total water demand of the water development project sets

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Month	Volume of runoff passing through the Ban Kai Irrigation project head regulator	Average volume of water from the downstream of main left canal Ban Kai irrigation project	Total water budget	Agircultural water demand in area of Na Ta Kwan Canal	Agircultural water demand in area of the Tha Ka Sao - Ban Huay Ma Pheung pumping station with deleveried system	Domestics water demand	Total water demand	Note
Unit : cubic metres								
Apr	147,378	1,339,200	1,486,578	384,925	608,133	6,600	999,658	No shortage
May	825,709	1,296,000	2,121,709	17,591	117,955	6,820	142,366	No shortage
Jun	929,166	1,339,200	2,268,366	34,223	229,484	6,600	270,307	No shortage
Jul	1,083,377	1,339,200	2,422,577	67,042	236,369	6,820	310,231	No shortage
Aug	780,812	1,209,600	1,990,412	166,861	287,314	6,820	460,996	No shortage
Sep	1,617,257	1,339,200	2,956,457	2,464	16,523	6,600	25,587	No shortage
Oct	2,493,719	1,296,000	3,789,719	-	-	6,820	6,820	No shortage
Nov	980,895	1,339,200	2,320,095	211,336	429,595	6,600	647,531	No shortage
Dec	375,766	1,296,000	1,671,766	470,641	757,757	6,820	1,235,218	No shortage
Jan	184,467	1,339,200	1,523,667	376,506	670,553	6,820	1,053,880	No shortage
Feb	148,354	1,339,200	1,487,554	268,849	667,340	6,160	942,349	No shortage
Mar	193,251	1,296,000	1,489,251	423,567	792,639	6,820	1,223,026	No shortage
Annual	9,760,152	15,768,000	25,528,152	2,424,005	4,813,663	80,300	7,317,968	No shortage

- Notes :
- 1) The amount of water in the left main canal of Bankai irrigation project is average of 0.50 meters per second
  2. Domestics water is estimated from 5 village water supply systems for a population of about 2,200.
  - 3) No shortage means the total water budget is greater than the total water demand.

The proportion of allocated water for the water demand in each sub-districts area is shown in Fig. 4-4. It is the basic criteria for the administration of water budgets that the criteria are estimated from basic data lead to the real demand of each sub-districts. Eventually, these three sub-districts is contained the water demand analyzed data for proposing of water supply according to the project

The steps of planning process are developed until make accomplishment of the water resources development project, which make the linkage of the various agency are involved in missions and roles. The implementation of the water resources management project is established since the planning process of the district administration organization until sending the accomplishment plan to Provincial administration organization development plan and budgets. This process is a mechanism to connect with the local agency, provincial functions agencies and central functions agencies which avoid conflict

or integrate development of water resources whole the district, province and central functions. It is shown in Fig.4-5

In the initial period of this process are 3 years, which deals in the record in the roles and functions of the organization, i.e. (1) Royal Irrigation Department supports water management and technical. used to develop water resources projects of the sub-district administration organization, (2) Rayong Provincial administration organization supports budgets for the development that is the water resources development project, which complies with the requirements in the area, and 3) sub-district administration organization groups prepare of the project, facilitate, and encourage assistance for the project developer or Rayong Provincial administration organization requirement that use in water resource development project of sub-district administration organization groups

