Failure analysis of malfunction water resources project in the Northeastern Thailand: Integrated mental models and project life cycle approach

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A dissertation submitted to Kochi University of Technology in partial fulfillment of the requirements for the degree of Doctor of Philosophy

Kochi, Japan
March 2013

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Abstract

Thailand has put more emphasis on water resources project development resulting in many small, medium and large-scale construction projects to supply national water demand. However, there are many serious problems in management issue needed to be solved. These problems include the lack of a formal system of water allocation and water right, a lack of clear policies, less effective implementation of budget and lack of coordination among organizations. Many projects have been neglected or abandoned due to collapse of project operation and lack of maintenance and repair management, especially in the Northeastern Thailand. To cope with this problem, behavioral objectives and factors for each key stakeholder that hinders an achievement of a water resources project management were studied in order to propose a methodology or mechanism to loosen constraints in small-scaled water resources project in the Northeastern Thailand for the improvement in water resources project management.

Initial diagnosis of malfunction project causes based on Failure Knowledge Database was conducted to identify "Causes", "Actions", and "Results" of the event. Continuing from the initial diagnosis of malfunction project causes, the empirical study was conducted by two case studies of malfunction project in the Northeastern Thailand to elicit and analyze similarity and difference in stakeholder group mental models. The semi-structured interviews were conducted on twenty-one interviewees from three groups of stakeholder. Multi-stakeholder mental models map, which represents the mindset of stakeholders and their decision making and their actions, were constructed to explore behavioral objectives and factors for each key stakeholder that hinders an achievement of a water resources project management. These findings from different stakeholder group mental models then integrate to project life cycle to analyze small-scale water resource project management problem existing in Northeastern of Thailand based on project phases and stakeholder's mental models.

A number of mental models influence diagram were illustrated to represent concepts and causal relation that hinder success of a project. The majority of acute response occurred at the Local Administration Office and project user level, although this may be due to the failure of project planning and management scheme. The analysis suggested that each stakeholder group perceived the malfunction project as being caused their limitations and other groups of stakeholder's responsibility. In addition, differences in perception of malfunction project embodied various interpretations of the malfunction definition and causes lead to significant obstacles in reaching a common understanding in project management.

Result from constraint analysis suggests that the identified constraints may be characterized into: (a) Lack of planning for implementation of the Department of Water Resources (DWR); (b) Capacity of the DWR and staff in project planning and management; and (c) Absence of stakeholder participation and stakeholder capacity building. In order to deal with complex challenges of malfunction project in a systematic way, the following thematic proposals is structured into 3 thematic:

Thematic 1: Utilization project life cycle planning and management
Thematic 2: Improving the DWR capacity to deliver service
Thematic 3: Stakeholder participation and capacity building

In response to thematic and cross-sectional modules, introduction of measures in the recommendations and supporting actions were developed and expected to contribute to reducing the malfunction project and enable stakeholder and enhance group of stakeholders to

achieve the objectives or to satisfy the constraints. In addition, the beneficiary contribution system was introduced to ensure stakeholder participation and project sustainability. The beneficiary contribution approach is a combination of stakeholder management, responsibility sharing and technical matters. The consistency scenario of the beneficiary contribution approach was tested by using cross-impact balance analysis.

Acknowledgement

This thesis dissertation would not have been possible without the guidance and the help of several individuals who in one way or another contributed and extended their valuable assistance in the preparation and completion of this study.

I wish to express my gratitude to my supervisor, Prof. Dr. Tsunemi Watanabe who was abundantly helpful and offered me invaluable assistance, support and guidance.

My gratitude are also due to the members of the supervisory committee, Professor, Dr. Seigo Nasu, Professor, Dr. Osamu Tomisawa, Professor, Dr. Yoshinori Nakagawa and Associate Professor, Dr. Takashi Goso. Without your advice and assistance this study would not have been successful.

Prof. Lawrie Hunter, who is not only teaching me Formal Academic English (FAE) but also my mentor. He always offers advice and suggestions whenever I need them.

I would also like to convey thanks to the International Relationship Division including former members; Ban sensei, Mr. Motoi Yoshida and Ms. Kimi Kiyooka and current member; Prof. Dr. Hatta Akimitsu, Ms. Sonoko Fukudome, Kubo sensei, Ms. Kimiko Sakamoto, Ms. Mari Yamasaki and my friend Ms. Rika Fujii for providing warm welcome and all the help to support foreign students to live their life in Japanese environment .

All my lab members at the Watanabe Laboratory made it a convivial place to work. In particular, I would like to thank Dr. Dewi LARASATI Zr., Dr. AN Tingyu, and Mr. Susumu Nakaya for their friendship and help in the past three years. All other members, including Mr. Piyapong Janmaimool, Ms. Eliza Rosmaya Puri , Ms. Wang Ling Ling and undergraduate Japanese students who had inspired me in research and life through our interactions during the long hours in the lab. Thank you.

The staff of the Department of Water Resources especially Mr. Yudthana Chomwong and Director Prasit Warnset and his staffs for being accommodating to my queries and providing support for field study and data. Despite the distance, they have painstakingly e-mailed the information I needed.

I would like to sincerely thank all interviewees who participated in my case study for their time and valuable information. Without their kind cooperation and valuable information, this study is not possible. Their opinion is a very important to my study and my career.

I am very much thankful to Professor Masanobu Nagano and Professor Katsuki Matsumura for his valuable advice and support to my family.

Special thanks also to all my Thai friends in Kochi, including Ms. Nipaporn Ichiyama, Dr. Narongpon Dumavibhat, Ms. Tanitra Ju-ngam, Dr. Naruemol Kaewjampa, Dr. Phaisarn Sudwilai, Dr. Wimon Sanum, Dr. Nattakorn Bongochgetsakul and his family, Mr. Anuwat Attachaiyawuth, Mr. Panon Latcharote, Mr. Danai Jampanil, Mr. Wittaya Tawong, Dr. Teeya Keawtawee, Mr. Khanit Matra, and Mr. Chaklam Silpasuwanchai for sharing invaluable memory. Especially thank to Dr. Pongsak Suttinon and his family for kind support and assistance to my family while settling life in Kochi.

Not forgetting to my brothers in Kochi University of Technology, Dr. Shivaji Bachche Gunga and Dr.Ros Soty who always been there.

The generous support from the North Kochi Rotary Club is greatly appreciated. Without their financial support, my ambition to fulfill this report can hardly be realized.

Also, I would like to convey my special thanks to Dr. Jirapong Pipattanapiwong who introduced me the Special Scholarship Program (SSP) in Kochi University and guidance before coming to join the SSP.

Thank you Shane San who always took a good care of my dormitory life in Kuzume dormitory as I were his son.

I would like to extend my thanks for People in the Monobe River for their spirit, love and kindness.

My deepest gratitude goes to Uraiwong family for their unflagging love and support throughout my life, my mother who always keeps her good hope and supports education to her son as much as she can.

Last but not the least, I sincerely appreciate and thankful for my wife, Shizu Takami, from her dedication, support, care and love. Thank to my daughter, Nara Takami Uraiwong. You make my life more beautiful. This dissertation is simply impossible without them.

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Chapter 1: INTRODUCTION

1.1 General overview

Water is universally recognized as an essential source for humans and ecosystems. Under the circumstances of increasing water demands and increasingly degradable water quality, water resources management practices becomes a challenge for water management professionals.

Water resources management is a complex of activities and always related to four main factors: the equitable distribution of water among users, the demands of economics development, the prevention of negative impacts to environment and the need for long-term water supply (Gupta 2001; Jermar 1978).

Recently, however, water resources project planning has become more complicated due to the highlighted attention being paid to public involvement, to the environment and to social issues. Evaluations of a number of previous water resources projects have identified poor identification of stakeholder needs and inadequate assessment of social impact as main factors of project failure (Grigg, 1996).

1.2 Thailand water management

Water resource in Thailand is mainly influenced by precipitation from the regional monsoon during May to October. The average annual rainfall countrywide is 1,700 mm with the estimation of total volume at 800,000 million m^3 (Department of Water Resources, 2007).

After the rapid economic development in the past thirty years, the water resources development program has been implemented to support rapid rural development, industrialization, tourism development, domestic consumption, agriculture and other purpose drastically. Water resources development scheme in Thailand has shifted from an initial government dominated and ineffective management process to a more stakeholder involvement (GWP, 2008). In an attempt to increase participation and decentralization of water management, the Government of Thailand has taken initiative in adopting integrated water resources management (IWRM) principle for implementation at a river basin level. Thailand has been divided into 25 major river basins, further divided into a total of 254

sub-basins. Two main government agencies involving water resources project management in Thailand are the Royal Irrigation Department, Ministry of Agriculture and Cooperatives and the Department of Water Resources (DWR), Ministry of Natural Resources and Environment. However, in the recent years, Thailand has faced serious water problems not only water body problems, such as water shortages, drought and floods, water pollution, but also water resources management problems. Therefore, water resources development and management has become a complex challenge for water management professional in Thailand (Sethaputra, 2001).

1.3 Water-related problems in Thailand

Water-related problems have been chronicle problems in Thailand for a long time. These problems include water shortage in dry season, flood in rainy season and water quality deterioration due to rapid development as well as problems of water resources management.

1.3.1Floods and drought

Floods and water disaster occurs regularly in Thailand effecting people livelihood and country economy. Floods and droughts statistics from 1989 to 2010 in Thailand shows that 1.03 million of farmer household was affected from flood and 2.58 million of farmer household was affected droughts annually. Annual flooding damages is more than 6.11 billion baht and 0.6 billion baht for damages from annual droughts (Department of Disaster Prevention and Mitigation, 2012).

1.3.2 Water pollution

It is evident that water pollution is one of the most serious problems in Thailand. From the investigation and monitoring of water quality in 52 water sources in the main 48 rivers and 4 wetlands, it was found that majority of water sources quality is in good and fair condition of 74% while deteriorated and severe deteriorated quality is of 23% and 3% respectively. Approximately 6,190 ton BOD per day was released to water sources from different types of sources including waste water from community consumption, industry factories, and agricultural practices (Department of Water Resources, 2007).

1.3.3 Management problems

Due to growing demand of water use in Thailand for domestic consumption, agriculture and industrial development in the past fifty years, Thailand has put more emphasis

on water resources project development resulting in many small, medium and large-scale construction projects to supply national water demand. However, there are a number of serious problems in management issue that need to be solved. These problems include the lack of a formal system of water allocation and water right, lack of clear policies, less effective implementation of budget and lack of coordination among organizations. In addition, involvement of stakeholder in water resources management is not well developed (IWMI, 2003; Sethaputra, 2001; WWAP, 2006). Although there is current emphasis in participatory water resources management (Kanjina, 2007; MRCS,2010 ; Taesombut et. al., 2002), public participation process in water resources project does not represent multi-stakeholder management which focuses on identification of stakeholders so as to understand their behavior, intentions, interrelations and interests.

1.4 Research problem statement

A water resources project provides a basis for economic and social uses of water, and many projects enhance water quality. Water resources projects require attention to the stakeholder tasks of planning, design, construction, operation, and maintenance. The Thai government has funded many medium and small scale water resources projects, but many cases resulted in an undesirable and long-term fiscal burden on the national government. Many projects have been neglected or abandoned due to collapse of project operation and lack of maintenance and repair management.

Due to the survey on current condition of small-scaled water resources project in the northeastern Thailand conducted by the department of water resources (DWR) in 2008, the result indicated that 17% of the small-scaled water resources project in the northeastern was in good condition and 27% would be minor-maintenance. On the other hand, 43% of them needed rehabilitation while 7% required re-construction and 5% was rejected from water users. Figure 1 shows situation of small-scaled water resources project in the northeastern in figure of project number. Examples of malfunction projects can be seen from Figure 2.

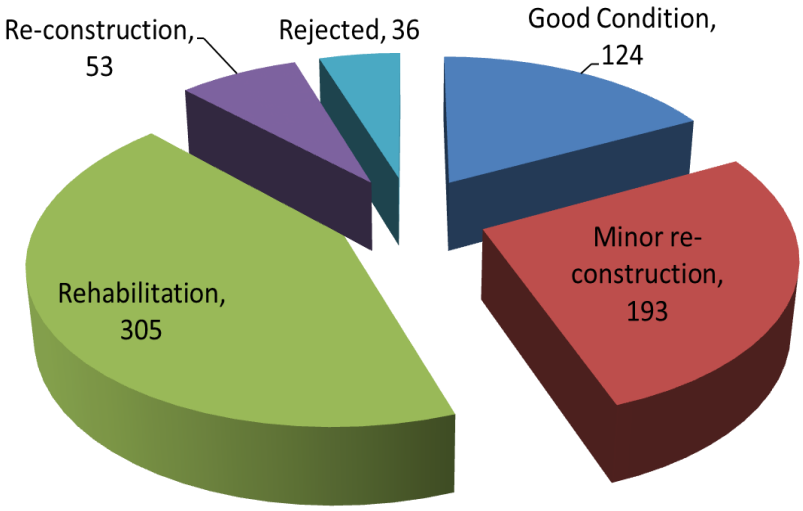


Figure 1 Current situation small-scaled water resources project in northeastern Thailand (source: the Department of Water Resource, 2008)

Figure 2 Examples of malfunction small-scaled water resources project

Thus, in the context of small-scaled water resources project in the northeastern Thailand, a number of complexities and difficulties in project management may have arisen from the following conditions:

- Costly investment and centrally controlled water resources projects were inadequately satisfied stakeholder needs and faced maintenance problems leading to low efficiency and collapse project.

- There are number a of stakeholders involved in decision making and managing infrastructure project, with individual objectives, scale of interest.
- Stakeholders may not communicate sufficiently and effectively due to lack of common ground of project understanding.
- The decentralization policy gives the right to locals and organizations to manage their own natural resources, but there is no effective mechanism to facilitate and empower local communities to gain better and real participation in the decision-making activities related to water resources project management.

1.5 Research questions

Several approaches have been adopted and applied to tackle the complexities and difficulties of water resource project management; some has achieved to solve above mentioned problems while left some others for further explorations. In this research, it will focus in particular on the issues outlined in the problem statement by exploring the implementation of mental models approach to analyze behavioral objectives of stakeholders related to small-scaled water resources project management. Based on the context of complexities and difficulties in small-scaled water resources projects management in the northeastern Thailand, the key issues are:

1. There is no effective mechanism to enhance the collective action of stakeholders with regard to management of small scale water infrastructure, thus consequence on project collapse due to lack of maintenance.
2. It is difficult to identify a shared common understanding and knowledge among stakeholders.
3. Conditions and problems are very dynamic.

From the existing approaches with multi-stakeholders involved, the research questions are formulated as follows:

1. What are factors which cause an ineffective/failure water resources project?
2. What are behavioral objectives and factors for each key stakeholder that hinders an achievement of a water resources project management?
3. What would be a methodology or mechanism to loosen constraints in small-scaled water resources project in the Northeastern Thailand in order to improve water resources project management?

1.6 Research objectives

The three main objectives of this research are:

1. To identify factors which cause malfunction in water resources project
2. To elicit, structuring and analyze behavior of key stakeholder who participated in malfunction of water resources project
3. To offer tools and methods that loosen constraints regarding malfunction water resources project

1.7 Research structure and research framework

A central issue in this research is the way how stakeholders deal with malfunction project, how they perceive and conceive and tackle malfunction water resources project in Thailand, and how to loosen constraints associated with malfunction water resources project. Based on research objectives and scope, this research is divided into three phases: initial malfunction project diagnose phase, empirical study phase and develop improvement options for dealing with malfunction of projects phase.

1.7.1 Initial malfunction project diagnose phase

The initial malfunction project diagnose phase has the purpose of analyzing the data from literatures to identify root causes of malfunction small-scaled water resources project. Data from literatures were analyzed using Failure Knowledge Database analysis technique (Hatamura Y. , 2005). Failure Knowledge Database is a failure analysis technique that the sequence of cause, action and result leads to failure as a "scenario". In this research, Failure Knowledge Database analysis was used to identify causes, events and results of malfunction project phenomenon. Results and findings from Failure Knowledge Database analysis then contributed to further empirical research conducted in the second phase.

1.7.2 Empirical study phase

In order to comprehend behavioral objectives and risk factor for each key stakeholder associated with malfunction of a small-scaled water resources project in the northeastern Thailand, empirical study approach has been developed in form of multi-stakeholder mental models analysis. The study utilized the mental models approach by eliciting the multi-stakeholder mental models related to malfunction of water resources project cases regarding project management process through interviews and dialogue conversation. Three main stakeholder groups involved in small-scaled water resources project including the

Department of Water Resources, the Local Administration Office agencies and the project beneficiaries were interviewed in the case study.

In order to facilitate the understanding of stakeholder mindset and behavior associated with a project element, stakeholder mental models map related to a project element is integrated to a project life cycle to provide better understanding how stakeholder mental models influences project function. Taking an integration system approach of a project element has implications to determine the differences between project actual state and desired state especially in this malfunction project study. Utilization of the proposed approach mainly identify issue for discussion based on the insights gained into the existing objectives, opinions and knowledge of the stakeholders to improve project outcomes.

1.7.3 Develop improvement options

Results from the empirical study were used to help establish a change in project management which may affect to a change in the mindsets of related stakeholders. Implementation of changes in project management may require introducing change in several locations within the water institution components and stakeholder's behavior and using several methods. The major premising deliverables of this research comprise of ground truth for malfunction project modeling and insight into stakeholders and water institution interaction enabling for water institution adaptation for improvement of malfunction project funded by the department of water resources. The framework of this research is defined as shown in Figure 3.

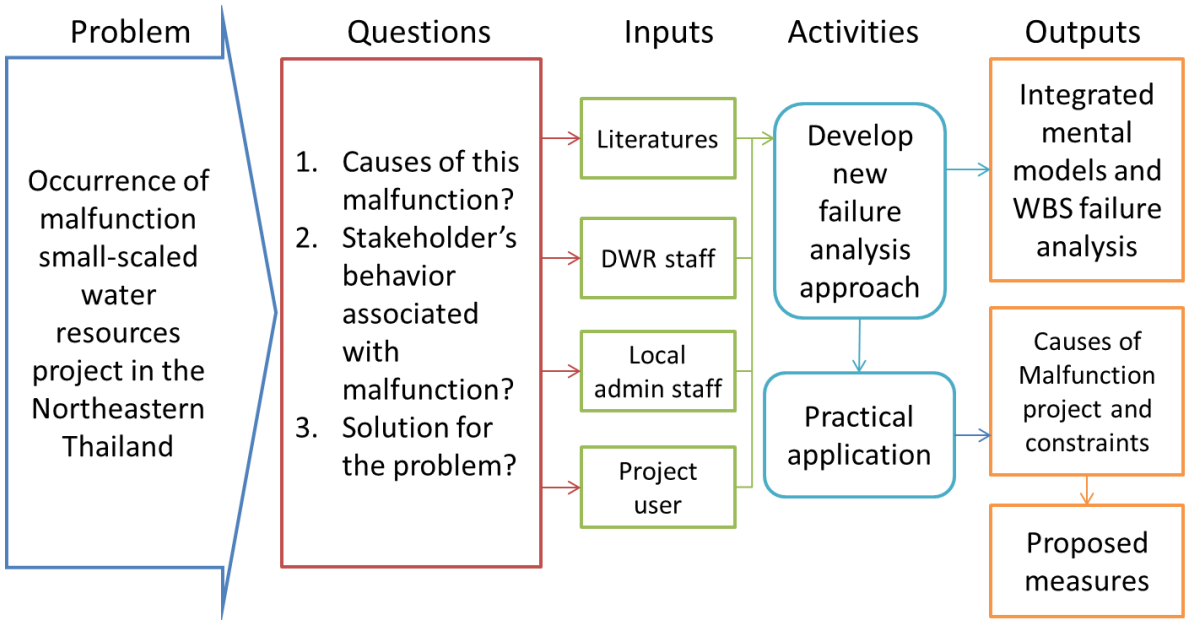


Figure 3 Research framework

1.8 Organization of dissertation

This dissertation presents six chapters, providing details on the sequence of the different investigation steps and their findings. The rest of the dissertation is organized as follows;

Chapter 2 provides further detail and background on Thailand water resources management, particular how these link to changes and complexities in the small-scale water resource project management in Northeastern of Thailand. It presents a review approaches and tools employed in Thai water resource management. Also management problems are discussed in this chapter.

Chapter 3 illustrates literatures review of Failure Knowledge Database, mental models approach and application in water resource management to provide comprehensive understanding and implementations. Overview of stakeholder analysis approach is also reviewed and summarized aiming to discuss applicability to multi-stakeholder mental models associated with malfunction of small-scale water resource project.

Chapter 4 includes methods and techniques to investigate research questions. The present research is based on two case studies. The methodology that was developed and used for empirical study is explained for each phase of interaction with stakeholders. A brief introduction of empirical study aims and methods is given to each stakeholder in each case

study regarding their environmental, administrative and societal characteristics. The development of integrated multi-stakeholder mental models and project life cycle is also introduced.