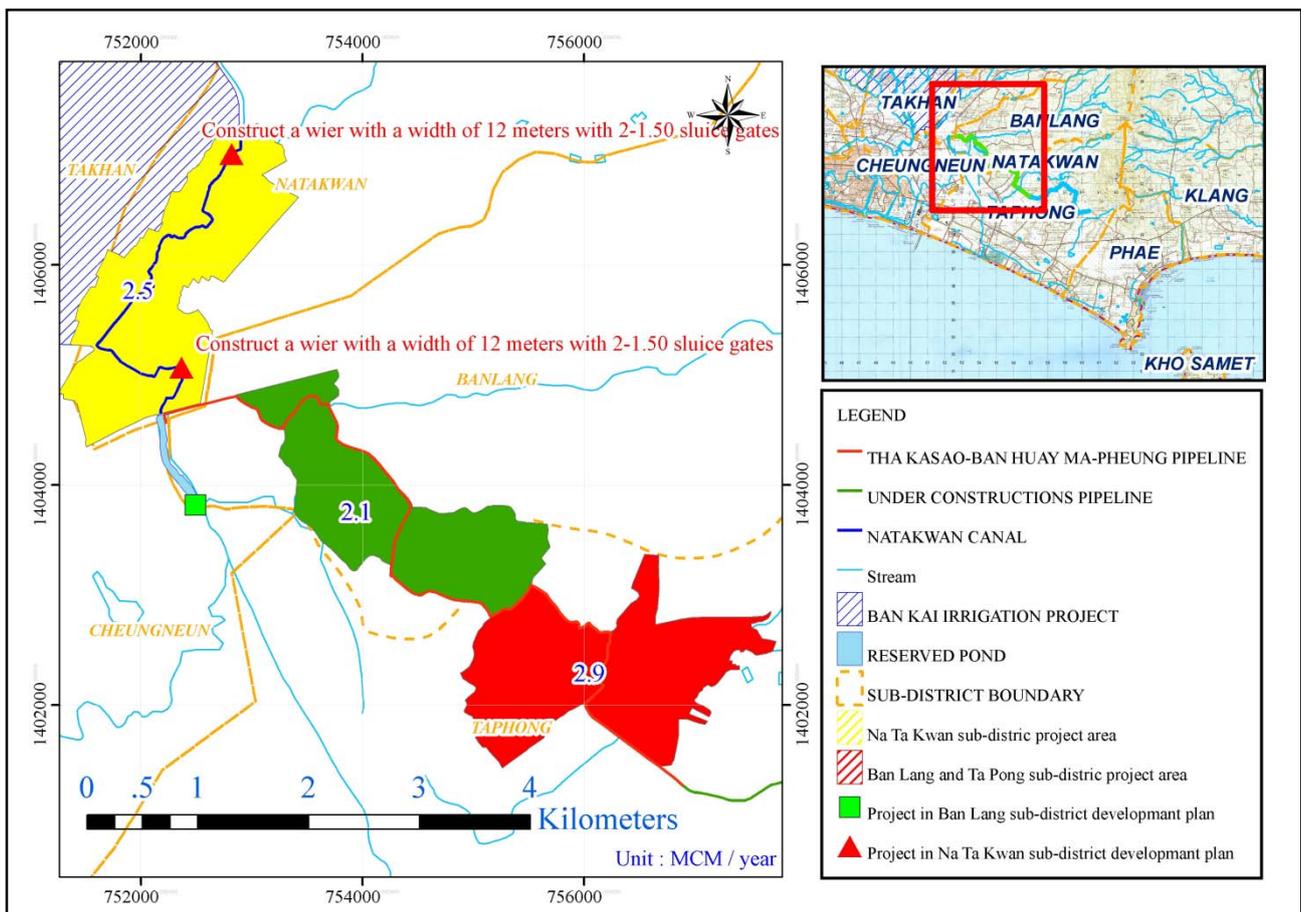


Fig.4-4 the allocated water of water resources development project sets is estimated for each sub-district.