In chapter 5, details are given to the empirical study methods and results. In chapter 6, the central aspects and conclusions of the empirical study are taken up and discussed. This section gives an outlook into follow up options that could facilitate an achievement of a small-scaled water resources project management in Thailand on the basis of results carried out from this research.

Chapter 7 presents the conclusions and outlook section summing up the onset of this thesis and the key findings with regard to the research questions. In addition, the use of the integrated approach presented in this thesis is reflected upon.

The semi-structure interviews results are attached separately to the main body of the thesis (Appendix I and II). They give insights mainly regarding the behavioral objectives and factors for each key stakeholder associated with an achievement of a water resources project management in the Northeastern of Thailand (research question 2). Annex III illustrates collection of interviewee's mental models influence diagrams contributed to malfunction project.

Chapter 2: BACKGROUND ON THAILAND WATER MANAGEMENT

This chapter provides an introduction to Thailand water management- its hydrology characteristics, administrative setting, current condition of management scheme and current management problems. The purpose is to provide an overview of the existing water management framework based on the integrated water resource management approach to allow for an assessment of the gaps that exist between the government policies and the status based on present situation.

2.1 water resources management in Thailand

Water availability and management is a key issue for Thailand. For hydrology purpose, Thailand has been divided into 25 river basins. The average annual rainfall country wide is of about 1,700 mm. The total volume of water from rainfall in all the river basin in Thailand is estimated at 800,000 million m^3, 75% of which or about 600,000 million m^3 is lost through evaporation, evapotranspiration and infiltration; the remaining 25 % or 200,00 million m^3 constitutes the runoff that flows in rivers and streams (Sethaputra, Thanopanuwat, Kumpu, & Pattanee, 2001). Table 1 presents the runoff volume, water demand and analysis of water balance in Thailand.

Table 1 Runoff volume, water demand and analysis of water balance (DWR, 2007)

	Beneficiary areas (km^2)	**Runoff volume (million m^3/year)**	**Water demand (million m^3/yr)**	**Shortage water (million m^3/yr)**
Northern and central basin	195,023.81	50,827.72	29,178.21	2,576.14
North-eastern river basin	167,338.02	55,504.17	10,993.87	1,260.05
Eastern river basin	37,548.03	24,029.69	4,102.53	294.09
Western river basin	43,522.90	17,159.87	8,126.57	140.13
Eastern south river basin	51,646.51	43,384.45	4,245.92	488.65
Western south river basin	18,929.00	22,396.60	655.67	3.07
Total	**514,008.23**	**213,302.50**	**57,302.77**	**4,762.13**

After rapid economic development in past twenty years, the water resources development projects has been increasing and represents a large portion of national budget for development. Approximately, 70,770 million m^3 annually is kept in some 650 large-scale or medium-scale and 60,000 small-scale water resources projects all over Thailand.

2.2 Water resources management in Northeastern Thailand

In this research, it focuses on particularly water resources project in the Northeastern Thailand. General overview of water resources management in the Northeastern Thailand is summarized as following.

The Northeast Region is comprised of 19 provinces where Nakhon Ratchasima province is the largest province with an area of 12,810 km^2. Provincial boundary is shown in Figure 4.

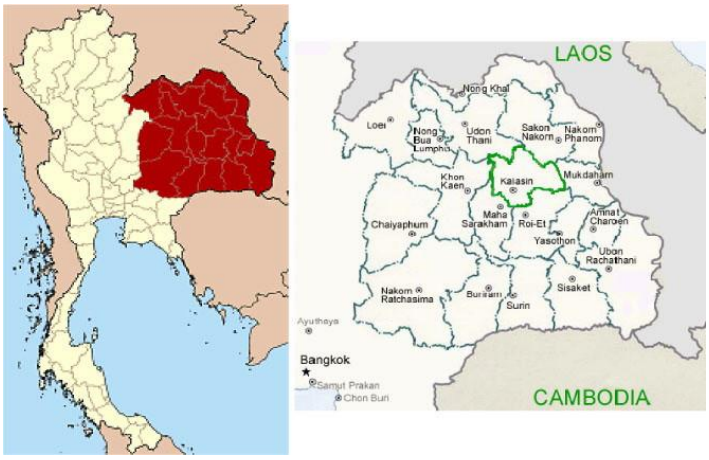


Figure 4 Provincial boundaries in the Northeastern Thailand

Northeast region is located at Central Area of the lower Mekong basin with the basin area of 165,700 km^2. Three important river basins in this region are Khong basin (46,500 km^2), Chi basin (49,500 km^2) and Mun basin (69,700 km^2). Water resources and irrigation development project in the northeastern are composed of large scale, medium scale, small scale and pumping projects operated by three main agencies, Royal Irrigation Department (RID), Department of Water Resources (DWR), and Electric Generating Authority of Thailand (EGAT). There are in total 6,831 existing projects in the northeastern with total water storage capacity of 10,995 MCM and total irrigable area of 6,048,711 rai (JICA, 2010)

2.3 Institutional Organization for Water Resource Management

Institutional organization for water resources management in Thailand can be categorized into four levels (WWAP, 2007; Sethaputra et.al, 2001; DWR, 2010; JICA 2010)

2.3.1 International Level

Thailand shares an international river, the Mekong, with 5 other countries, Cambodia, China, Lao PDR, Myanmar, and Vietnam. Mekong River Commission (MRC), the organization managing the river, comprises of 4 member countries namely Cambodia, Lao PDR, Thailand and Vietnam. The 1995 Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin is framework for cooperation among member countries for sustainable development, utilization, conservation and management of the Mekong River. However, the MRC is considered as a sideline from the actual national plan (Keskinen, 2010)

2.3.2 National level

In 1989, the Government issued the Office of the Prime Minister's Regulation on National Water Resources Management. As a result, the National Water Resources Committee (NWRC) was established according to Article 6 of the Regulation. It consists of the Prime Minister as chairman and other members appointed by the Prime Minister. The NWRC's member mainly comprises representative from various concerned agencies and experts in water and related fields.

Originally, the total number of committee members was 26 including representatives from water users, academics and NGOs. However, due to the reforming in March 2009, the number was increased to 41 in total, including in addition those representatives from provincial government, TAO, communities as well as 9 members from the 25 RBCs nation-wide. The authorities and roles of NWRC are summarized as follows.

- To submit to the Cabinet for approval policies for development of small, medium and large scale water resources so as to meet the water demands
- To indicate guidelines on water resources development and project plan formulation to the government agencies and state enterprises concerned
- Scrutinizing and approval on project plans, instruction, supervising and monitoring on project implementation and reporting on water quantity and quality
- To solve urgent issues and problems
- Priority setting on water allocation and coordination on water demands by various users as water supply, hydropower generation, industrial and irrigation etc. and reporting to the Cabinet
- To propose to the Cabinet adopting/amending of regulations/laws concerning water resources development, monitoring of water quality and conservation

At the initial stage, the Office of NWRC was established and operated under the Prime Minister's Office, but due to the governmental reform affected in 2002, the Office was transferred to the DWR under MNRE. Figure 5 shows the organization chart of NWRC and its relationship with the other agencies.

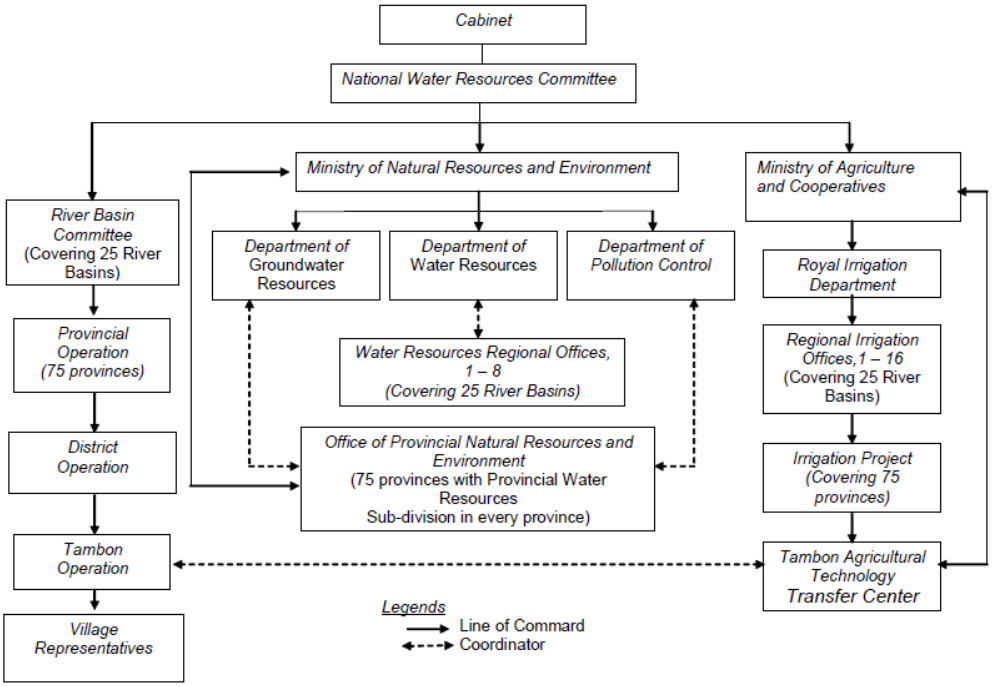


Figure 5 Organization chart of NWRC and its relationship with the other agencies (WWAP, 2007)

2.3.3 Basin Level

River basin committee (RBC) establishment is based on the Regulation of Prime Minister's Office on National Water Resources Management 2002. RBC members are selected from government officials, state enterprise representatives, elected representatives of local government units, water user groups, stakeholders who work or live in the river basins, and qualified persons who have knowledge and experience relating to water resources management. At present, in most cases, the committee chairmen are assumed by provincial governors.

At basin level, the RBCs will be responsible for the actual management of river basins and the implementation of associated projects and activities. The Department of water Resources (DWR) at the national level will also provide technical, research information, and financial support to the RBCs. They are funding through normal budget of DWR, the amount of budget allocated to each RBCs covers only administrative purpose. The RBCs have been given wide ranging advisory roles covering most aspects of integrated water resources management. They will be responsible for river basin water allocation and at the same time developing basin-specific programs in close consultation with basin stakeholders to incorporate their particular needs and concerns. The organization of the RBCs comprises

working groups, which represented by officials at provincial level, local government units and local communities.

2.3.4 Provincial and local level

The offices of Provincial Administration and District Administration (and similar agencies at local government level) have an operational role in supplying local domestic water at the provincial levels. However, it's role in the context of water resources planning and management is less significant so far as basin wide issues are concerned.

At the local level, representatives of the local government units have been selected to attend training courses in water resources management as part of the capacity building programs in this field. The Tambon Administration Organization (TAO), resulting from the 2002 Bureaucratic Reform Act which affirmed the central role of elected sub-district organizations, is an organization being responsible for local level development and natural resource management. Much of the central budget is now directed to the TAO with the line agencies at district and province now required to provide technical assistance in the implementation of TAO development plans. The TAOs are thus the main planning mechanism at the local level and the main formal institution for local participation in planning processes. While TAOs have the responsibility for local development and natural resource management, much of the investment to date has been on local infrastructure – such as local roads, schools etc., rather than in social development or natural resource management. However, there is growing evidence that this trend is changing with many TAO increasingly engaging in broader local development (MRC, 2010).

2.4 Legal Aspect of Water resources Management

There are four plans and policies relevant to the national water resources and dam management aspect; the policy of the Thai Government, the policy and plan for enhancement and conservation of national environmental quality, the policy of the ministry of natural resources and environment, the national water resources policy (Pichyakorn, 2011).

2.4.1 Draft water resource act

In 1997, the National Water Resources Committee (NWRC) proposed a Draft Water Law to the parliament but no much progress was seen in the processing. Thereafter, the MoNRE drafted another Draft, passed through 13 times of public hearings with participation

of 72 provinces and 3,000 participants and submitted the final Draft to the Cabinet to secure the approval on May 2007. Presently, however, the Draft is still in the position waiting for due debating at the parliament. At the present condition, the established NWRC and RBCs as well as the roles assigned to DWR are based on the Regulation of the Prime Minister's Office in 1999, and it can be said that the authorities to control the water resources are not clearly demarcated legally.

The current draft water law is intended to be framework legislation for water resources utilization, development, management and conversation. In addition, in order to tackle the vagueness of the water right issue, the permit system was addressed by the draft water law. Formulation of water resources fund and river basin fund, decentralization and participation of the people at the river basin, and the establishment of water organizations at the national, river basin, and sub-basin levels inclusive of water user organizations are also stated in the recent draft (Wongbandit, 2011; JICA, 2010; DWR, 2010).

2.4.2 Existing laws and regulations

In consideration of existing water laws, codes, and instructions, they have been framed for particular, and usually singular, purposes. There is no umbrella legislation to link these laws and codes, and consequently that is no legislative backing for any organization to undertake integrated water resource management. Collection of existing water laws and regulations relating to the enforcement is divided into three categories as shown in Table 2.

Table 2 Collection of existing water laws and regulations (Hydro and Agro Infometic Institute, 2011)

Set	Type	Organization
1. Irrigation 2. Energy and Municipal Water 3. Channel and Water Ways 4. Disaster Prevention 5. Water 6. Agriculture Forestry Fishery	1. Act 2. Ministerial Regulation 3. Regulation	1. Ministry of Interior 2. Ministry of Justice 3. The Secretariat of the Office of Prime Minister 4. Ministry of Industry 5. Ministry of Energy 6. Ministry of Natural Resources and Environment 7. Ministry of Transportation 8. Ministry of Finance 9. Ministry of Agriculture and Cooperatives 10. Ministry of Information and Communication Technology

2.5 Thailand Water management paradigm shift

As pointed out by Pahl-Wolst (2007), "A water management paradigm refers to a set of basic assumptions about the nature of the system to be managed, the goals of management and the ways in which these management goals can be achieved. The paradigm is shared by what can be called an epistemic community of the actors involved in water management. The paradigm is manifested in artifacts such as technical infrastructure, planning approaches, regulations, engineering practices, models etc." Over the past two decades, a water management paradigm shift in Thailand involves major structural changes in infrastructure and regulatory framework. In the past, Thailand water management focused on supply management for domestic consumption, agriculture and industrial development in the rapid economic growth period. Water management was facilitated by the central government embarking on the water supply mission. However, problems of resources integration, sustainability and public participation were not taken into consideration (Mirunachi, 2011). This system paradigm can be characterized as a "predict-and-control" approach.

Due to the predict-and-control approach, the Thai government devoted significant resources to meet large water demand which successfully in giving millions of Thai people access to water for domestic and industrial usage, irrigation and power generation. However, as water has become increasingly scarce to satisfy the increasing needs of the country, water management created conflicts between existing water uses and users. In an attempt to resolve this conflict and increase need of water, the Thai government adopted the principles of Integrated Water Resources Management (IWRM) in the early of 1990's. The introduction of IWRM principles into practice is to generate consensus, support and approval from a wide range of water sector stakeholder for effective water management in the country (Anukularmphai, 2010). Through the IWRM approach of which is adopted in Thailand, the water management paradigm shifted from building storage capacity and construction of major water resources infrastructures and drainage systems on a large-scale to the establishment of IWRM, in which small-scale water resources schemes, river management measures and integrated river basin management became key elements (Lien, 2003). Under the Thailand's effort in IWRM implementation, a numbers of reform measures have been implemented including reforming existing policy, legal and institutional framework, decentralization of water resources management in river basins, formulation of a strategic plan for IWRM of all the 25 major river basins and preparation of action plan with a comprehensive work plan. In 2000, the national water vision and policy were endorsed by the Thai government which stated that "By the year 2025, Thailand will have sufficient water of good quality for all users through efficient management and an organizational and legal system that will ensure equitable and sustainable use of water resources, with due consideration for the quality of life and the participation of all stakeholders."

In addition to IWRM approach, a significant influence on the Thai government agencies and related stakeholders manage water resources is the enactment of the new Constitution in 1997. The 1997 Constitution and reaffirmed in 2007 provides for increasing requirement of direct public participation in planning, managing and utilizing a natural resources projects implemented by the government agencies. Moreover, the 2002 Bureaucratic Reform Act has significant influence to the central role of elected sub-district organization, the Tambon Administration Organization (TAO) as being responsible for local level development and natural resource management. As a result, the TOA are the main planning mechanism at the local level and the main formal institution for local participation in water resources project planning process with technical assistance from line agencies at

district and province level (Mekong River Commissions, 2010)

2.6 Participatory water resources management in Thailand

The decentralization promoted in the 1997 constitution is the major drive for stakeholder participation in water resources management. In water sector the River Basin Committees (RBCs) establishment is a very important step in involving stakeholders and empowering people in water resources management in a river basin context. The national water policy was formulated in 2000 where integrated water resources management was adopted and stakeholder participation in water management was encouraged.

The increasing of stakeholder participatory approach has evidenced through a series of consultative and discussion among project related stakeholders. However, there remain many serious problems in stakeholder participation issues that need to be resolved. These include poor involvement of stakeholders in the project development process, free water access attitude, free of charge on a project provided by the government, little appreciation in project, and, therefore, lack of a sense of ownership. Also, inadequacy of qualified staffs and a restriction in budget allocation for managing river basin committee are a bottleneck to support and promote stakeholder participation in Thailand (Lien, 2003; UN-WATER/WWAP, 2007).

Regarding stakeholder identification in small-scaled water resources project in Thailand, groups and subgroups of stakeholder were identified- including government organizations at national and regional levels, international partners, politician, locals, traditional authority, de-concentrate government service, non-government organizations (NGOs), academic and research institutions, businesses and individuals who have interest in the water sector and media (Uraiwong and Watanabe, 2011). Prablibu (2009) reported that five distinguished stakeholder groups were classified due to water resources management; government offices, politicians, individual and group of individuals affected from a project, group seeking for the profit from a project, and education organization.

However, it was observed that the organization structure of the river basin working group is dominated by the state agencies, accounting for more than a third of total members. Based on the Mae Sa river basin management case (Kanjina, 2011), it is apparent that the local communities have largely been excluded from the working group which initially intended to enhance participation from these stakeholders in the areas. The state agency

members in RBC working group are passively participated due to its organization structure and their rigid bureaucratic boundaries. Prabribu (2009) has noted the following problems related to effectiveness of water resources management organization;

1. Lack of data management

Water resources project data were collected by individual agency in order to meet the agency own requirements rather than stakeholder needs. This resulted in preparation of data by plural numbers of agencies even the data are of similar natures. Moreover, there was a lack of data exchange among agencies or between agencies and stakeholders.

2. Shortage duration for water resources plan to be approved

One of River Basin Committee (RBC) mandates was to consider and approve water resources management plans with relevant agencies in the basin. In practice, there were a large number of proposed projects while duration for consideration is limited, most of the time within a day. Thus, this meeting atmosphere and duration did not encourage the project understanding among participating member especially non-government representatives.

3. Budget constraint

Necessary budget for water resources management in the basin level was not provided, approximately 1.2 million-baht per a fiscal year. The provided budget was mainly for meeting and administration purpose. Due to this limited budget, it seemed difficult to promote and follow up public participation activities.

Many positives steps have been taken toward the more effective management of water resources management, particular the recognition of need to manage resources from stakeholder perspectives (Taesombut, 2002; Health research system institute). Stakeholder participation in Thailand needs to be addressed all levels of participation- from information sharing and consultation to the more strategic and technical levels. In addition, there is a clear recommendation for a technical advisory board on social development and stakeholder participation to be established in Thailand (MRC, 2010).

2.7 The Department of Water Resources project development process

The two main government agencies currently responsible for water management are the Royal Irrigation Department (RID) in the Ministry of Agriculture and the Department of

Water Resources (DWR) in the Ministry of Natural Resources and Environment. In this thesis, however, the small-scaled water resources project funded by the DWR is main focus of this study. Process of a water resources project development, operation and maintenance is presented in Figure 6.

2.8 Water resources management problems

Water resources management problem in Thailand can be summarized as follows (Department of Water resources, 2007; World Water Assesment Program, 2006):

1. Problem of policy, plan and legal framework in national level

Policy and plan for water resources management has not been integrated, and there is absence of practical action plan for national level. It was only establishment of national vision and solution policy with no acceptable and efficient strategies and implementation plan for both national level and affecting the management in river basin level. In addition, there are variety of acts and laws concerning water resources but not even one directly relates to water resources management. This creates confusion and problem in practical enforcement in terms of uncertainty to select and interpret the proper enforced article that suit with the case. Therefore, the national water law promulgation is urgently needed in order to react properly to increasing problems or requirements.

2. Problem of institution structure

There are more than 30 agencies in 9 ministries currently working in water resources development and there are 7 national committees involved in water resources management. With this overlapping and work duplication, some important tasks are lacking responsible host and causes confusing resulting in lack of cooperation among agencies.

3. Problem of available information and knowledge base

Due to the fact that there are various exiting water resources management related agencies, available information is scatter around those agencies and lack of systematic arranged under single standard. Therefore, it is difficult to make an efficient and effective water management from scattering data and information.

4. Problem of public participation

In water resources management, public participation is process that involves the public in problem solving, planning, policy setting, or decision-making (Davenport, 2002). In

Thailand, it is evident that it is important to seek the opinion of all the concerned parties or stakeholders and get their involvement from the very early stage of project formulation. However, it is observed that public participation is in the form of "being informed" rather than "participate". In addition, since water is free and all water resources projects are provided by the government, the users have feeling that it is a government project; it belongs to the government. The users, therefore, do not appreciate value of the projects, as a result, have little sense of ownership and not enthusiastic in maintenance of the projects.

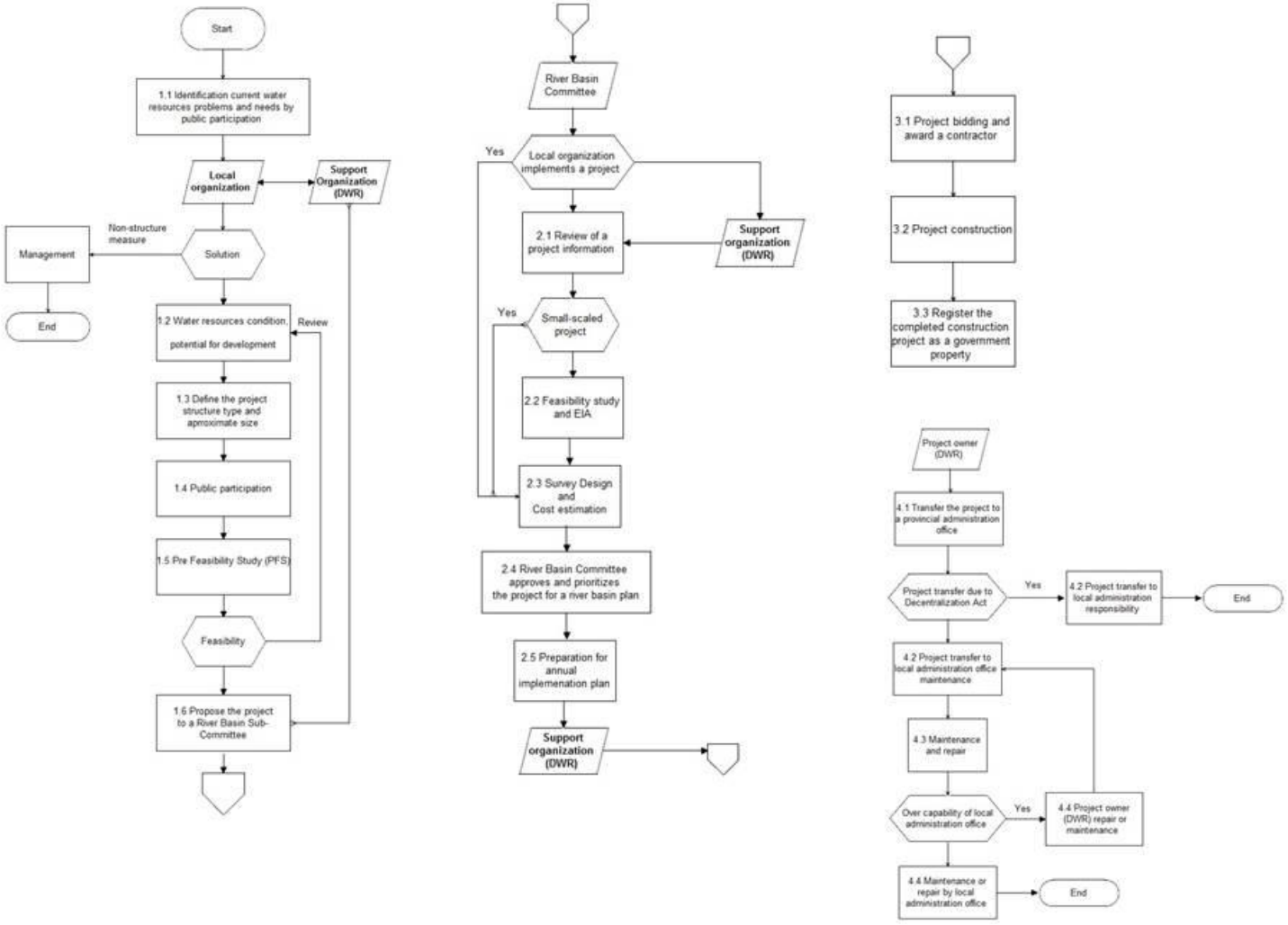


Figure 6 the Department of Water Resources project management diagram (DWR, 2007)

2.9 Summary

The root causes of water resources management problems are weakness in the national water resources policies, poor coordination and regulatory management, and insufficient stakeholder participation in decision making. The current water resources management scheme offers stakeholder participation as an important step for sustainable development. However, it is apparent that the organization structure of the river basin working group is dominated by the state agencies and the local communities have largely been excluded from the working group which initially intended to enhance participation from these stakeholders in the areas. In addition, there is no effective platform to facilitate and empower local communities to gain better and real participation in the decision-making activities related to water resources project management. As a result, this research will focus on the analysis of concerned stakeholder behavior regarding the ineffective small-scale water resources project management and developing tools and methodology that could improve stakeholder coordination through the mental models causal loop diagram and dynamic system analysis.

Chapter 3: CONCEPTUAL FOUNDATIONS

3.1 Introduction

This chapter aims to provide the comprehensive reviews of mental models and stakeholder management literatures mainly for a water resources project management. The content begins with the general explanation of mental models and application of mental models in water resources management development. Then essence of stakeholder management is reviewed. The remainder of this chapter surveys work in connection of mental models and stakeholder management in water resources management.

3.2 What is mental models

It is thought that people use "mental models" for making sense of the world, translating incoming information and filtering it selectively. The term "mental models" was first mentioned by Craik in 1943 with the publication of "The Nature of Explanation." Craik summarizes that "Mental models are psychological representation of real, hypothetical, or imaginary situations." In 1983, two influential books both named "Mental models" were published with holding different meanings. The first book was published by Johnson-Laird (Johnson-Laird, 1983) who viewed mental models as a working model to support human reasoning. Unlike the Johnson-Laird, the second "Mental Models" book, edited by Gentner & Stevenson (1983), viewed mental models as a model stored in the long-term memory and used to support humans to generate predictions about what should happen in various situation (Winter, 2009).

Mental models is also described as a frame of reference form interpreting the world in form of intuitive knowledge which forms the bases for reasoning, decision making and working with problems. Mental model are constructed by individual life experiences, perceptions and understanding of the world (Rouse & Morris 1986, Jones et.al. 2011). It can be concluded that they is no agreement in literature about what exactly constitutes mental models regarding their structure, content and function (Isendahl, 2010). Comprehensive summary of mental models can be found in the work of Gentner (2002)

Research within mental models is extensive and varied by disciplines under wide range including:

- Risk communication (Fischoff, Bostrom, & Jacob, 2002) (Galada et al., 2009) (Gilmour and Sysak, 2009) (Botzen, Aerts, & van den Bergh, 2009) (Austin & Fischhoff, 2012) (Cooper, 2011),
- Data privacy and security (Diesner, Kumaraguru, & Carley) (Asgharpour, Liu, & Camp, 2007),
- Climate change adaptation (Otto-Banaszak, Matczak, Wesseler, & Wechsung, 2011) (Shaffer & Naiene, 2011),
- Education (Shepardson, Wee, Priddy, & Harbor, 2007) (McNeil) (Vosniadou, 2002),
- System dynamics research (Doyle & Ford, 1998),
- Urban storm water management (Winz & Brierley, 2007)
- Communication in agriculture (Abel, Ross, & Herbert, 1998)

3.3 Characteristics of mental models

Throughout principles related to mental models and their implications, some characteristics of mental models can be briefly described:

1. Mental models are incomplete and simplified (Norman, 1983)
2. Mental models are unstable over time (Norman, 1983).
3. People's ability to employ there are severely limited (Norman, 1983).
4. Mental models do not have firm boundaries (Norman, 1983).
5. Mental modes are parsimonious. Extra physical actions are utilized rather than mental actions to avoid complexity in mental models (Norman, 1983).
6. Mental model changing involves time delays (Doyle et al., 2001)
7. Mental models reasoning relies on qualitative relations rather than on quantitative relations (Gentner D. , 2002).
8. Elements in Mental models may contradict among themselves without being aware that they contradict (Redish, 1994).

Other than above mentioned, it was assumed that mental models shares the following features with construct systems in Personal Construct Psychology (Abel, Ross, & Herbert, 1998).

- It helps people to anticipate how physical, social, economic or other processes will occur, and to plan their behavior accordingly.
- It is developed and amended progressively in the light of their creator's

experience. Personal background, exposure to and interest in accepting new information, and personal experimentation all play a part in shaping and reshaping a mental model.

- Individual mental models differ, but can contain common aspects with those of others and be shared through common concepts and language.
- People's mental models, or parts of them, may be of varying detail and complexity, depending on their interests and experience
- Mental models may be arranged as subsystems within larger systems.
- Each model has a range of convenience, or situations to which it applies most aptly.
- Mental models may be more or less permeable, or capable of accepting new detail. They may also be more or less adaptable when potentially conflicting information becomes available.
- It is possible for mental models, or subsystems within them, to contain incompatible aspects.
- People who have similar mental models of a situation or set of processes will tend to hold similar expectations and will act similarly.
- In order to communicate effectively or cooperate with another person, one need not hold the same outlook or mental model, but must be able to appreciate the other person's outlook or model.

3.4 Mental models and decision making

Mental models is behind the frames of actors for decision making. Mental models determines what data the actor perceives in the real world, and what knowledge the actor derives from it. Decision making involves the problem of choice (between alternatives—doing nothing also being an alternative). Choices are made in all steps of the cycle, and are driven by the frames. Analysis of the decision-making process literature indicates that choices, which are made in all steps of the problem solving cycle, are based on an individual decision maker's frame of perception. This frame, in turn, depends on the mental model residing in the mind of the individual. Thus, we identify three levels of awareness on which the decision process can be analyzed (Kolkman, Kok, & Van der Veen, 2005). The problem solving cycle influenced by mental model is presented in Figure 7.

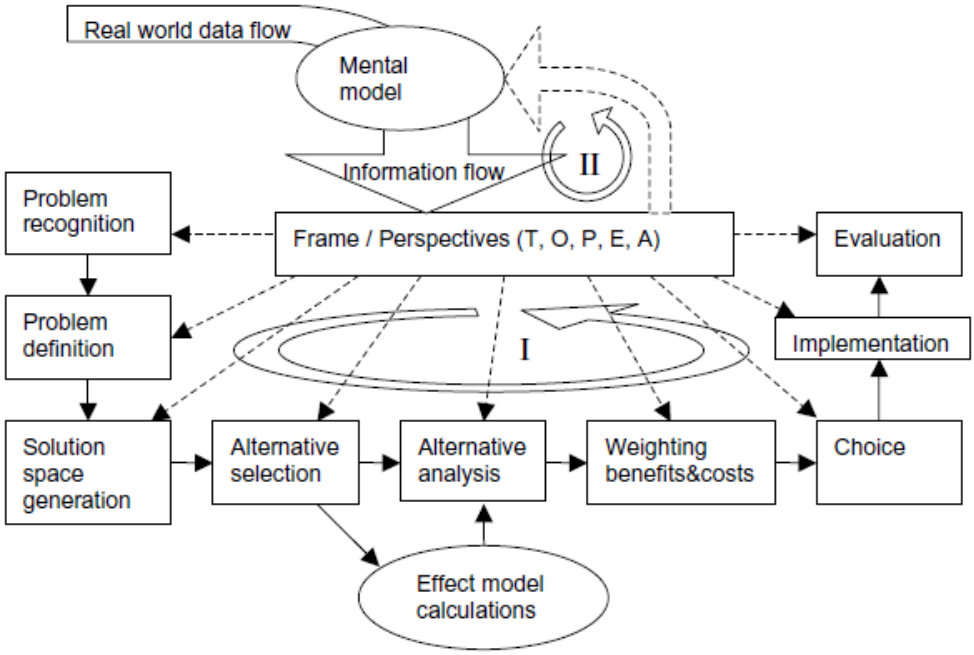


Figure 7 The problem solving cycle influenced by mental model (Kolkman M.J., Kok M., Veen A. van der , 2005)

Similar but less complicated than Kolkman et al. (2005), Isendahl (2010) argues the key aspects and processes of a mental models of an individual in a decision situation through four processes of observation, perception, mental processing and issue framing as presented in Figure 8.

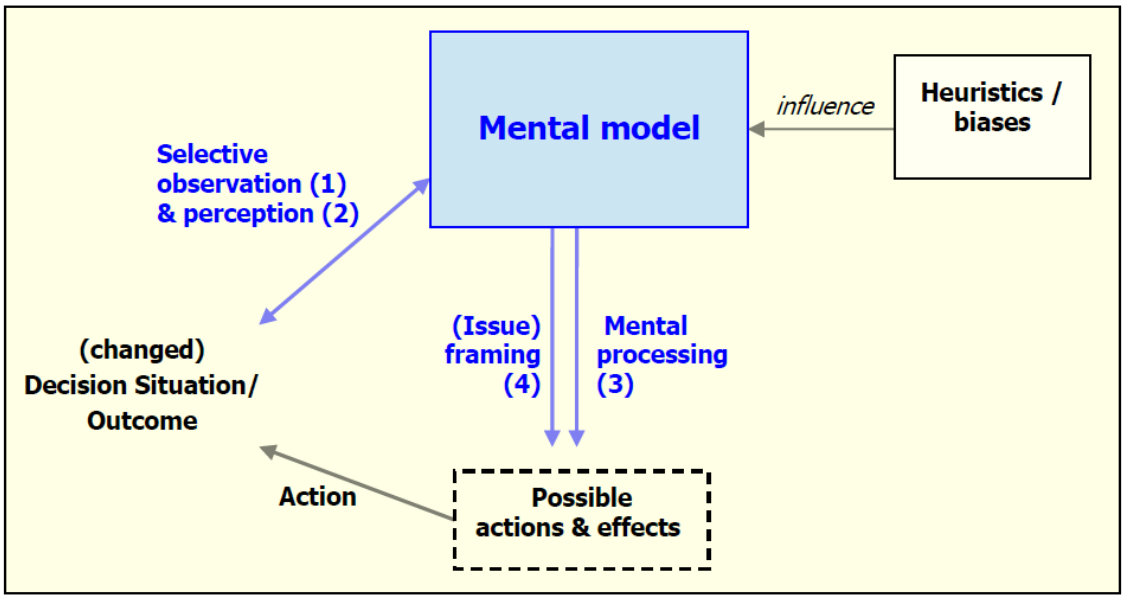


Figure 8 Schematic of mental models in a decision situation (Isendahl, 2010)

The process starts when individual can consider only some details and information of a certain situation through their limited mental models observing selectively only those parts from their interest, concern and perception [(1) and (2) in Figure 8]. The perceived information is processed (3) and translated (4) into approaches to deal with the respective situation [box 'possible actions & effects']. All those four processes of observation, perception, mental processing and issue framing may be influenced by heuristic cognitive processing.

3.5 Methods of eliciting mental models

As interest in mental models has gained among practitioners in natural resources management field as recognizing the linkage of the plurality of values and goals of resources to the range of stakeholder perceptions, mental models are elicited for the following reasons (Jones, Ross, Lynam, Perez, & Leitch, 2011) :

- To explore similarities and differences between stakeholders' understanding of an issue to improve communication between stakeholders
- To integrate different perspectives, including expert and local, to improve overall understanding of a system
- To create a collective representation of a system to improve decision making processes
- To support social learning processes
- To identify and overcome stakeholders' knowledge limitations and misconceptions associated with a given resource
- To develop more socially robust knowledge to support negotiations over unstructured problems in complex, multifunctional systems

There are many variants of the technique to elicit people mental models. The initial elicitation of mental models can be done by direct elicitation procedures and indirect elicitation. Representation of mental models can directly elicit by interview from the interviewee through a diagrammatic interview or semi-structured interview. Participants may be asked to draw a diagrammatic representation of their mental models, using pictures, words, and symbols, or they may be provided with existing concepts on a set of cards and asked to arrange them into a representation. Semi-structured interview was mentioned as "more accurate estimates of belief prevalence identifying relevant issues and familiar language"

(Gilmour and Sysak, 2009). On the other hand, mental models can be extracted from written documents or verbal text, which may be elicited via an interview. The verbal structure identified within a text is a sample of the full symbolic representation of an individual's cognitive structure (Jones, Ross, Lynam, Perez, & Leitch, 2011; Gentner, 2002).

3.6 Representing and analyzing mental models

In order to represent and utilize mental models, tradition six-step processes in mental model mapping is used as illustrated in Figure 9 (Trochim, 1993).

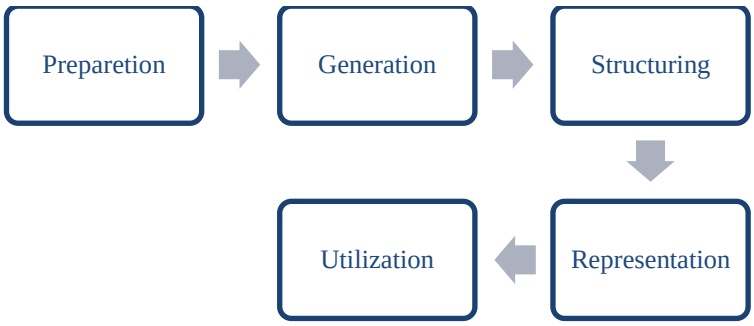


Figure 9 The six-step in mental models process

Through the structuring process, data from mental models elicitation procedures (direct and indirect method) can compose overall mental models image or "mental models map" as a series of psychological transformation about the phenomenal in everyday life. In some cases, mental models map is used interchangeably with the term "cognitive map". Variety of procedures has been shown different perspective of its effectiveness, for examples, causal mapping, semantic mapping and concept mapping (Dagon, 2002).

Derived from personal construct theory positing that an individual's set of perspectives is a system of personal constructs and individuals use their own personal constructs to understand and interpret events (Kelly, 1955), causal mapping is one of the most commonly used cognitive mapping techniques in investigating the cognition of decision makers in organizations (Swan, 1997). A causal map represents a set of causal relationships among constructs within a belief system through capturing the cause effect relationships insights into the reasoning of a particular person. Example of a causal map of relationship between subordinates setting and ultimate results is presented in Figure 10 (Manzoni & Barsoux, 2009).

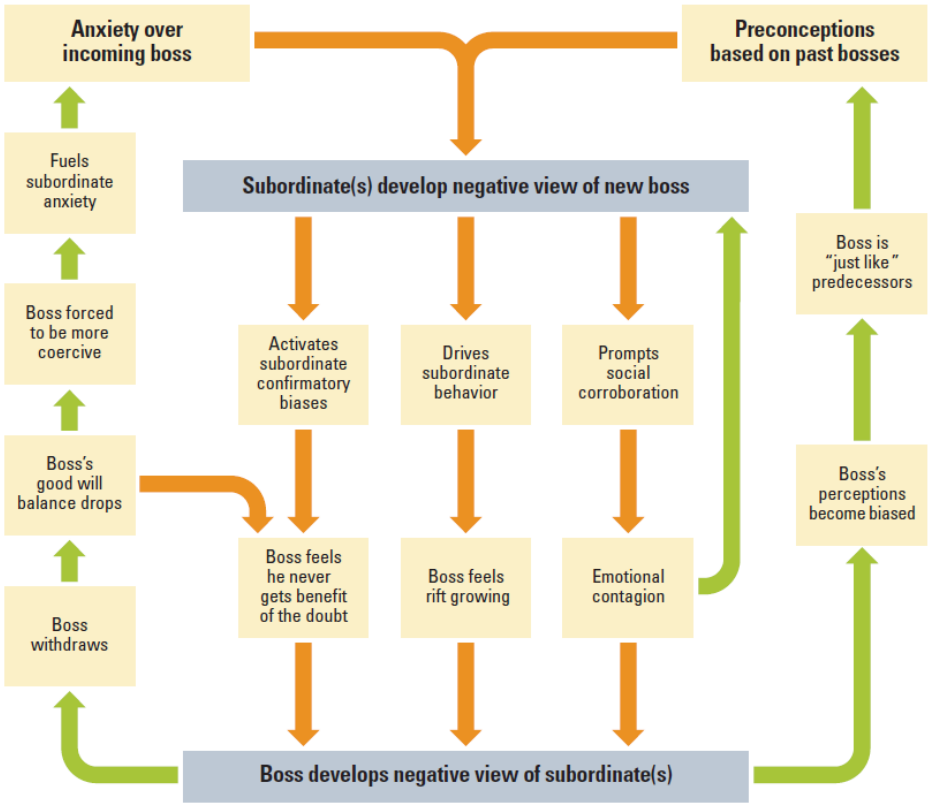


Figure 10 An example of causal map

Semantic map is a visual strategy used to explore an idea without the constraints of a superimposed structure and identify other relations among concepts (Buzan, 1993). There are three components to a semantic map:

1. Core question or concept: this is a key word or phrase that is the main focus of the map.
2. Strands: subordinate ideas that help explain or clarify the main concept. These can be generated by the students.
3. Supports: details, inferences and generalization that are related to each strand. Supports clarify the strands and distinguish one strand from another. Illustration of semantic map components is shown in Figure 11.