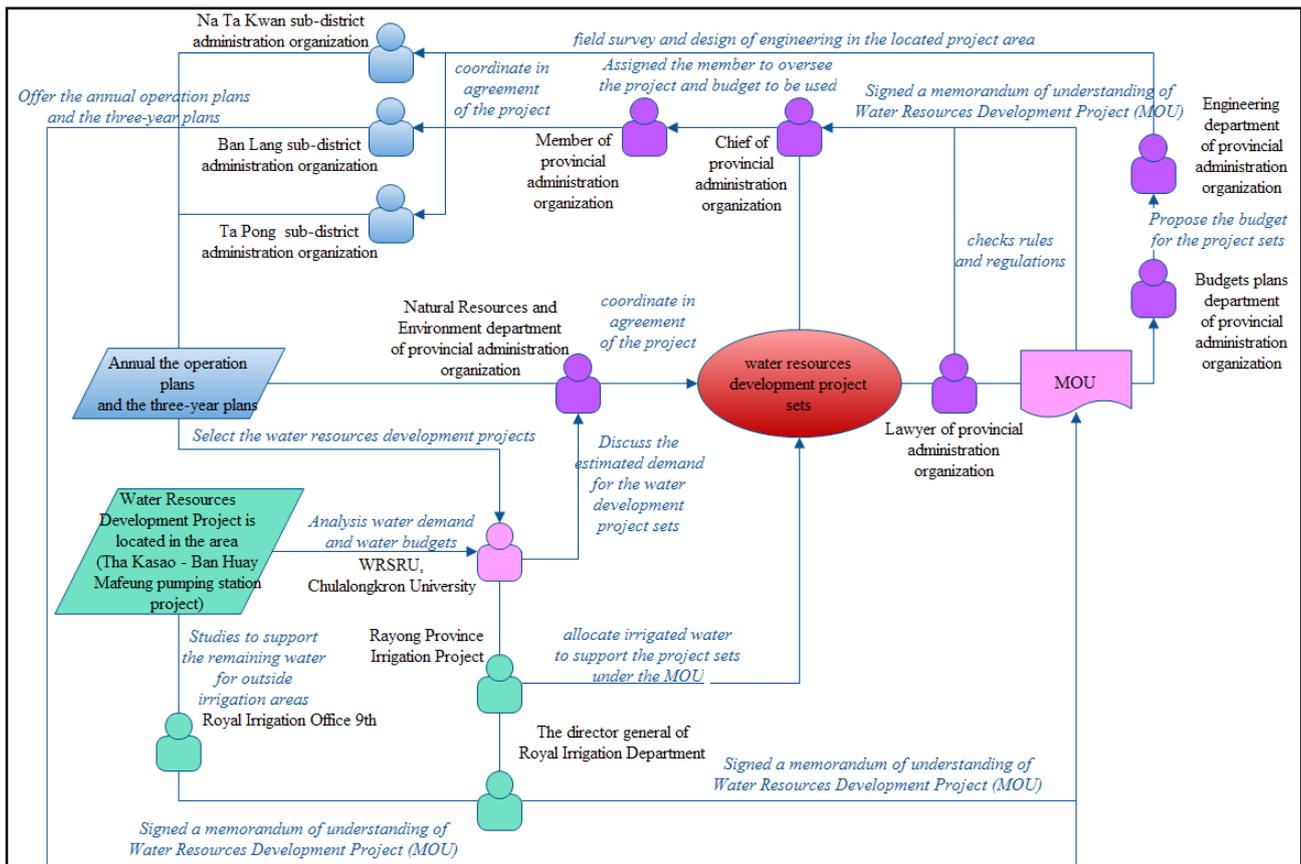


Fig.4-5 the planning process of water resources development is connected with of each agency.

## 5. CONCLUSIONS

In Thailand, The country is developed by the government from top to bottom with the government plan that both the ministry/departments and provinces must plan under the laws. In the provincial level plans with the strategic plan of infrastructures development and the development of natural resources and environment that are included in provincial action plan. The large scale projects in the plan are run by the both central government and provincial agencies that lead to the limitation on the construction process and budgets of project, which affected to the water resources problem of that area and can not be resolved systematically. The planning process of local agencies water resources development project from the demand side is lacked with the linkage with the central government development project.

This research carried out by reviewing the water resources development project in the pilot area of the systematic water development project sets in the sub-districts, i.e.; Na Ta Kwan, Ban Lang and Ta Pong, in Rayong province, which cover whole of upstream, middle and downstream. This planning process has created the roles, functions, and budgets of each agency in the new format. This collaboration

in the water resources development projects within the district, provincial and central functions agency makes conflicts is avoided or helps completely develop in water resources in the next as shown in Fig. 5-1.

## 6. RECOMMENDATIONS

This research aimed to find in the linkage process of the rules, functions and budgets of each agencies based on monthly water status data estimation for the setting of project though water supply crisis case is still not included at the present stage of the study. Therefore, if this process is applied to other area-based water resources management in the future, it should consider in case of amount of water supply that follows water year also.