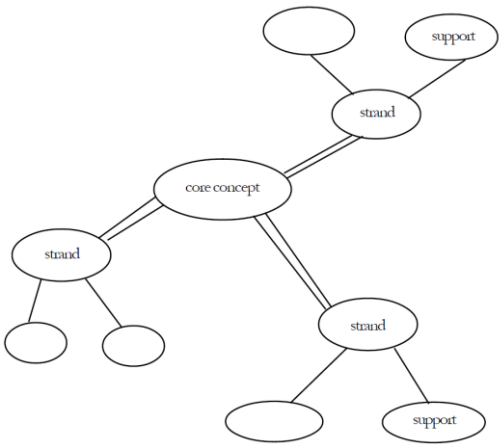


Figure 11 Three components to a semantic map (source: http://literacy.kent.edu/eureka/strategies/semantic_mapping.pdf)

Concept mapping has recently been popular mapping technique representing a graphical representation where nodes represent concepts, and links represent the relationships between concepts. The links, with labels to represent the type of relationship between concepts, can be one-way, two-way, or non-directional. The concepts and the links may be categorized, and the concept map may show temporal or causal relationships between concepts (Plotnick, 1997; Pokharel). Example of concept map is presented in Figure 12.

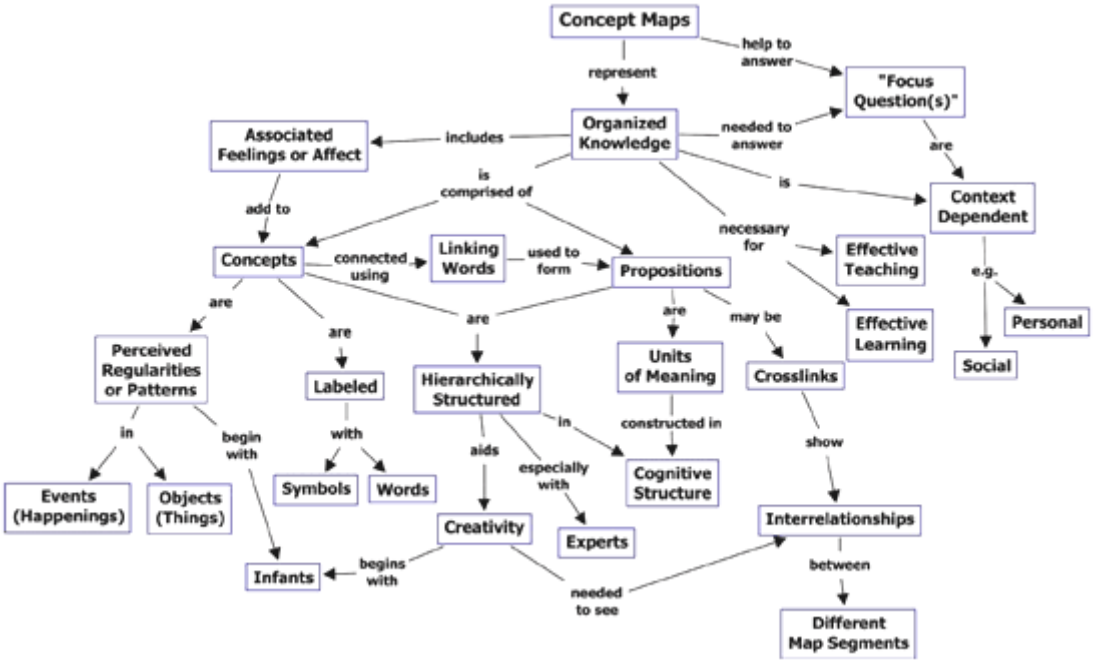


Figure 12 Example of concept map (source: http://intraspec.ca/cogmap.php#.UPN4oif5k6Y)

3.7 Mental models application in water resources management

Application of mental models concept in water resources management can be generally categorized into 1) Utilization as a tool for participative planning and management, 2) Comparison on mental models elicitation method and 3) Utilization as input into computer modeling. The brief summary on each application is presented as following.

3.7.1 Utilization of mental models as a tool for participative planning and management

Elicitation and analysis of mental models of different stakeholder groups associated with water management allow us to develop mechanisms to enhance effective management and use of water resources. Analysis can aid integration between disciplines, participation of public stakeholders, and can stimulate learning processes. Mental model mapping is recommended to visualize the use of knowledge, to analyze difficulties in problem solving process, and to aid information transfer and communication. One of examples in mental models utilization for water resource public policy is found in the water issue in Shikoku Island to form an agreement on adaptation policy as a result from the information sharing and understanding. The recognition maps of issues by four prefecture's citizens were made and compared to propose appropriate solution for the water management. In the HarmoniCOP project (the development of a framework for social learning for resources management), the stakeholder's mental models was elicited and interpreted as combining content management as well as social involvement processes to achieve both technical and relational outcomes.

3.7.2 Comparison on mental models elicitation method

The elicitation and analysis of mental models of different stakeholder groups associated with water management to explore the degree to which different groups shared mental models of the whole system, of stakeholders, of resources, of processes, and of interactions among these last three. Different metal model elicitation methods were compared in the study between consensus analysis and the ARDI (Actors- Resources- Dynamics-Interactions) approach in the Crocodile Catchment. Both methods were used to explore specific questions within the context of understanding whether differing views about the catchment would yield insight on non-compliance with environmental flows. This research found that with respect to the techniques for eliciting mental models, both methods accommodate high levels of representation and inclusivity and are therefore in accordance with participatory water resources management.

3.7.3 Utilization as input into computer modeling

In the modeling water resource in the Australian Capital Territory, mental models elicitation was used as the methodology to collect, analyze and merge views elicited from stakeholders (i.e. users and managers) and to form them into a conceptual causal feedback representation of the problem. This representation forms the basis for subsequent stages in which quantitative models and computer simulations will be developed. Another application of mental models elicitation as input into computer modeling was found in the multi-agent modeling.

3.8 Stakeholder analysis in water resources management

This section aims to provide reviews of stakeholder analysis literatures mainly for water resources project management and stakeholder participation in water resources project in Thailand. The contents cover the general explanation of stakeholder analysis, stakeholder participation and sense of ownership, and issue of water resources project stakeholder participation in Thailand.

Stakeholder analysis in natural environment has largely been recognized since the 1990s due to a number of unsuccessful projects regarding non-cooperation or opposition from project related stakeholders (Grimble, 1998). Stakeholder is generally defined as an interested individual, group or institutions that may be impacted by, or can influence the success or failure of a project (Bourne, 2009) (IUCN) (Joep, 2006). Stakeholder analysis is a process to understand existing pattern of stakeholder interaction involving project or resource by means of stakeholder identification and stakeholder interest and influence assessment. A number of literatures have conducted stakeholder analysis carried out by the essential analytical steps in Figure 13 (CEDARE, 2007) (Daiwen & Minquan, 2009) (Prell, Hubacek, & Reed, 2007) (Maheshwari & Pillia, 2008) (KBR, 2008). Intensive review of stakeholder analysis methods for natural resource management can be found in the work of Reed, et al.(2009).

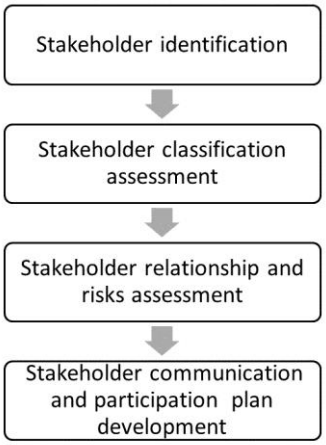


Figure 13 Stakeholder analysis steps

In order to assess stakeholder classification, stakeholders may be classified by using attribution possession of importance and influence dimension (Chigona, Roode, Nazeer, & Pinnock, 2009). Other examples of analytical stakeholder classification include using levels of interest and influence (Lindenberg and Crosby, 1981 cited by Reed, et al. , 2009), urgency, legitimacy and influence (Mitchell et al., 1997 cited by Reed, et al., 2009), power, proximity and urgency (Bourne, 2009). Stakeholder analysis is proved as a useful a tool used to develop stakeholder participation plan (CANARI, 2004).

3.7.1 Stakeholder participation and sense of ownership

Current water resources mangament paradigm has moved towards stakeholder participation approach (ADB, 2001; GWP-TAC, 2000; Neef, 2008). Stakeholder participation is defined as "the process through which the views of all interested parties (stakeholders) are integrated into project decision-making" (Jain & Singh, 2003 p.529). Although there is no guarantee that stakeholder participation can enhance the quality of project decision-making, there is evidence that good practice in stakeholder participation can both reduce the risk of project failure and improve transparency in decision-making (Baldwin & Twyford; Jain & Singh, 2003; Reeds, 2008; Newig, Pahl-Wostl, & Sigel, 2005).

Regarding ownership, the state of psychological ownership emerges when individual or group has a feeling of possessiveness and of being psychologically tied to an object (i.e., "it is MINE!") (Pierce, Kostova, & Dirks, 2001). To determine the potential for broad public participation and the quality of a community development process and outcome, Lachapelle (2008) suggested three essential characteristics of a sense of ownership as: 1) ownership in

process, 2) ownership in outcome, 3) ownership distribution. It is largely accepted that the idea of a sense of ownership is a vital issue to water resource project sustainability. However, little is known about what a sense of ownership for water resources project is, or what form of participation can encourage a sense of ownership to stakeholders during project life cycle.

It may be concluded that benefit that water resource project can bring from stakeholder participation includes a sense of ownership development and responsibility sharing among stakeholder toward a project (Jain & Singh, 2003). It is argued that participatory process which takes stakeholder's viewpoints into accounts may lead to a sense of ownership over the process and outcome (Reed, 2008). In addition, public participation implies sharing of responsibility, and it may be one of the most effective ways to unlock to the *not in my backyard* (NIMBY) syndrome. Empirical references from water resources projects suggested that public participation would eventually instill a sense of ownership in a project and increase sustainability of the project, (Marks & Davis, 2011; ADB, Consultation and Participation, 2011)

3.7.2 Stakeholder participation in Thai water resources project

The constitution is a major drive for stakeholder participation. Under the 1997 Constitution, all related stakeholders should participate in the development and management process. While the national water law is not promulgated, there are three regulations relevant to water resources management public participation aspect: (a) the Decentralization Act B.E.2542; (b) the Office of Prime Minister Regulation on Public Consultation B.E.2548; (c) the Office of Prime Minister Regulation on water Resource Management B.E.2550 (Department of Water Resources, 2007). Decentralization has been promoted to devolve power from the central government to the local government in line with adoption of Integrated Water Resources Management (IWRM) to encourage public participation in water resources management in Thailand (Kanjina; Lien, 2003). Establishment of river basin committee in the whole 25 river basins of Thailand have been playing an important role in empowering and involving related stakeholder in water resources management in river basin context (UN-WATER/WWAP, 2007; Department of water resources, 2007). As a result from the 2002 Bureaucratic Reform Act, the Tambon Administration Organization (TAO) is responsible for local natural resources development at local level. The TAO receives a large amount of the budget from the central government and are the main planning organization at the local level with the assistance from line agencies. Under the trend of accelerating

decentralization, small-scale water resources project operation and maintenance has been transferred from the Department of Water Resources and the Royal Irrigation Department to TOAs (Mekong River Commissions, 2010).

Aiming to introduce a collaborative management and involve related stakeholders in Thai water resources project management, the possible way is to encourage Thai government agencies to conduct project stakeholder analysis which can start from the establishment of in-house policy for stakeholder management in water resources project development. This requires interaction and cooperation among divisions or bureaus inside the organization. Taking the Department of Water Resources (DWR) as an example, project feasibility, project design of development water network, management and improvement of project operation and maintenance is under responsibility of the Bureau of water resource development and the Bureau of water resources coservation and rehabilitation. At the same time, the Bureau of mass promotion and coordination takes charge of promotion of participation in water resources management, conservation and rehabilitation work as well as building awareness among government officers and private sector work. Technicians and engineers in Bureau of water resource development and the Bureau of water resources coservation and rehabilitation are usually not familiar to deal with social and political issues, the negotiations and conflicts among stakeholders or the political process. Interaction and cooperation among these bureaus is essential in order to lead to an integrated technical aspect and participation aspect for a water resources project. However, the actual coordination depends on official staff attitude and interest toward the coordination and whether or not person is enthusiastic about it. This interaction and coordination scheme is also required to the DWR regional offices. The key advantages to the government agency from employing stakeholder analysis are discussed below.

A) Better understanding in stakeholder conflict and trade-off

Conducting stakeholder analysis is a way to identify and understand stakeholder interests, characteristics and curcumstances. In additon, it can represent existing patterns of interaction between stakeholders which could assist to identify conflict of interests and trade-off among stakeholders. Conflict is defined as a situation of competition and potential disagreement between two or more stakeholder groups over the use of resource (Grimble, 1998). A trade-off is defined as a decision making unit to balance conflict objective's values of a stakeholder group (give up one to gain another). Conflict and trade-off is likely to occur

together when the resources become scarcer or highly valued, and it is common issue in water resources management. Considerable values from potential conflicts and trade-off consideration among stakeholders by stakeholder analysis could assist government agencies to improve the selection and design of a small-scaled water resources project and ensure project outputs to meet the needs of stakeholders (Grimble, 1998). To put it into practice, stakeholder analysis should be conducted at the earliest stage possible in decision-making especially when project is being conceived.

B) Facilitate public participation and improved decision making

Public participation concept in small-scaled water resources project in Thailand was introduced by the Ministry of Natural Resources and Environment (MoNRE), new established ministry after the 2002 Bureaucratic Reform in Thailand. In addition, under the trend of accelerating decentralization, the establishment of the sub-district (Tambon) administrative organizations (TAOs) could encourage locals to more participate in project decision-making. These increasing of stakeholder participatory approach have been evidenced through a series of consultative and discuss among project related stakeholders. However, there remain many serious problems in stakeholder participation issues that need to be resolved. For example, in some cases the government officials are doubted in locals' knowledge and capability to manage their own resources associated with lack of knowledge to moderate participatory event due to having been trained in technical issue. Furthermore, public participation was seen as involving a higher number of stakeholders in information delivery rather than engagement of stakeholders which is denoted that participation is used as a label to gain legitimacy for project implementation (Neef, 2008).

Based upon the previous experiences and lesson learned, stakeholder analysis could incorporate stakeholder value and facilitate stakeholder participation. Stakeholder analysis can be used as a primary participatory tool for the government officials to identify project related stakeholders and develop a common understanding among stakeholders. For small-scaled water resources project in Thailand, stakeholder analysis is encouraged to conduct with the active participation of related stakeholders where two-ways exchange of information between stakeholders and the government as equal partners. In worst case scenario, level of participation in stakeholder analysis may take passive consultation where related stakeholders simply provide information for the analysis (Reeds, 2008). Once the stakeholders participate in the project, it could lead to improving the quality of planning and

decision-making, the positive image to government and development of a sense of ownership and responsibility among stakeholders toward a project.

C) Develop stakeholder relationship management plan

One of outputs form stakeholder analysis is a stakeholder relationship management development. The information and results from stakeholder identification, stakeholder classification and assessment and stakeholder relationship and risk assessment are inputs into the stakeholder relationship management plan. Success in stakeholder relationship management is likely to achieve through a continuous communication among stakeholders. The bases on effective communication plan comprise of facts and information regarding to a project, the effective message format and the appropriate methods and frequency of delivery.

Facts and information regarding a project should be provided to related stakeholder in every project lifecycle stage to ensure mutual understanding between the government officials and other stakeholders. If it is possible, the project information should be communicated or disseminated in local language without too much technical terms. A variety of tools can be used depending on site conditions, level of literacy, cultures, and attitude of the stakeholders. In addition, how frequency the information is delivered in applicable timeframe must be concerned. The effective of communication also depends on the relationship between sender and receiver, and facilitation skill of the government official field staffs is essential (Jain & Singh, 2003; Reeds, 2008).

The increasing of stakeholder participatory approach has evidenced through a series of consultative and discuss among project related stakeholders. However, there remain many serious problems in stakeholder participation issues that need to be resolved. These include poor involvement of stakeholders in the project development process, free water access attitude, free of charge on a project provided by the government, little appreciation in project, and, therefore, lack of sense of ownership. Also, inadequacy of qualified staffs and a restriction in budget allocation for managing river basin committee are a bottleneck to support and promote stakeholder participation in Thailand (Lien, 2003; UN-WATER/WWAP, 2007).

3.9 Summary

It is hoped that by better understanding each stakeholder group mental model in water resources project management, each stakeholder will bridge communication gaps which

may lead to the modification of technology and project management scheme for modifying decision making environment for better society.

Chapter 4: METHODOLOGY

4.1 Introduction

This chapter explains the research design for conducting research and specifies details of the methodology procedures that were necessary to obtain data needed to investigate the research questions in Chapter 1. The research was divided into three phases (Figure 3 in Chapter 1) using qualitative research approach and case study approach as following:

Phase I: Initial diagnosis of malfunction project causes

Phase II: Empirical study

Phase III: Developing improvement options for dealing with malfunction of projects

This section reviews each phase of the research's methodology in sequence since each phase's results informed and altered the subsequent phase's content. The results of each phase can be found in Chapter 5.

4.2 Phase I: Initial diagnosis of malfunction project causes

The purpose of the initial diagnosis of malfunction project causes was to identify causes, actions and results regarding malfunction of small-scales water resources in the Northeastern Thailand. As the existing literatures identified in literature reviews (Chapter 2) are inadequately identify root causes of malfunction projects, concept of Failure Knowledge Database (Hatamura Y. , 2005) was employed in this stage to investigate three elements; "Causes", "Actions", and "Results" of the event.

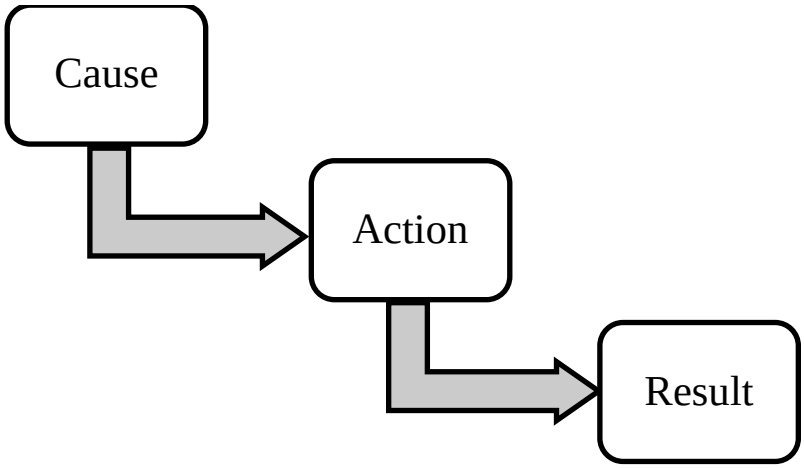


Figure 14 Three basic elements of failure case

Failure knowledge database was developed based on learning experience and lesson learns from failure for the purpose of avoiding and preventing project failure (Wang, Pan, & Li, 2010). A failure consists of three basic elements; “Cause”, “Action”, and “Result” as illustrated in Figure 14. A cause is described in response to which a person takes action, leading to the resulting failure. In this reasoning, action can be regarded as the human intervention that links the cause and result of the failure, neither cause alone nor action alone will lead to failure, and failure can only result when both cause and action exist. Structure of cause, action and result leading to failure can also be presented in form of a diagonal scenario (Hatamura Y. , 2005; Hatamura & Iino, 2004).

In Figure 15, the elements of failure is expressing through three Mandalas, one each for Cause, Action and Result, referred to as “Failure Mandalas”. The following list summarizes the top level key phrase of Cause, Action and Result in Failure Mandalas (Hatamura Y. , 2005).

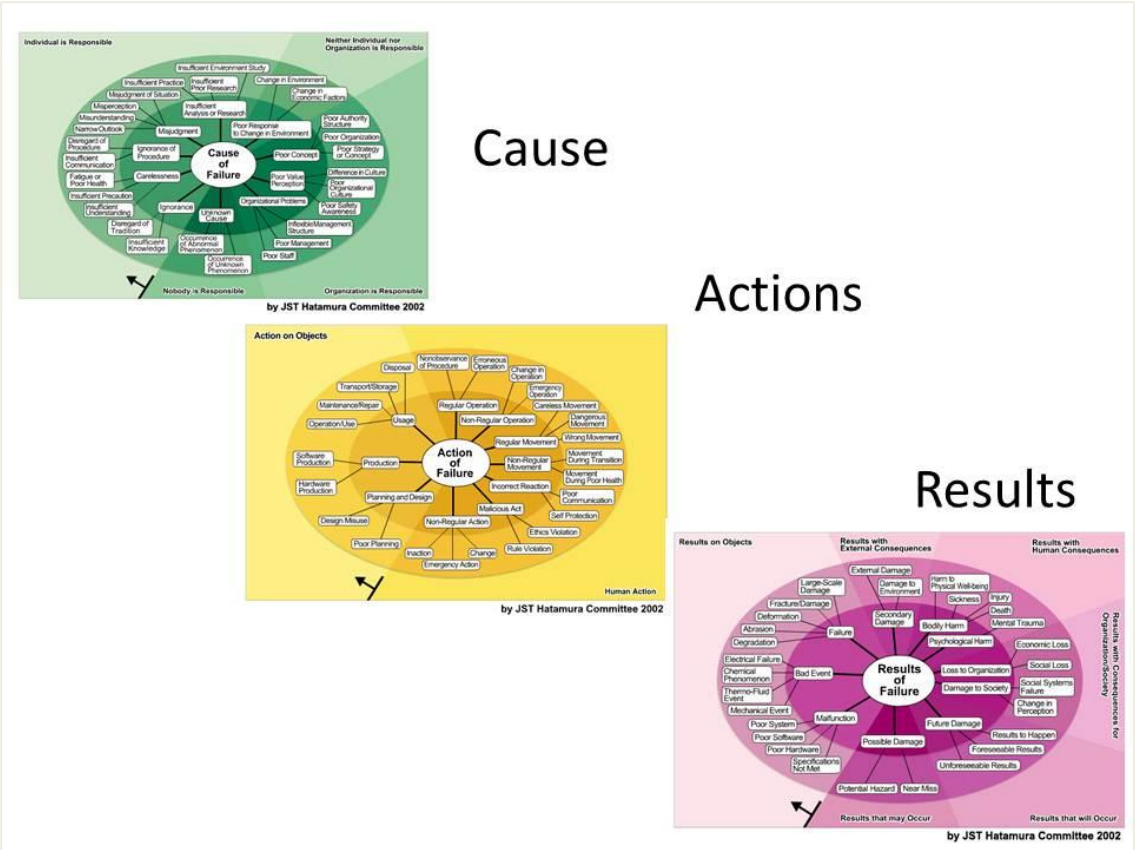


Figure 15 Failure mandalas

- Cause
  - Individual is responsible
  - Organization is responsible
  - Neither individual nor organization is responsible
  - Nobody is responsible
- Action
  - Action on object
  - Human action
- Result
  - Results on objects
  - Results with external consequences
  - Results with human consequences
  - Results with consequences for organization and society
  - Result that will occur
  - Result that may occur

The causes, actions and results based on the failure knowledge database were developed to focus on the malfunction of small-scaled water resources project in Thailand. The results of analysis are presented in Chapter 5. The failure knowledge database results identify key aspects of small-scaled water resources malfunction causes that increase understanding of failure phenomenon. However, the results from this analysis treat the malfunction project as physically with less concern about how related stakeholders understand and response to malfunction projects. For this reason, the output from the failure knowledge database analysis was used as input to design set of question guide in semi-structured interview in order to understand stakeholder mindset associated with malfunction project by means of stakeholder mental models elicitation in empirical study phase.

4.3 Empirical study

Continuing from the initial diagnosis of malfunction project causes in Phase I, the empirical study phase focuses on developing a schematic representation of multi-stakeholder mental models associated with malfunction of water resource project. Elicitation of multi-stakeholder mental model was done by means of two selected case studies located in Chaiyaphum province, the Northeastern region of Thailand. Case study research allows for study of a phenomenon within a real life context and relies on multiple sources of evidence (Veel, 2005). The case study was conducted in the northeastern Thailand where study site was selected due to the availabilities of participants, responsiveness and access to information relevant to the study. Related stakeholders were requested to join this study to cover main stakeholder based on a project life cycle.

This phase aims to present the analysis of a different stakeholder group mental models which can reveal experiences, perceptions, assumptions, knowledge and subjective beliefs of stakeholders toward small scale water resource project management. Stakeholders who presume to be relevant to the study were identified and continued to consult throughout the course of this study. Purposive sampling was employed due to difficulty to determine the sample size in advance and limited knowledge about the larger population from which the sample is taken (Neuman, 2006)

In order to elicit stakeholder belief and their understanding of water resources management, semi-structured interview was used. All data collected in the interviews were

transcribed into individual record and exported to a software analysis tool (Weft QDA) to code and manage qualitative data.

Stakeholder mental models influence map, which represents the mindset of stakeholders and their decision making and their actions, were constructed to explore behavioral objectives and factors for each key stakeholder that hinders an achievement of a water resources project management. These findings from different stakeholder group mental models then integrate to project life cycle to analyze small-scale water resource project management problem existing in Northeastern of Thailand based on project phases and stakeholder mental models. A framework over each process in empirical study phase is presented in Figure 16.

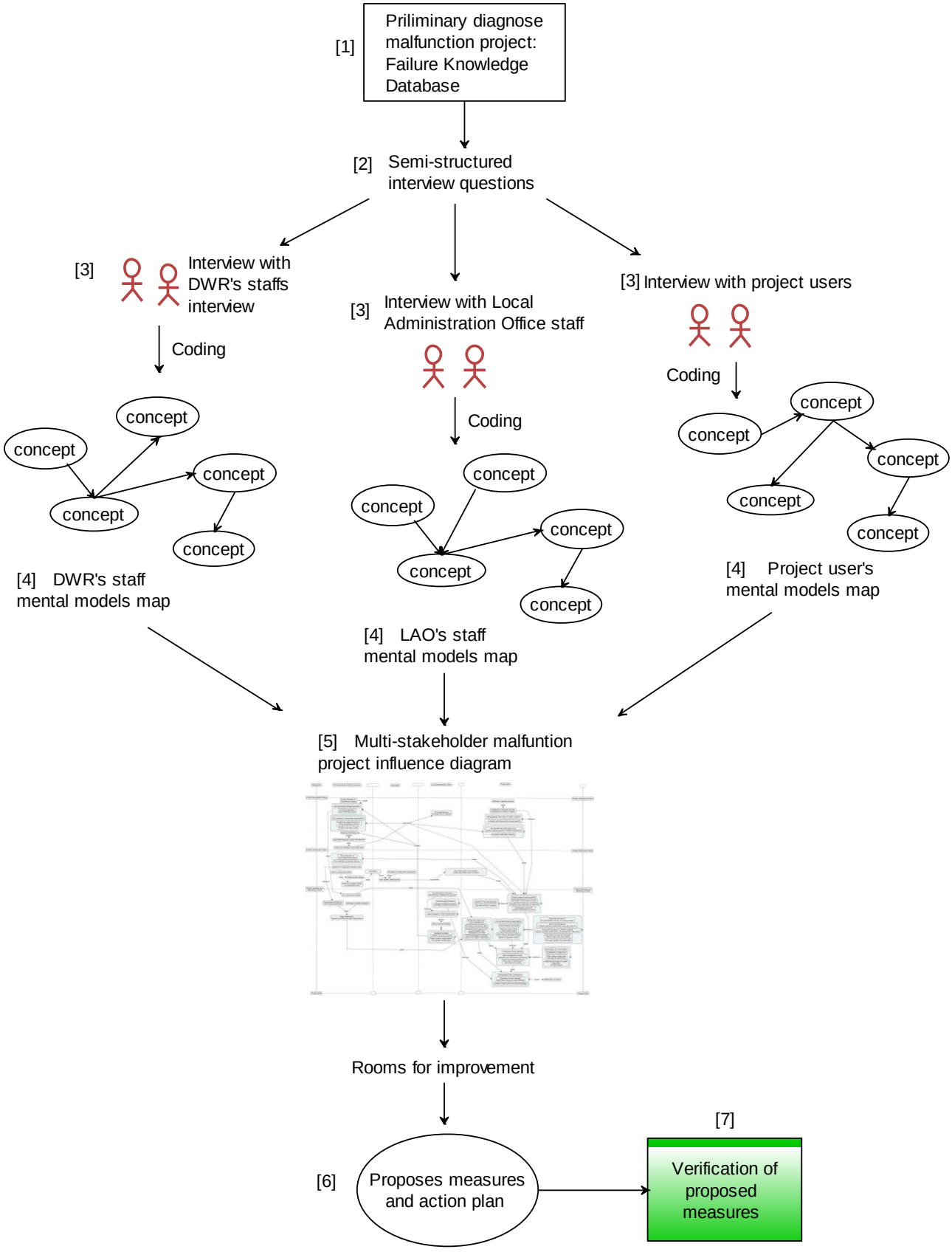


Figure 16 Empirical study phase framework

4.3.1 Stakeholder semi-structured interview

The goal of stakeholder mental models interview is to get stakeholder to talk as much as possible on how they think about the malfunction of project and the project management while imposing as little as possible of other people's ideas, perspectives and terminology. Semi-structured interview was used as a strategy for accomplishing this goal. The semi-structured interview is not highly structured, as is the case of an interview that consists of all closed-ended questions, nor is it unstructured, such that the interviewee is simply given a license to talk freely about whatever comes up. The advantage of the semi-structured interview is that the interviewer is in control of the process of obtaining information from the interviewee, but is free to follow new leads as they arise. Each respondent was asked to give a once off, in-depth interview of approximately twenty minutes to one hour in duration. The interview guide used was a set of questions, targeted at different categories of respondents based on their status and position and phrased in a similar way across respondents to encourage consistency in data collection and to make comparisons between the various respondents (Bernard, 1988).

Interview question guide for semi-structured interview was prepared to explore the views, knowledge and understanding of stakeholders with the project conditions as it currently exists, examine stakeholder's role and responsibility to the project and elicit their attitudes and mind-set towards the malfunction project. The interviews were structured as presented in Table 3.

Table 3 Semi-structured interview questions guide

Category	Questions
Warm-up	1. An overview of your purpose and intended uses for the interview data 2. The measures taken to protect confidentiality and anonymity 3. Discuss and get permission for tape recording or note-taking
Stakeholder analysis	1. Demographic data 2. Could you tell me about this project? 3. How this project/water is managed? 4. What is your relationship to the project? 5. What is impact from the project (positive and negative) from the past and current use? 6. Who else use this project? 7. Who has rights and responsibilities over the project?
Project development process	1. Do you have idea how this project is develop? 2. What do you think about the way that project was develop? 3. Did you involve with the project development? How? 4. Were there any problems associated with project development? 5. What were the causes and effects of these problems in your opinion? What can be solution to address these issues? 6. Can you identify the mindsets that are underlying a behavior/ decision/ solution?
Malfunction of the project	1. Can you tell me about problems associated with the malfunction of this project or this water use? 2. In your opinion, what cause these problems and what are effects of these problems? 3. What make you think these issues are problems? 4. What can be solution to address these issues? 5. What are barriers to implementing these solutions? And why?

Closing interview Thanking subjects for their participation	1. How was it to participate in this interview 2. Were any questions too hard, unclear, or unpleasant to answer? 3. Were there any issues related to the malfunction of this project that you thought of but didn't get a chance to talk about?

The interviewees were formed into three groups; the Department of Water Resources officer, the officer in the local administration office and project beneficiary. The interviewees list of twenty one different stakeholders is shown in Table 4.

Table 4 Number of different stakeholder group

Interviewee group	Number
Officer in the Department of Water Resources	5
Officer in the local administration office	4
Project beneficiary	12
Total	*21*

4.3.2 Background to the case studies

Two case studies, the Kud Sri Phum weir project and the Wang Ta Ke weir and canal system project, were investigated for the analysis of stakeholder mental models related to malfunction of small-scaled water resources project in Thailand. The basic information regarding case studies are presented as follows.

1. Kud Sri Phum weir project

The Kud Sri Phum weir project is located in Kud Sri Phum village, Kud Yom sub-district (Tambon) in Chaiyaphum province, the Northeastern of Thailand. The total population in the Kud Yom sub-district is approximately 5,854, with 1,121 households. The main income is from farming, but rather low income which occupation is reinforced by woven wool.

The project was constructed in 1999 by the Office of Accelerated Rural Development. After the 2002 Thai government bureaucratic reform, the project was transferred to the

Department of Water Resources. The project is broad-crested weir constructed in the Kud Reau canal with 50.60 meter width and 4.00 meter high aiming for water storage purpose. The project serves 108 households. Major hydrological input includes water from the Chulaporn dam in the upstream and rainfall (including runoff). Current condition of the Kud Sri Phum project is presented in Figure 17.

Figure 17 Kud Sri Phum weir project

Current problems project users facing are water shortage in dry season and flooding in rain season. Some major defects occur on infrastructure, for example, cracks on the retaining wall and leaking underneath the weir. In addition, there is no establishment of water user group for the project which the administrative control and responsibility with the project rests with the local administration office and the Department of Water Resources for the maintenance and repair work of the project.

2. Wang Ta Ke weir and water distribution project

The project is located in Wang Ka Ta village, Wang Ta Ke sub-district, in the province of Chaiyaphum. The Wang Ta Ke sub-district is about 60 kilometers from Chaiyaphume province, by car on the west highway number 225. The sub-district has a total area of 306 Km^2 with 18 villages. Total population in the Wang Ta Ke is about 13,959 with 4,372 households. Main occupation in this area is farming which main crops include rice,

cassava, maize, sugar cane and peppers. The area geographical condition is knows as terrain condition where 70% of the area is covered by the Sai Thong national park. The average annual rainfall in Chaiyaphum province is about 1,153 mm per year, with average 105 precipitation days per year.

Figure 18 Wang Ta Ke project

The Wang Ta Ke weir project was constructed as temporary reservoir by local villagers about 40 years ago, and has been rehabilitated later by provincial administration office, the office of Accelerated Rural Development and the Department of Water Resources. The 2.8 km reinforced concrete canal was constructed by office of Accelerated Rural Development in 2002 in order to deliver Water from the reservoir to farmland. In 2010, the emergency wet crossing weir was constructed by the Department of Water Resources to prevent damage from flood to the main road and villager's property. With the failure in construction and management, however, the project is now in malfunction condition. Regarding the 1997 decentralization Act, the project is supposed to transfer from the Department of Water Resources responsibility to the Wang Ta Ke Local Administration office, but the local administration office rejects to accept the project in the current condition. Appearance and function of the Wang Ta Ke project is shown in Figure 18. Severe damages on infrastructure occurred, including damages from flooding on the box culvert and malfunction of water distribution system.

4.4 Qualitative data analysis

This research employs qualitative data analysis (QDA) which the qualitative data are collected from interviews, observations and documents to elicit stakeholder mental models. Some preliminary analyses were conducted between interviews as a means of refining the exploratory nature of the project management. After completing the interviews, formal analysis began on the audio recordings and written notes collected during each participant's interview. These were then transcribed and digitized for easier analysis. In respect privacy of the interviewees, the transcripts and notes were anonymized and assigned a name code. All identifying information, such as names, positions and locations were edited out and replaced with pseudonyms. Once this was completed, the analysis focused on insights from the related stakeholders where the emphasis was placed on characterizing the stakeholder mental models to identify relevant causes and constraints to malfunction project. The processes in qualitative data analysis are show in Figure 19.

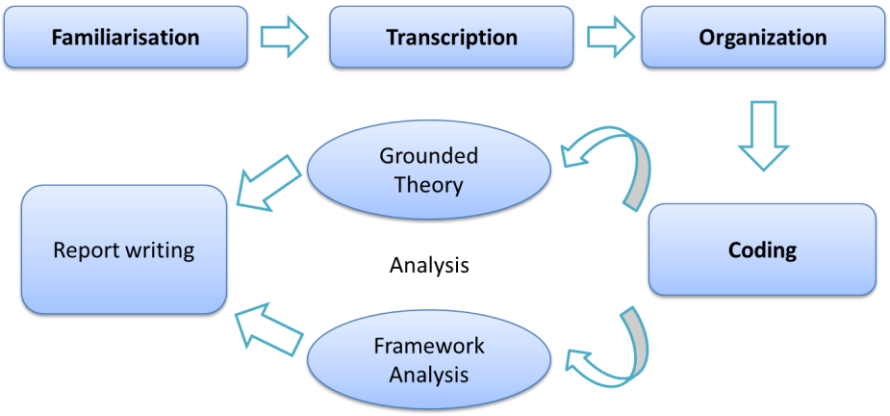


Figure 19 Qualitative data analysis process
(http://www.learningdomain.com/PhD/QualCORE2.html)

4.4.1 Open coding and axial coding

Coding is known as a process of mechanically data reduction and analytical categorization of data. Codes can be based on themes or topics, ideas or concepts, terms or phrases and keywords (Neuman, 2006). Gibbs (2005) suggested what to code shown in Table 5.

Table 5 What can be coded

NO.	WHAT CAN BE CODED
1	Behaviors, specific acts
2	Events – short once in a lifetime events or things people have done that are often told as a story.
3	Activities – these are of a longer duration, involve other people within a particular setting
4	Strategies, practice or tactics
5	States – general conditions experienced by people or found in organizations
6	Meanings – A wide range of phenomena at the core of much qualitative analysis. Meanings and interpretations are important parts of what directs participant's actions. a. What concepts do participants use to understand their world? What norms, values, and rules guide their actions b. What meaning or significance it has for participants, how do they construe events what are the feelings c. What symbols do people use to understand their situation? What names do they use for objects, events, persons, roles, setting and equipment?
7	Participation – adaptation to a new setting or involvement
8	Relationships or interaction
9	Conditions or constraints
10	Consequences
11	Settings – the entire context of the events under study
12	Reflexive – researcher's role in the process, how intervention generated the data

In order to make qualitative data manageable, three kinds of qualitative data coding were defined; open coding, axial coding and selective coding (Strauss, 1987 in Nueman, 2006). An open coding is used to examine the data to condense them into primary analytical categories or codes, and then axial coding is a second stage to organize the codes and make connection among them to analyze key categories. After the major categories were scanned and linked, selective coding is applied to examine and identify the selected data that will support the developed conceptual coding categories (hypothesis). In this research, open coding and axial coding approach was used to identify factors or variables involved

malfunction of project that reflect stakeholder's mental models associated with small-scaled water resources project in the Northeastern Thailand.

4.5 Stakeholder mental models analysis

Each interview was transcribed, coded and organized into mental models map. Content analysis was used to take language expressed by individual stakeholder and create 'a map' of concepts and ideas. Mental models maps are used to graphically represent knowledge and feelings and are composed of concepts that may be labeled in circles or boxes. The relationships between two concepts are shown by a connecting line that links both concepts where multiple linkages are possible. Stakeholder's mental models maps were analyzed and clustered for their structure to determine supporting or preventing mindset in malfunction projects.

4.6 Development of integrated multi-stakeholder mental models and project life cycle approach for failure analysis

Failure analysis helps project manager to manage and resolve project failure problems. The integrated multi-stakeholder mental models and project life cycle approach is developed to determine the cause of a failure associated with insight from groups of stakeholder's mental models for solving the malfunction of small-scaled water resources project problem.

Conventional failure analysis or root-cause analysis methods, including Check sheets and Modified Pareto analysis (1897), Cause-and-effect diagram (Ishikawa diagrams, 1960's), Fault tree analysis (Fussel, 1976), Failure Mode and Effects Analysis: FMEA (IEEE std 352) and Failure knowledge database (Hatamura, 2005), have paid low consideration in factors involved with stakeholder behavior. In order to generate recommendations or implementations to prevent damages, most of the conventional analysis methods (Figure 20) focus on identifying causes and effects or sequent of events leading to failure phenomenon rather than emphasize on human behavior or mind-set that cause decision making which gives rise of action to cause failure. To overcome limitation of regardless complexity of stakeholder mindset and behavior associated with a failure project, the integrated multi-stakeholder mental models and project life cycle approach is proposed.

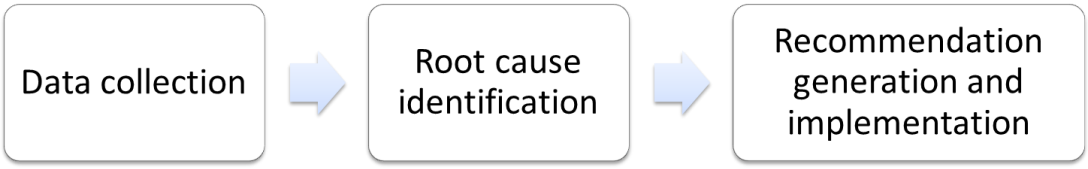


Figure 20 Conventional project failure analysis

The recognition of the importance of stakeholder's mental moldels in project management has been emerged in various views including policy design, stakeholder's perception, social learning, organization learning, adaptive management and risks and uncertainties associated with stakeholder. Understanding stakeholder's mental models can assist each stakeholder group to understand other's value and interests identify similarities and differences, explore options and agreement towards project. In the field of project management, especially public project management, it is noted that the project life cycle (PLC) management plays a key role in the control strategy for the evolution of the project which represents significant changes as the project progresses through succeeding levels of the project's maturity (Wideman, 2004). Figure 21 illustrates the various phases of the life-cycle of a project and the lifecycle of water resources project of a simple small-scaled water resources project.