In the steps of bottom-up planning process from the demand sides should also consider the planning timing, i.e., the beginning time until the time that sub-district development plan is finished. It must relate with the period time of the provincial budgeting request process that the sub-district plan must consider timely into the steps of provincial plan process so that the planning result can be bring continuously to the upper budget planning process.

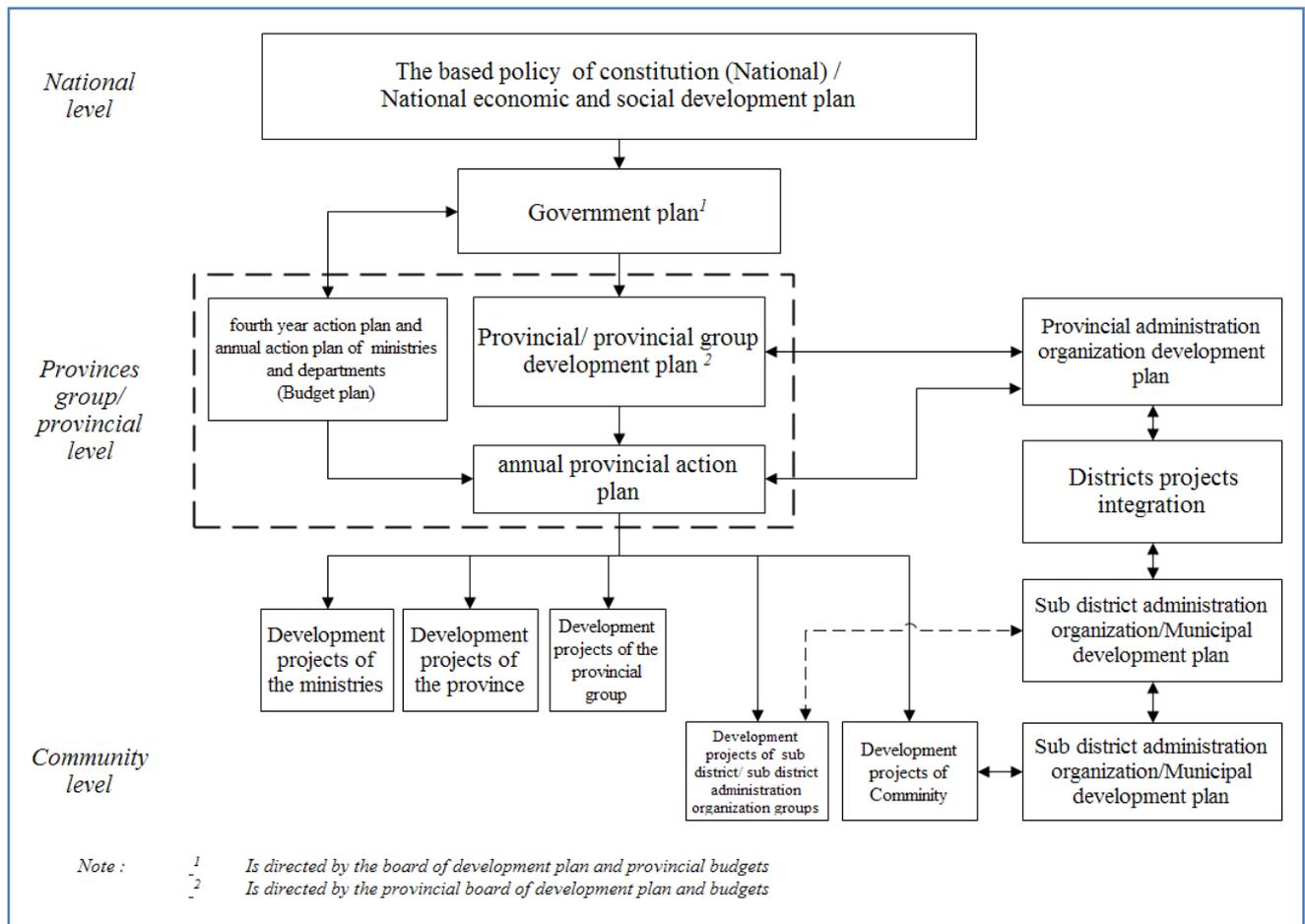


Fig. 5-1 the planning process in the new format linking with the district, provincial and central functions

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