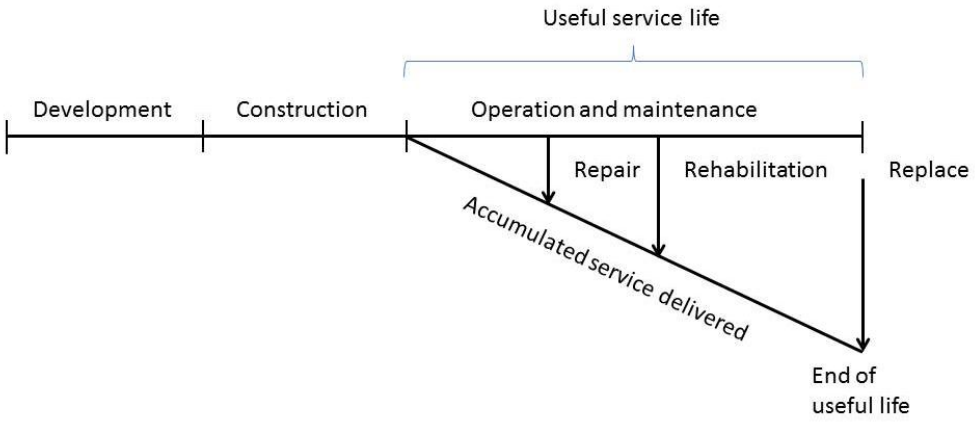


Figure 21 The life cycle of water resources project (adapted from Grigg, 1992)

In general, project life cycle defines two main components; 1) set of work should be done and 2) related stakeholder in each phase (Project Management Institute, 2001). The project life cycle management, however, focus on the project hierarchy of deliverables regardless complexity of stakeholder mindset and behavior associated with a project (Figure 22).

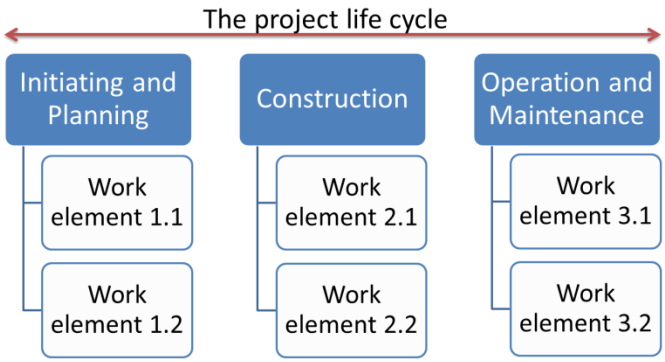


Figure 22 Project life cycle and work breakdown structure

To this aim, a mental model can be defined as a representation of thought process for how something works in the real situation. To overcome the limitation of project life cycle management, the attempt is to develop an integrated stakeholder mental models and project life cycle in order to identify stakeholder mindset associated with project work elements and analyzed differences in actual situation.

4.6.1 Stakeholder mental models, action situation, project life cycle and chronological progression of failure

Within one project task or project phase, numerous different mental models from different stakeholder may exist. As a result from different in mental models, different stakeholder may engage to the project with their different interests, beliefs, cultural background etc. This is the key reason affecting contrast expectations about each other decision making and behavior (Figure 23) (Pahl-wostl, Isendahl, Brugnach, Jeffrey, Medema, & Tess de Vries, 2006).

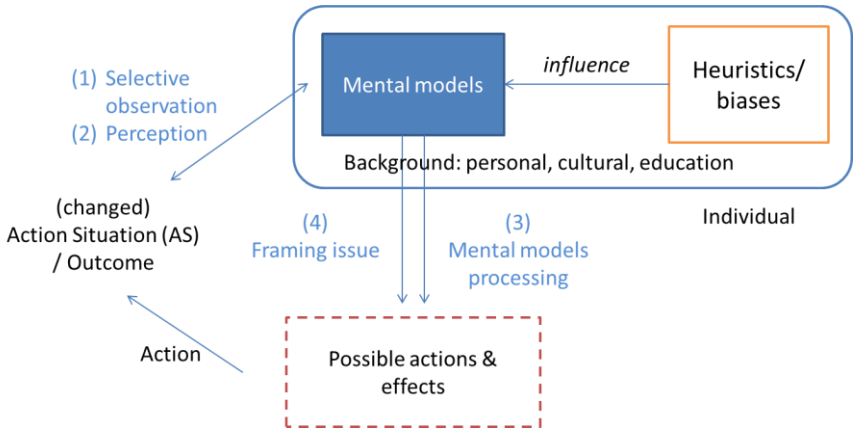


Figure 23 Key aspects and process of mental models of an individual in decision

More stakeholders involving in a project may give rise of increasing uncertainty associated to the project which could develop more diverse decision making. Uncertainty is

perceived as a subjective property relating to certain values or interest of the stakeholder who claims the uncertainty. In other words, stakeholder frames their uncertainty based on their interpretation and perception of world that they are embedded (Isendahl, 2010). Individual factors and social-structural are two influencing factors that shape perception of uncertainty. Individual factor includes personal skills, motivation etc., while social-structural factor refers to culture beliefs and externally control access to information, for example, laws, technology, etc. "A prerequisite for the occurrence of an uncertainty is an actor's awareness and subsequence attention or worry about an action situation. In case the actor is aware of a situation but attention or importance is zero, obviously uncertainty does not play a role in that situation for the specific actor but it may play a role for another actor" (Pahl-wostl, Isendahl, Brugnach, Jeffrey, Medema, & Tess de Vries, 2006). The relationship between stakeholder mental models, uncertainty and action is presented in Figure 24.

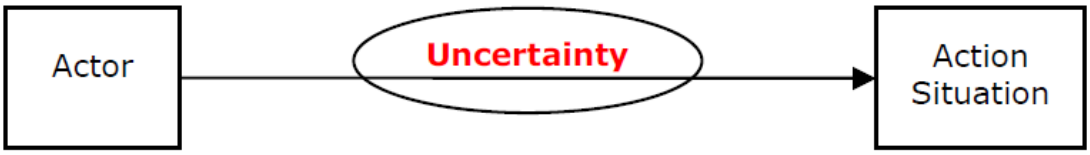


Figure 24 Uncertainty as rational property to actual situation

Various stakeholders hold different mental models within each project work element and project phase and participate in the same project task with different mental models and uncertainty. Therefore, actual results or situations may be consequence differently through different mental models. In Figure 25, the stakeholder holds their mental models in each work element or in each project phase, parts of which they may share with regard to outcome of the project (AS3). Action situation is framed differently through mental models (AS1 – AS5), and stakeholder may maintain the same mental models with regard to different situation. As a result, stakeholder frames and acts differently through different mental models in a project work element and project phase.

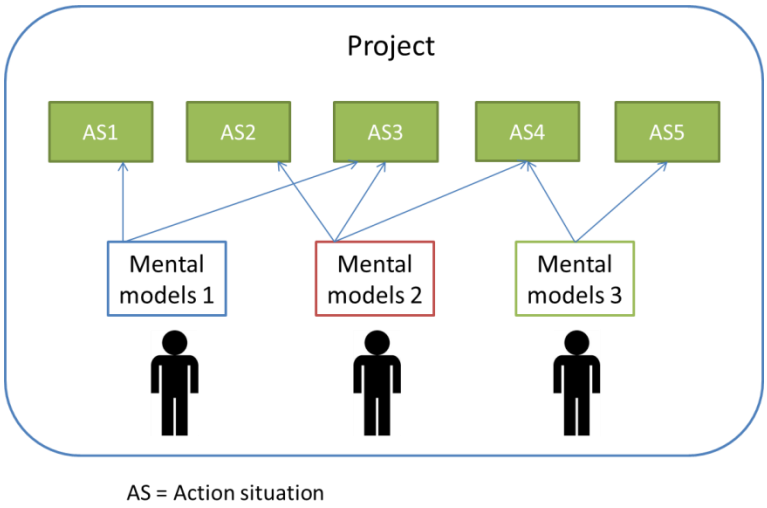


Figure 25 Mental models and situations

In conventional failure analysis, it is common to look for "cause and result". It is assumed that "cause" can be identified where "result" exists. However, on many occasions when it didn't allow identifying the causes from existing result or failure event when the causes were removed or hidden, the repetition of failure tends to occur. In a variety project failure examination, it appears to be some common aspects that a developing failure event becomes evidence with low understanding of the cause or the background. Consequently, actions were taken to deal with the unfolding sequence of failure events. For this reason, it is possible to view the failure in terms of chronological progression, with a trigger from cause and background to the result (Hatamura Y. , 2005). The chronological progression of failure is presented in Figure 26. In order to gain better understanding of the causes of project failure, it is important to analyze the connection between project failure analysis and project's stakeholder mental models and stakeholder behavior associated with the failure project.

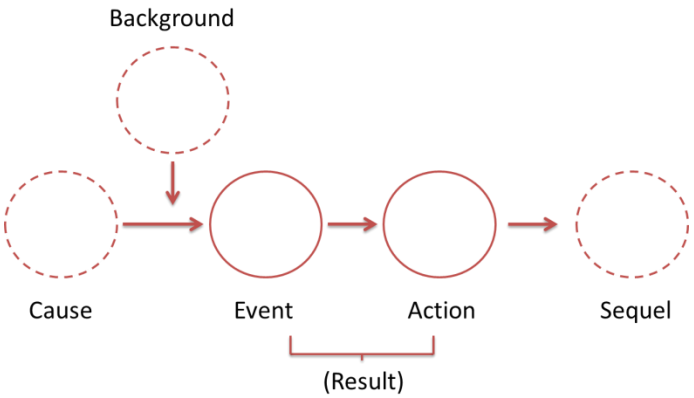


Figure 26 Chronological progression of failure

4.6.2 Integrated framework

The purpose of integrated multi-stakeholder mental models and project life cycle is to incorporate the related stakeholder's mindset and the project lifecycle attempting to improve project failure analysis efficiency and to reflect the decision and actions taken by related stakeholder in failure project.

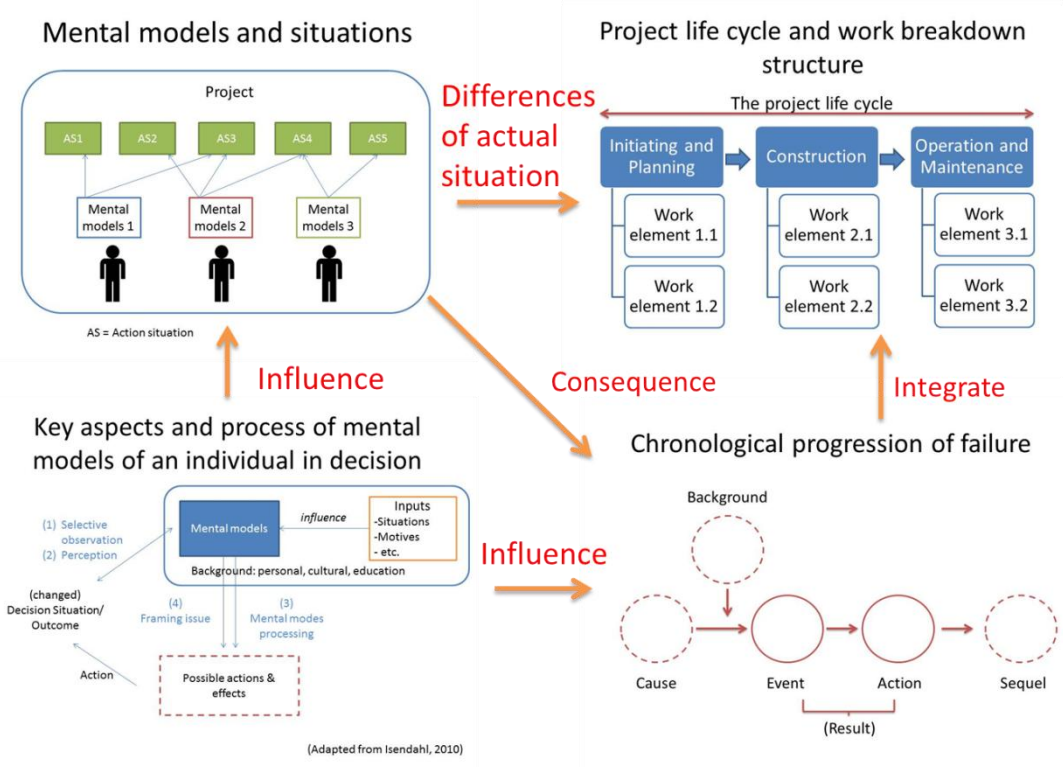


Figure 27 Integrated approach

As shown in Figure 27, each stakeholder takes action in each project phase which was framed by individual mental models, and these action situations (which were framed by mental models) are relative to background and cause for the chronological progression of failure. Because the project life cycle represents the framework for project management which identify project set of work and stakeholder, integrated approach for failure analysis is understood by integration of group of stakeholder's mental models and action situation into project life cycle. This integration generates the transformation between stakeholder action and project task corresponding to failure and enhances the usability of mental models as a tool to support failure analysis. Figure 28 shows how stakeholder's mental models integrate with project life cycle to clarify progression of project failure.

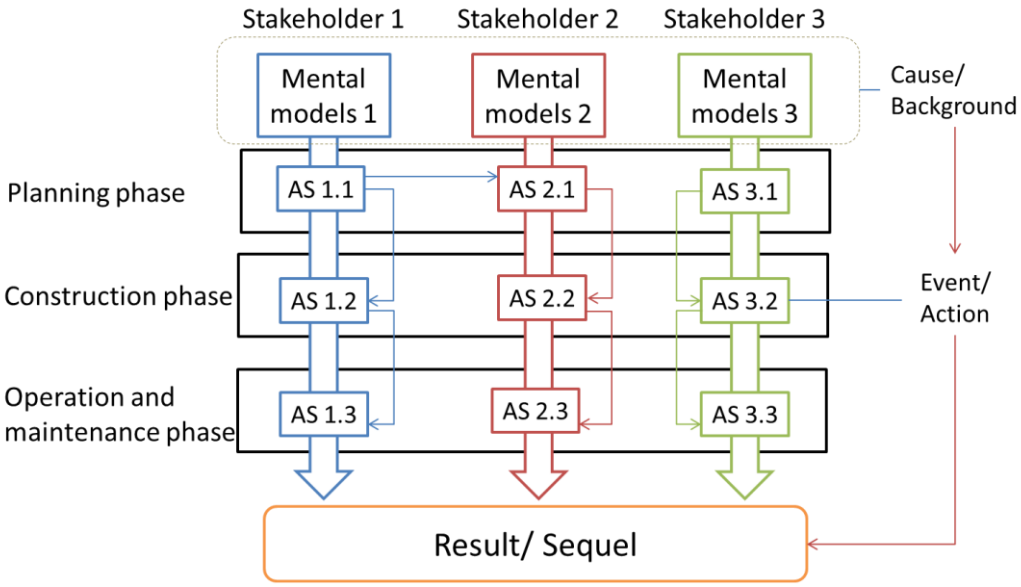


Figure 28 Transforming stakeholder's mental models to project life cycle

4.6.3 Integrated process

The proposed integrated stakeholder's mental model and project life cycle for failure analysis focus primary on stakeholder's mental models approach to identify mindset and action situation that explicitly incorporates failure of a project. Specific processes of integrated approach are detailed as following.

1. **Define problem context.** The primary step is to characterize project characteristic and project situation which focus on defining the problems, the physical failure phenomenal and the boundaries of analysis by employing project lifecycle approach and failure knowledge database. Additional required aspects may include project history and budget line that help decode the complexity of the problem. This process can be done by conducting project document review and field data collection.
2. **Identify project stakeholders and elicit stakeholder's mental models.** The primary consideration for identifying project stakeholder would be the inclusion of individuals, groups or organizations who are actively involved in the project or whose interest may be positively or negatively affected as a result of project execution. Once project stakeholders are identified, the semi-structured interview is conducted to elicit stakeholder's mental models associated with project failure. The semi-structured interview questions are developed based on the results of failure knowledge database and project life cycle analysis. As a result, each stakeholder group's mental models and action situation associated

with failure project are defined and presented as individual influence map.

3. **Apply multi-stakeholder mental models and action situation under project life cycle.** In this approach, stakeholder's mental models is used to describe stakeholder behavior and response due to the failure of project. Once mental models and action situation of individual group is defined, it is necessary to integrated multi-stakeholder mental models and action situation with project life cycle phase to define how each action situation influences each other which enable the progress of failure to be captured.

In this research, two case studies were analyzed with regards to how different mental models affect to malfunction of water resources project in the perspective of project life cycle management. The additional attention was given to the extent to which whether or not the stakeholders in the case studies shared the mental models they hold about malfunction project.

The integrated multi-stakeholder mental models and project life cycle management can be used as a tool for assisting practitioner and project manager in increasing understanding structuring the different actions of different stakeholder influenced failure of the project. Moreover, the current problems responding measures which are derived from different group of stakeholder mental models and action situation based on this analysis can be proposed.

4.7 Developing improvement options for dealing with malfunction of projects

Results from the empirical study were used to help establishing a change in project management which may affect to a change in the mindsets of related stakeholders. Implementation of changes in project management may require introducing change in several locations within the project management components and stakeholder's behavior and using several methods.

4.7.1 Approach and procedure for deriving proposed measures

Analysis of multi-stakeholder mental models and action situation is considered as a way to access more specific data required for the production of focused measure. Given the objective of reducing number of failure water resources project, major construction effort to radical change in management regimes and changing mental models must be taken into account. Recognizing power and limits of mental models would benefit to change in

management regime which may affect better project performance. As highlighted by Pfeffer (2005), success or failure of project can be determinded by mental models or ways of viewing organization (in this research context, it can be refered as ways of viewing project), and mental models must evitably be an important focus attention in order to change practices and interventions. In order to change mental model, the process to change are: a) recognizing the power and limits of the mental model, b) keeping the mental models relevant, c) overcoming inhibitors to change, and d) transforming the world (Wind , Cook, & Gunther, 2006). However, changing people mental models seems to be more difficult than changing the way people do, for example, redesigning plan or inplementing new management regimes (Pfeffer, 2005).

In this research, deriving proposed measure for malfunction of water resources project is developed in the context of failure analysis and changing mental model. The development of proposed measures is a step process involving the following:

1. **Root causes identification derived from multi-stakeholder mental models and action situation analysis in project life cycle**. Preventive mindset and action situation leading to failure will be identified as project constraints. The identification of root cause helps to determine the reason that the event occurs. Process of constraints identification is essential element during development of proposed measures in terms of looking for how to change mental models and behavior toward desired state.
2. **Derivation of measures from identified constraint.** As such *identified constraint* determines how problem frames, characteristic of proposed measures is that the result derives from identified constraint and the recommendations or measure can be generated for preventing its recurrence. Once changing mental model is time consuming process and more difficult than changing the way people do, it is recommended to focus on designing specific system to produce change of project performance in the immediate time. Through recognition of a change in information (action or management) concerning organization's environment, mental models is modified (Spicer, 1998). Therefore, the proposed measure must have the ability to implement change based on the availability of practical evidences. Specific proposed measures can be derived using three separate approaches, including:
   - Direct adoption of existing standard or practice;

- Derivation of site-adapted standard (which involves modification of existing standard or practice); and
- Development of site-specific measure

The presence of current management scheme (Integrated Water Resources Management), a unique characteristic in Thai culture, and norm at certain sites may necessitate the derivation of site-adapted measures.

3. **Assessment of proposed measure.** Assessment of proposed measure contains the argument to determine the extent to which project's objectives are being achieved toward the designed changes.

4.8 Research Limitation

The quality of data depends heavily on the stakeholder participation and how well the researcher can elicit stakeholder understanding on the research interest. In addition, some information may be difficult to obtain from the stakeholder, as they may not know how to express themselves in a quantifiable way or may not wish to reveal certain information.

Chapter 5: RESULTS AND ANALYSIS

5.1 Introduction

In the following, the findings of this research are discussed. The section summarizes the main findings of the present research and discusses them in relation with the three main research questions.

5.2 Results from the initial diagnosis of malfunction project causes based on Failure knowledge database

From the result of analysis, it is suggested that *insufficient knowledge of project user, disregard of procedure in project operation and maintenance and narrow outlook of the Department of Water Resources staff* are causes described by individual responsibility. Causes described by organization responsible include *inflexible management structure in the government processes, poor staffs, poor authority structure and poor strategy or concept in project planning and management*. The action level in Failure Knowledge Database refers to action taken by individual or organization that leads to project failure. Given the causes of failure project, poor planning and poor hardware production are action on project implemented to cause project failure. In addition, *inadequate maintenance and repair, nonobservance of instruction, inaction of stakeholder, corruption and no sense of ownership* are described as human action leading to failure project. The contents of results from related causes and actions are *economic loss, negative organization perception from project user, social loss, structure damage and property damages caused by structure damage*.

Resulting from literatures review and official reports, the small-scaled water resources project malfunction diagonal scenario is presented in Figure 29. The top left are causes of project malfunction consisting of top level and second level key phrase written out in order. A double line is inserted to separate the causes, actions and results. Explanation of key phrase regarding small-scaled water resources project malfunction analysis is presented in Figure 30.

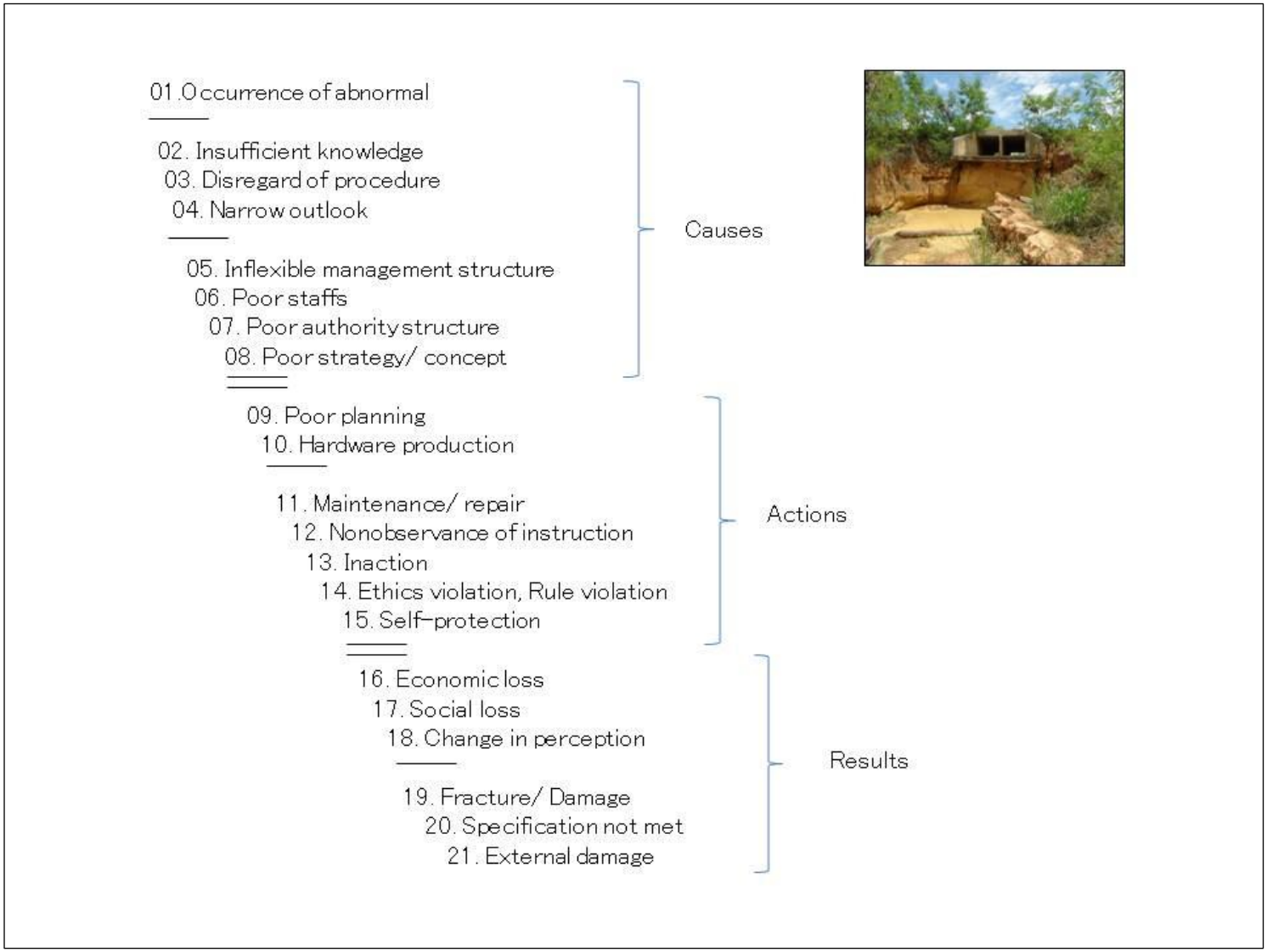


Figure 29 Small-scaled water resources project diagonal scenario

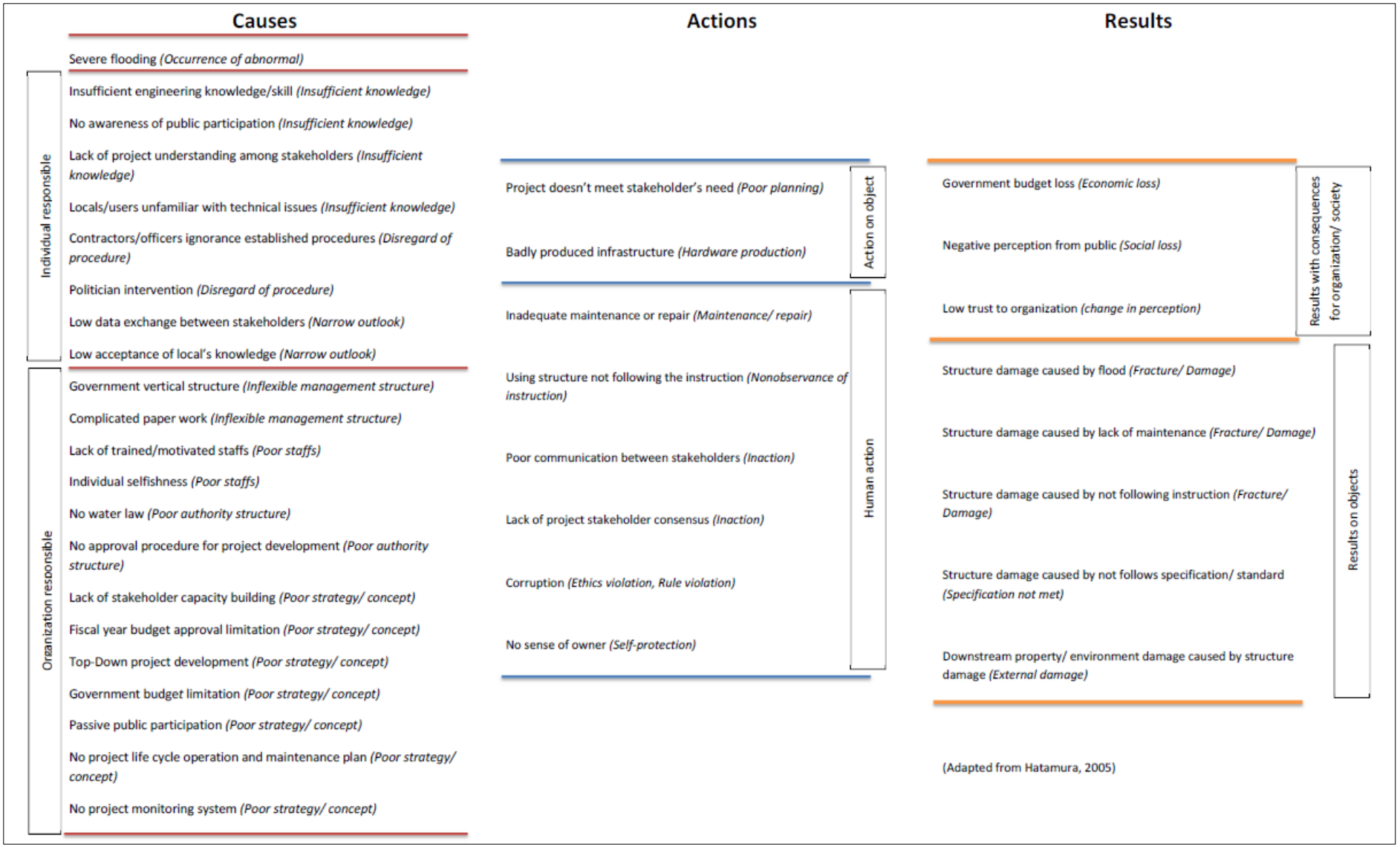


Figure 30 Explanation of key phrase in project malfunction diagonal scenario

5.3 Empirical study data results and analysis

Result from empirical study and the analysis are organized into four parts as following;

- Stakeholder's interview transcripts data analysis to analyze insight perspectives from interview
- Multi-stakeholder mental models integrated with work breakdown structure
- Comparison of multi-stakeholder mental models
- Multi-stakeholder mental models influence diagram, mental models analysis and malfunction project influence diagram

5.3.1 Stakeholder perspectives from interview highlights

Elicitation of stakeholder mental models to ground-truth malfunction water resources project management helps to verify the extent of locally important factors of malfunction project causes and offer insight into the experiences of project management under actual condition. To elicit stakeholder mental models associated with malfunction project, semi-structured interviews were probed around set of questions (Table 3 in Chapter 4) conducted to gain perception of participants regarding malfunction of a project. Twenty-one semi-structured interviews were completed with three groups of stakeholder: 1) the Department of Water Resources officer, 2) the officer in the local administration office and 3) project beneficiary. Figure 31 presents example of stakeholders and environment while having semi-structured interview.

Figure 31 Example of interview with stakeholders

The interview records were transcribed and analyzed (referred to section 4.4 in Chapter 4). In respect privacy of the interviewees, the transcripts and notes were anonymized and assigned a name code presented in Appendix I and the interview transcribes is presented in Appendix II. At the first stage, the interview transcribes were read and reread closely in order to become familiar with the content. After that three steps of coding were conducted to analyze interview transcribes. To generate concepts, the interviews open coding were coded on a line-by-line basis and later moved to paragraph by paragraph as some concepts emerged repeatedly. Throughout the open coding process, transcripts coding was conducted with regards to the relationships among concepts and categories emerged. An example of open-coded transcript is presented in Figure 32.

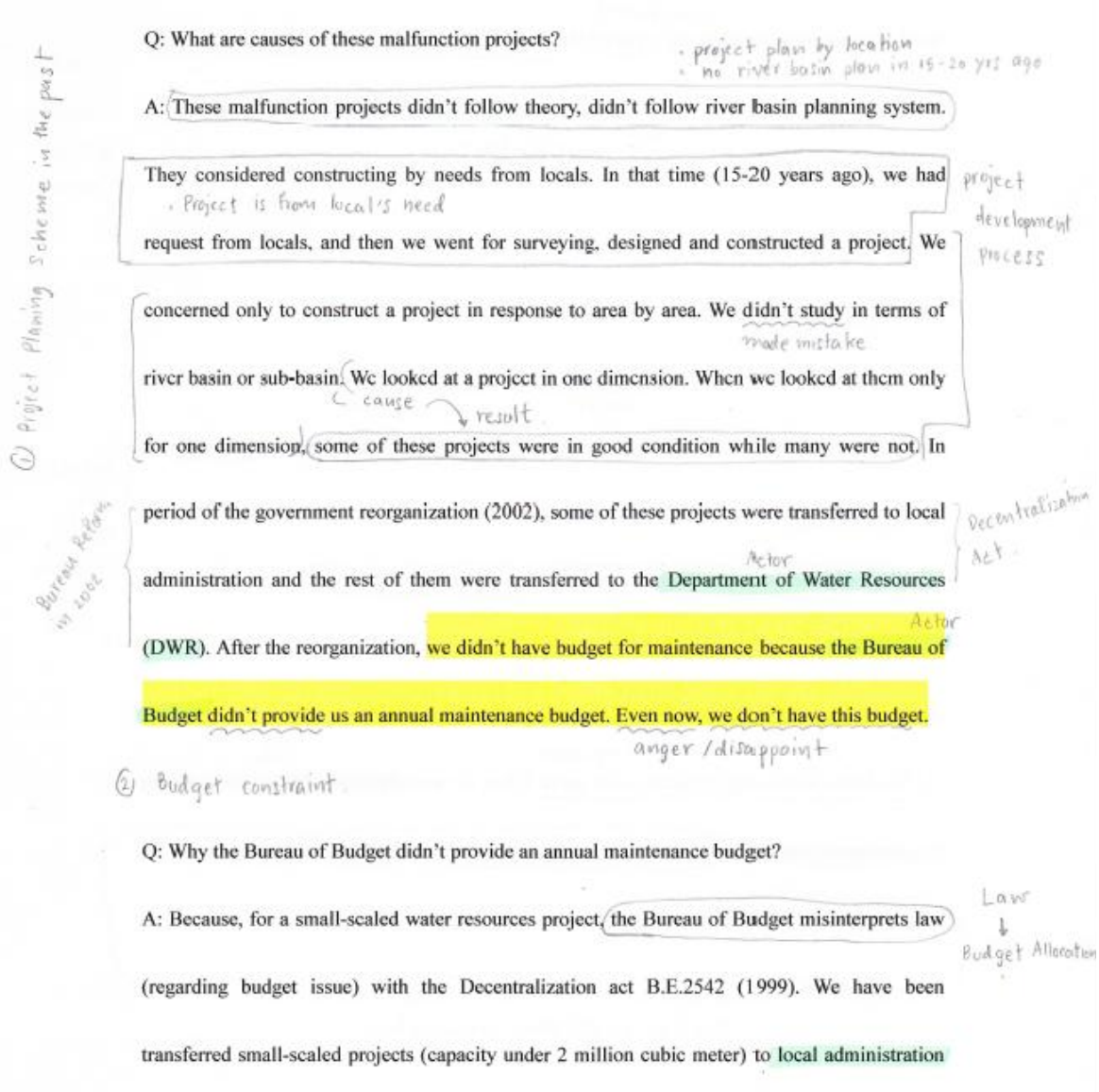


Figure 32 An example of open coding from the interview with an officer in the

Department of Water Resources

After open coding complete, concepts emerged from open coding were assembled by making connection between concepts in axial coding process. Axial coding consisted of the relationships among categories with respect to

- The *conditions* that gave rise to it
- *Context* into which it was embedded
- *Action/interaction strategies* in which it was handled, managed, carried out
- *Consequences* of those strategies

Weft QDA (Qualitative data analysis software) was used for axial coding in this research (Fenton, 2012). Through coding process, themes and concepts were identified. An overview example of themes and sub-themes coding analysis from Weft QDA software is presented in Table 6.

Table 6 Extraction of themes from interview transcripts

Theme	**Open coding**	**Axial coding (Concepts)**	**Analysis**
Budget constraint	DWR-HQ1 [684-881] In period of the government reorganization (2002), some of these projects were transferred to local administration and the rest of them were transferred to the Department of Water Resources (DWR).	Project responsibility is changed according to the government re-organization in 2002	Significant event
	DWR-HQ1 [882-1063] After the reorganization, we didn't have budget for maintenance because the Bureau of Budget didn't provide us an annual maintenance budget. Even now, we don't have this budget.	Lack of maintenance budget because the Bureau of Budget didn't provide it	Cause and consequences Condition and interaction
	DWR-HQ1 [1805-2229]		

	Q: Why the Bureau of Budget doesn't understand this problem? A: They (the Bureau of Budget) don't understand. I have been fighting for this maintenance budget for longtime since we establish the department, and finally they gave us some budget in specific description; "budget for water infrastructure improvement for each project". It means that this budget is for a severe damage project. Then we can use this budget. DWR-HQ1 [2230-2354] Q: So this kind of malfunction project is not categorized for this budget? A: No. These malfunction projects won't get it. DWR-HQ1 [2867-3050] But in nowadays, it has to be serious damages. Otherwise it won't get a budget for repairing. After big rehabilitation, a project will be ready for transfer to local administration. DWR-HQ1 [3051-3309] Q: Does it mean these malfunction projects are caused by unclear law/ regulation regarding maintenance budget? A: For these projects, it is caused by lack of maintenance budget. We couldn't defend budget because of this ambiguous of budget law/ regulation. DWR-HQ1 [3310-3414] Q: Why locals don't fix these damages by themselves? A: They don't fix it because there is some cost!!	Only severe damaged project get "budget for water infrastructure improvement" : case by case Regulation on maintenance budget Project condition prior transferring process Ambiguous of maintenance budget law/	Category and concept Condition and interaction Condition and interaction Condition and interaction Strategy and process

		regulation	
	DWR-HQ1 [3546-3614] Poor people are very poor. For water infrastructure, it needs money.		
	DWR-HQ1 [3776-3799] Everything is costly.	High cost in project maintenance work	Condition and interaction
	DWR-HQ1 [5381-5428] But, still we don't get budget support anyway.	Poverty and willingness to pay	Condition and interaction
	DWR-HQ1 [5430-5552] Q: Budget is main problem for water resources project management?	Poverty and willingness to pay	Condition and interaction
	A: Budget and awareness in importance of basin planning.	The DWR Budget limitation	Cause and consequence
	DWR-HQ1 [6420-7720] Before now, we transferred a project to the local administration for project maintenance, but are not the project owner. We (the department) are the project (infrastructure) owner, and we are responsible for a project budget. However, the department transferred a project to a local administration to take care and maintain a project, but they (local administration) are just take care but not spending their budget for repairing when a project becomes damaged!! It is the department	The DWR Budget limitation Responsibility and budget on a transferred project	Cause and consequence Condition and interaction Condition and interaction

	who has to provide maintenance or repairing budget. When a project becomes damaged, local administration call the department to repair. But the department doesn't have budget, then local administration just leave a project damaged. So, it becomes the same loop. Even many projects, which we already maintain in a good condition before transfer, if local admins does not take a good care or does not pay attention to a project, it will collapse again. In fact, with small budget in local administration, they don't want to spend on water resources project. They (local administration) want to spend for a road project!! Wherever road passes by, the land price becomes high while water resources project is a source of income but no attention is paid. They want other agencies to support on water resources project.	Risk transfer	Strategy and process
	DWR-HQ1 [8486-8849] Another point is that it doesn't matter large organization or small organization, they don't realize significance of water resources project maintenance work. Every item needs clarification from the Bureau of Budget. There is no budget for water infrastructure repair!! But what we are doing is from remaining budget (extra budget that left from annual budget)	Project failure loop Maintenance work of local administration office	Cause and consequence Strategy and process
	DWR-HQ1 [8850-8952] Q: Why the Bureau of Budget doesn't provide budget for repair work? A: They haven't mention reason.	Strategy of Local administration office budget planning Risk transfer	Strategy and process Strategy and process

	DWR-HQ1 [11592-11800] Q: If the department has sufficient budget for project maintenance and repair, this malfunction project can be eliminated? A: It is prohibited to say insufficient budget!! In fact the budget is insufficient.	Awareness on water resources project maintenance work Maintenance budget clarification Maintenance budget clarification Coordination among organization Transparency of management	Strategy and process Category and concept Category and concept Strategy and process Strategy and process
Law and regulation of budget allocation	DWR-HQ1 [1064-1804] Q: Why the Bureau of Budget didn't provide an annual maintenance budget? A: Because, for a small-scaled water resources project, the Bureau of Budget misinterprets law (regarding budget issue) with the Decentralization act B.E.2542 (1999). We have been transferred small-scaled projects (capacity under 2 million cubic meters) to local administration every year, and this decentralization act has its own timing. However, the Bureau of Budget understands that when this act is promulgated we already transfer all small-scaled projects to local administration which is not correct!! If a project, which the department transfer a project to local administration, is not in good condition, the local	Ambiguous of maintenance budget law/ regulation	Strategy and process Causes and consequence

	administration will not accept the project. DWR-HQ1 [2867-3050] But in nowadays, it has to be serious damages. Otherwise it won't get a budget for repairing. After big rehabilitation, a project will be ready for transfer to local administration. DWR-HQ1 [3051-3308] Q: Does it mean these malfunction projects are caused by unclear law/ regulation regarding maintenance budget? A: For these projects, it is caused by lack of maintenance budget. We couldn't defend budget because of this ambiguous of budget law/ regulation. DWR-HQ1 [10153-10257] The Bureau of Budget should define or designate rule for a project that come from river basin committee. DWR-HQ1 [10258-10400] It's not like a project that come from politician request is put in the annual budget plan. This is not right! It must have a rule for this.	Project budget allocation based on river basin plan	Strategy and process
Project planning scheme	DWR-HQ1 [79-226] Q: What are causes of these malfunction projects? A: These malfunction projects didn't follow theory, didn't follow river basin planning system. DWR-HQ1 [404-684]	Project development scheme in the past (area based approach)	Cause and consequence Strategy and process

	We concerned only to construct a project in response to area by area. We didn't study in terms of river basin or sub-basin. We looked at a project in one dimension. When we looked at them only for one dimension, some of these projects were in good condition while many were not. DWR-HQ1 [4497-4979] Q: What is a project development process? A: In the past, project proposal was requested from local's need. Then the government agency assigned agents to conduct preliminary study, design and later construct a project. However, in that period we considered those projects as project by location. Where there was available water we constructed at that location. Later on, we begin to consider project in basin area by utilizing body of knowledge in project planning and management.	No basin development plan Project developed from local's need Area based approach No operation and maintenance plan	Cause and consequence Strategy and process Strategy and process Cause and consequence Strategy and process
River basin management	DWR-HQ1 [4980-5180] Q: You meant that from now on there will not be such malfunction of water resources project? A: We have to continue working in basin management. The department must realize how important of this work. DWR-HQ1 [5430-5552] Q: Budget is main problem for water resources project management? A: Budget and awareness in importance of basin planning.	Importance of river basin management Budget limitation	Strategy and process Cause and consequence Strategy and process
Area base approach planning	DWR-HQ1 [79-474] Q: What are causes of these malfunction projects? A: These malfunction projects didn't follow theory, didn't follow river basin planning system.	Planning process	Strategy and process

	They considered constructing by needs from locals. In that time (15-20 years ago), we had request from locals, and then we went for surveying, designed and constructed a project. We concerned only to construct a project in response to area by area. DWR-HQ1 [475-684] We didn't study in terms of river basin or sub-basin. We looked at a project in one dimension. When we looked at them only for one dimension, some of these projects were in good condition while many were not.		
Project development process	DWR-HQ1 [4497-4980] Q: What is a project development process? A: In the past, project proposal was requested from local's need. Then the government agency assigned agents to conduct preliminary study, design and later construct a project. However, in that period we considered those projects as project by location. Where there was available water we constructed at that location. Later on, we begin to consider project in basin area by utilizing body of knowledge in project planning and management.	Project planning process	Strategy and process
Need from locals	DWR-HQ1 [226-474] They considered constructing by needs from locals. In that time (15-20 years ago), we had request from locals, and then we went for surveying, designed and constructed a project. We concerned only to construct a project in response to area by area.	Project developed from local's need	Strategy and process

	DWR-HQ1 [4497-4605] Q: What is a project development process? A: In the past, project proposal was requested from local's need.		
Event	DWR-HQ1 [684-1063] In period of the government reorganization (2002), some of these projects were transferred to local administration and the rest of them were transferred to the Department of Water Resources (DWR). After the reorganization, we didn't have budget for maintenance because the Bureau of Budget didn't provide us an annual maintenance budget. Even now, we don't have this budget.	Impact from the 2002 government reorganization and Decentralization Act 1999	Causes and consequences
Project transfer to local administration office	DWR-HQ1 [1257-1804] With the Decentralization act B.E.2542 (1999). We have been transferred small-scaled projects (capacity under 2 million cubic meters) to local administration every year, and this decentralization act has its own timing. However, the Bureau of Budget understands that when this act is promulgated we already transfer all small-scaled project to local administration which is not correct!! If a project, which the department transfer a project to local administration, is not in good condition, the local administration will not accept the project. DWR-HQ1 [4191-4496] In addition, local administration doesn't want to spend their budget for water resources project. They want the central government to be	Unclear project maintenance budget and responsibility Local administration office working strategy Unclear project	Causes and consequences Condition and interaction Strategy and process Causes and consequences Strategy and

	responsible for this and local administration wants to work on road or some other easier projects. So water infrastructure was not well maintained due to this reason. DWR-HQ1 [6420-7356] Before now, we transferred a project to the local administration for project maintenance, but are not the project owner. We (the department) are the project (infrastructure) owner, and we are responsible for a project budget. However, the department transferred a project to a local administration to take care and maintain a project, but they (local administration) are just take care but not spending their budget for repairing when a project becomes damaged!! It is the department who has to provide maintenance or repairing budget. When a project becomes damaged, local administration call the department to repair. But the department doesn't have budget, then local administration just leave a project damaged. So, it becomes the same loop. Even many projects, which we already maintain in a good condition before transfer, if local admins does not take a good care or does not pay attention to a project, it will collapse again.	maintenance budget and responsibility Unclear project maintenance budget and responsibility	process Causes and consequences Strategy and process
Strategy	DWR-HQ1 [2230-2602] Q: So this kind of malfunction project is not categorized for this budget? A: No. These malfunction projects won't get it. When we were the Office of Accelerated Rural Development (ARD), we provide specific annual budget for this kind of maintenance work. For example, we had 20-30 million baht and distributed to regional offices to do maintenance	Central budget for project reparation and maintenance	Strategy and process

	work from this budget. DWR-HQ1 [2604-2867] Q: In that period, there was no river basin committee organization? A: No. There was no such a committee. When there were some damages on a project, locals requested for repairing, and regional officer went to examine then repaired those damages from this budget. DWR-HQ1 [3825-4496] But there is a way to solve this malfunction project problem. After completion of decentralization (projects transfer), the central government will subsidy for 35% of total local administration budget. However, this is just a plan. It hasn't announced as a law yet. Now the central government subsidize local administration only some percentage of the budget plan. In addition, local administration doesn't want to spend their budget for water resources project. They want the central government to be responsible for this and local administration wants to work on road or some other easier projects. So water infrastructure was not well maintained due to this reason. DWR-HQ1 [5956-6151] But for a medium scale project, we have public participation promotion in parallel with construction work, for example, water user group establishment, project operation and maintenance training.	Subsidy from central government to local administration office	Strategy and process

	DWR-HQ1 [6420-7720] Before now, we transferred a project to the local administration for project maintenance, but are not the project owner. We (the department) are the project (infrastructure) owner, and we are responsible for a project budget. However, the department transferred a project to a local administration to take care and maintain a project, but they (local administration) are just take care but not spending their budget for repairing when a project becomes damaged!! It is the department who has to provide maintenance or repairing budget. When a project becomes damaged, local administration call the department to repair. But the department doesn't have budget, then local administration just leave a project damaged. So, it becomes the same loop. Even many projects, which we already maintain in a good condition before transfer, if local admins does not take a good care or does not pay attention to a project, it will collapse again. In fact, with small budget in local administration, they don't want to spend on water resources project. They (local administration) want to spend for a road project!! Wherever road passes by, the land price becomes high while water resources project is a source of income but no attention is paid. They want other agencies to support on water resources project. DWR-HQ1 [10629-10863] Our bureau changes a plan. We are doing a water management plan for every local administration which considers as a basin planning. The local administration job is to look for budget. But, again	Establishment of water user group Risk avoidance of local administration office Local water management plan based on river basin	Strategy and process Strategy and process Cause and consequence Condition and interaction Strategy and process

	it depends on vision of the executive.	management plan	
Beneficiary cost sharing	DWR-HQ1 [3310-3414] Q: Why locals don't fix these damages by themselves? A: They don't fix it because there is some cost!!	Unwilling to pay in big amount for public project	Causes and consequence Category and concept
Behavior-culture-norm	DWR-HQ1 [3415-3545] Locals' behavior in Thailand is waiting for help even though they get benefit from water. It's different from developed country. DWR-HQ1 [5717-5955] Q: Even a project was proposed through basin plan or pushing from local politician, if locals doesn't want to take care of a project, sooner or later it will became malfunction again? A: If they don't take care of a project, it's over. DWR-HQ1 [7971-8485] Q: In some projects, water users really take a good care of their project. Why did they do that? A: They need to manage water from available amount. Our structure is a tool for their water management. When we start construction work, we help them to establish water user group. One of the issues is local culture. People in the northern region look at water as important resources, and they well maintain for their water structures. On the other hand, people in the northeastern tend to wait for help (under hand). DWR-HQ1 [8952-9033] Thai people like to have a new project but never	Passive behavior Careless on project maintenance Awareness on project value Specific characteristic of locals Waiting for help Prefer the new rather than maintain the old	Cause and consequence Category and concept Strategy and process Strategy and process

	prepare budget for repair work. DWR-HQ1 [10865-11591] Q: How can we solve this problem? A: I don't know how to solve this problem. Every time the same discussion appears; need public participation, need capacity building. But whenever people are easy to induce by money, it is difficult. First thing to do is make them learn how to help themselves (self-help); no sense of survivor only waiting for help. This is Thai culture; patronage system. That's all. It's difficult to change and wide spreading everywhere from national level to local level. This is not only in water management but in every system. Sometime we make a pond close to their house, but people don't try to take water from the pond. They are waiting for help from us, waiting for new budget to buy a pump.	Induced by money Overwhelming patronage system Lack of self-help initiation	Cause and consequence Strategy and process
Stakeholder /locals capacity	DWR-HQ1 [3615-3824] Like this project (pointed to picture), this radial gate is mechanic. Locals can't fix this. If it is small damage like weir is broken, they can add some rocks. Everything is costly. They do what they can do.	User lack of project operation and maintenance knowledge	Cause and consequence
DWR shortage on manpower	DWR-HQ1 [5181-5241] However, now we are short of people who work on this issue	Short on skilled manpower	Condition and interaction
Integration among units	DWR-HQ1 [5241-5380] This planning and management paradigm was agreed among technician and publics through communication in order to improve project management.	Integration of bureaus under organization	Strategy and process
Politician interference	DWR-HQ1 [5553-5716] In fact, nowadays local politician is so powerful which influences basin planning back to spot (area	Interference of project	Cause and consequence

	base) planning again with no academic and technique support. DWR-HQ1 [9496-9858] Nowadays, the executive come from political influence. Also, human resource management is very important. The direction of our work is strongly influenced the executive attitude and viewpoint. It soon will be returned to the old time that projects are requested from politician. The executive vision must be the same direction of the central government vision. DWR-HQ1 [10258-10400] It's not like a project that come from politician request is put in the annual budget plan. This is not right! It must have a rule for this.	management Expecting votes for election Influenced executive vision and mission Corruption	
Public participation	DWR-HQ1 [6153-6420] Q: This public participation process is done before a project design? A: No. If we establish a water user group before a project construction, there is no advantage from doing that. A water user group will be established to manage a project that will be constructed.	Establishment of water user group	Strategy and process
Project maintenance responsibility	DWR-HQ1 [6420-7462] Before now, we transferred a project to the local administration for project maintenance, but are not the project owner. We (the department) are the project (infrastructure) owner, and we are responsible for a project budget. However, the department transferred a project to a local administration to take care and maintain a project,	Unclear project maintenance budget and responsibility	Cause and consequence Strategy and process

	but they (local administration) are just take care but not spending their budget for repairing when a project becomes damaged!! It is the department who has to provide maintenance or repairing budget. When a project becomes damaged, local administration call the department to repair. But the department doesn't have budget, then local administration just leave a project damaged. So, it becomes the same loop. Even many projects, which we already maintain in a good condition before transfer, if local admins does not take a good care or does not pay attention to a project, it will collapse again. In fact, with small budget in local administration, they don't want to spend on water resources project.		
Attitude of local administration office	DWR-HQ1 [6646-7970] However, the department transferred a project to a local administration to take care and maintain a project, but they (local administration) are just take care but not spending their budget for repairing when a project becomes damaged!! It is the department who has to provide maintenance or repairing budget. When a project becomes damaged, local administration call the department to repair. But the department doesn't have budget, then local administration just leave a project damaged. So, it becomes the same loop. Even many projects, which we already maintain in a good condition before transfer, if local admins does not take a good care or does not pay attention to a project, it will collapse again. In fact, with small budget in local administration, they don't want to spend on water resources project. They (local administration) want to spend for a road project!! Wherever road passes by, the land price	Low investment in maintenance budget	Condition and interaction

	becomes high while water resources project is a source of income but no attention is paid. They want other agencies to support on water resources project. Q: Successful of water resources project in each area depends on attitude of local administration on water resources project management? A: Right. It depends on how they realize the importance of a project management such as water user group, etc. DWR-HQ1 [11801-11927] Small-scaled water resources project can be well managed if the local administration has mechanism to support their own area.	Awareness on project importance Local administration office strategy on water resource project management	Cause and consequence Strategy and process
Executive vision and decision	DWR-HQ1 [9207-9857] Q: Excluding budget issue, what are other causes for malfunction problem? A: I think vision of organization management level is important issue. The organization leader (Director General) must think systematically which concerns project construction, maintenance and public participation. Nowadays, the executive come from political influence. Also, human resource management is very important. The direction of our work is strongly influenced the executive attitude and viewpoint. It soon will be	Systematic thinking of executive Influenced by politician	Cause and consequence Condition and interaction

	returned to the old time that projects are requested from politician. The executive vision must be the same direction of the central government vision.		
River basin committee	DWR-HQ1 [9859-10153] Q: What about the river basin committee or working group? A: River basin committee proposes projects for basin plan, but they are not authorized by any law!! They keep proposing project, but only few are implemented. That means there is no legal support for the river basin committee proposal. DWR-HQ1 [10399-10629] For this reason, our alliance is decreasing because they are tired of this phenomenal. The department is doing water resources integrated plan every year, but there is no outcome. It's just a plan. So we fail in this dimension.	Increasing importance of river basin committee Strengthening river basin plan to implementation plan	Strategy and process Condition and interaction Strategy and process

5.3.2 Multi-stakeholder mental models integrated with project life cycle

The coding themes and concepts which emerged from the interviews of three stakeholder groups were developed then classified and grouped into project life cycle phases (Planning and development- Project construction- Operation and maintenance). Themes and concepts were grouped into sets of variables according to the similarity and differences of themes. They were also pooled to form a single set of variable for each stakeholder group. Variables can be categorized into internal influential variable and influential variable. The *internal influential variable* refers to themes or concepts regards malfunction project which caused or influenced by stakeholder themselves, and *influential variable* refers to themes or concepts regards malfunction project which stakeholder perceives as being caused or influenced by other stakeholder. Both variables for all stakeholders were so numerous that single table representing all variables would be too complex to be useful. Therefore, individual table of variables for each stakeholder group are presented in Table 7- Table 9.

Table 7 Internal and External Influential Variables of the DWR officer

Project phase	Internal Influential variable	Local Admin Office Influential variable	Project User Influential variable
1. Planning and Development	- Unclear Mandate on maintenance budget - Annual operation and maintenance plan - Maintenance budget - Political interference - Corruption - Area based approach project development - Internal organization cooperation - Negative image	- Stakeholder participation	- Stakeholder participation - Information sharing
2. Project construction	- Corruption - Construction quality		
3. Operation and Maintenance	- Continuity of operation follow up - Attention on new construction project - Skilled manpower availability - Relationship between the DWR	- Budget limitation - Risk avoidance strategy - Skilled manpower availability	- Project operation and maintenance procedure - Project maintenance awareness - Spoils system and materialism - Contribution for project maintenance/

Project phase	Internal Influential variable	Local Admin Office Influential variable	Project User Influential variable
	and project user		cost avoidance - Self-help initiative - Establishment of water user group - Sense of sharing responsibility - Sense of ownership - Civic sense toward public project - Ignorance of minor damage - Benefit form project - User's satisfaction - Project function and performance

Table 8 Internal and External Influential Variables of Local Administration Office officer

Project phase	Internal Influential variable	The DWR Influential variable	Project User Influential variable
1. Planning and Development	Stakeholder participation	Duplication on budget and work	
2. Project construction		Quality of survey, design and construction	
3. Operation and maintenance	Unexpected event, contingency Number of workers Budget limitation Burden from a malfunction project Organization reputation Conflict management mechanism Involvement in project development Responsibility on project management	Responsibility for project maintenance	Unexpected event, contingency Disregard of project maintenance Establishment of water user group Project operation and maintenance knowledge Perception of malfunction Responsibility on project operation and maintenance Benefit form project Favorable toward new project

Table 9 Internal and External Influential Variables of Project User

Project phase	Internal Influential variable	Local Administration Office Influential variable	The DWR Influential variable
1. Planning and Development	- Influence from leader - Land acquisition	- Stakeholder participation	- Stakeholder participation
2. Project construction			- Quality of survey, design and construction
3. Operation and maintenance	- Water usage - Unexpected event, contingency - Project maintenance plan - Perception of malfunction - Self-interest - Ignorance of minor damage - Contribution for project maintenance/ cost avoidance - Ability to repair - Politician's power - Project operation and maintenance knowledge - Water fee - Sense of sharing responsibility	- Responsibility for project maintenance - Communication and cooperation between the DWR and local administration office - Un-seriousness regarding the problem	- Establishment of water user group - Communication and cooperation between the DWR and local administration office

Project phase	Internal Influential variable	Local Administration Office Influential variable	The DWR Influential variable
	- Project maintenance awareness - Attitudes of villagers in project management - Income - Sense of ownership - Civic sense toward public project - Project importance		

5.3.3 Comparison of multi-stakeholder mental models

Although each stakeholder possesses a unique mental models, stakeholders may share some aspects if they have similar experience or education [Denzau North, 2007]. In the context of this research, stakeholder groups shared the similar experience of malfunction water resource project. In order to explore whether or not different stakeholder shares their perception regarding malfunction project, stakeholder's mental model are compared and presented in Table 10. Concepts/ variables elicited from the three sample stakeholder groups: the officer of the Department of Water Resources (DWR), the officer of Local Administration Office (LAO) and project users (PU). A "1" in each column identifies that the concept was included in stakeholder mental models, and a "0" indicates that it was not.

Table 10 Comparison of stakeholder groups' mental models associated with malfunction project

	Concept/ variable	DWR	LAO	PU
Project development phase	Unclear Mandate on maintenance budget	1	0	0
	Annual operation and maintenance plan	1	0	0
	Maintenance budget	1	0	0
	Political interference	1	0	0
	Corruption	1	0	0
	Area based approach project development	1	0	0
	Information sharing	1	0	0
	Internal organization cooperation	1	0	0
	Political interference	1	0	0
	Negative image	1	0	0
	Stakeholder participation	1	1	1
	Influence from leader	0	0	1
Construction phase	Corruption	1	0	0
	Construction quality	1	1	0
Operation and Maintenance	The DWR continuity of operation follow up	1	0	0
	DWR's attention on new construction project	1	0	0
	Skilled manpower availability of the DWR	1	0	0
	Relationship between the DWR and project user	1	0	0

	Budget limitation of LAO	1	1	0
	LAO Risk avoidance strategy	1	1	0
	Skilled manpower availability of LAO	1	1	0
	User's ignorance of project operation and maintenance procedure	1	0	0
	User's absence of project maintenance awareness	1	0	0
	Spoils system and materialism	1	0	0
	User's contribution for project maintenance/ cost avoidance	1	0	1
	Lack of self-help initiative in user	1	0	0
	Establishment of water user group	1	1	1
	Sense of sharing responsibility	1	0	1
	Sense of ownership	1	0	1
	Civic sense toward public project	1	0	1
	Ignorance of minor damage	1	0	1
	Unexpected event, contingency	0	1	1
	Burden from a malfunction project	0	0	1
	LAO's organization reputation	0	1	0
	Conflict management mechanism	0	1	1
	Involvement in project development	0	1	1
	Project operation and maintenance knowledge	0	1	1
	Perception of malfunction	0	1	1
	Responsibility on project operation and maintenance	0	1	1
	Benefit form project	0	1	1
	Favorable toward new project	1	1	0
	User's satisfaction	1	0	1
	Project function and performance	1	0	1
	Water usage	0	0	1
	Project maintenance plan	0	0	1
	Self-interest	0	1	1
	Ability to repair	0	0	1
	Politician's power	0	1	1
	Project operation and maintenance knowledge	0	0	1
	Water fee	0	0	1
	Attitudes of villagers in project management	0	0	1
	Income	0	0	1
	Project importance	0	0	1

As indicated in Table 10, three groups of stakeholder mildly agreed with each other or shared a weak mental models. The result suggested that for all three stakeholder groups share similar mental models on "stakeholder participation" and "Establishment of water user group" concepts regarding the malfunction project (3.8%). In addition, **nine** individual concepts (Unexpected event/ contingency; Conflict management mechanism; Involvement in project development; Project operation and maintenance knowledge; Perception of malfunction; Responsibility on project operation and maintenance; Benefit form project; Self-interest; Politician's power) were shared between the Local Administration Office and project user (17%), **six** individual concepts (User's contribution for project maintenance/ cost avoidance; Sense of sharing responsibility; Civic sense toward public project; Ignorance of minor damage; User's satisfaction; Project function and performance) were shared between the DWR and project user (11.3%), and **five** concepts (Construction quality; Budget limitation of LAO; LAO Risk avoidance strategy; Skilled manpower availability of LAO; Favorable toward new project) were shared between the Department of Water Resources (DWR) and the Local Administration Office (9.4%). It appeared that the Local Administration Office and project user had highest shared mental models together, meaning that they perceived them as being more or less similar compared to other stakeholder. These groups were perceived to hold similar mental models mentioned in project operation and maintenance phase, suggesting that there may be some tendency towards agreement between groups. Sharing intellectual understanding, for example, language, set of concepts etc., is associated with sharing mental models. The reception and interpretation of a message are strongly influenced by experience and belief about the world. Local Administration Office and project user who shared a language (local language) were more likely to communicate effectively when both information sender and information receiver had common features in their mental models [Denzau North, 2007]. However, it is considerable differences in beliefs regarding the concepts that led to the malfunction project. Regarding differences in mental models among stakeholder groups, it might be assumed that the most efficient action for each stakeholder group decision-making is not only a technical issue but also the type of values that stakeholder wanted to protect or the main objectives of stakeholder.

It is apparent that similarities and differences perspectives or mental models were presented which indicated possibly a lack of common understanding in project and lack of communication between stakeholders in project life cycle.

5.3.4 Mental models influence diagram: representation of mental models

As the basis for structuring and understanding the beliefs of each participant regarding malfunction project, stakeholder mental models influence diagrams were constructed to provide a medium for problem formulation in this research. Diagrams are organized as action and factor oriented representations of the participants' own frame of reference in order to reveal consequences or implications for all statements made. Arrows that link two concepts thus show causes or explanations, the implied action as well as its possible outcome(s). As a result, the diagram provides meaning not only through individual concepts but the consequences attributed to them as well as the explanatory concepts that support them.

Illustration of an example mental models influence diagram of a local stakeholder, an officer in Local Administration, an officer in the Department of Water Resources are illustrated in Figure 33, Figure 34 and Figure 35 respectively. All stakeholder mental models influence diagrams are illustrated in Appendix III.

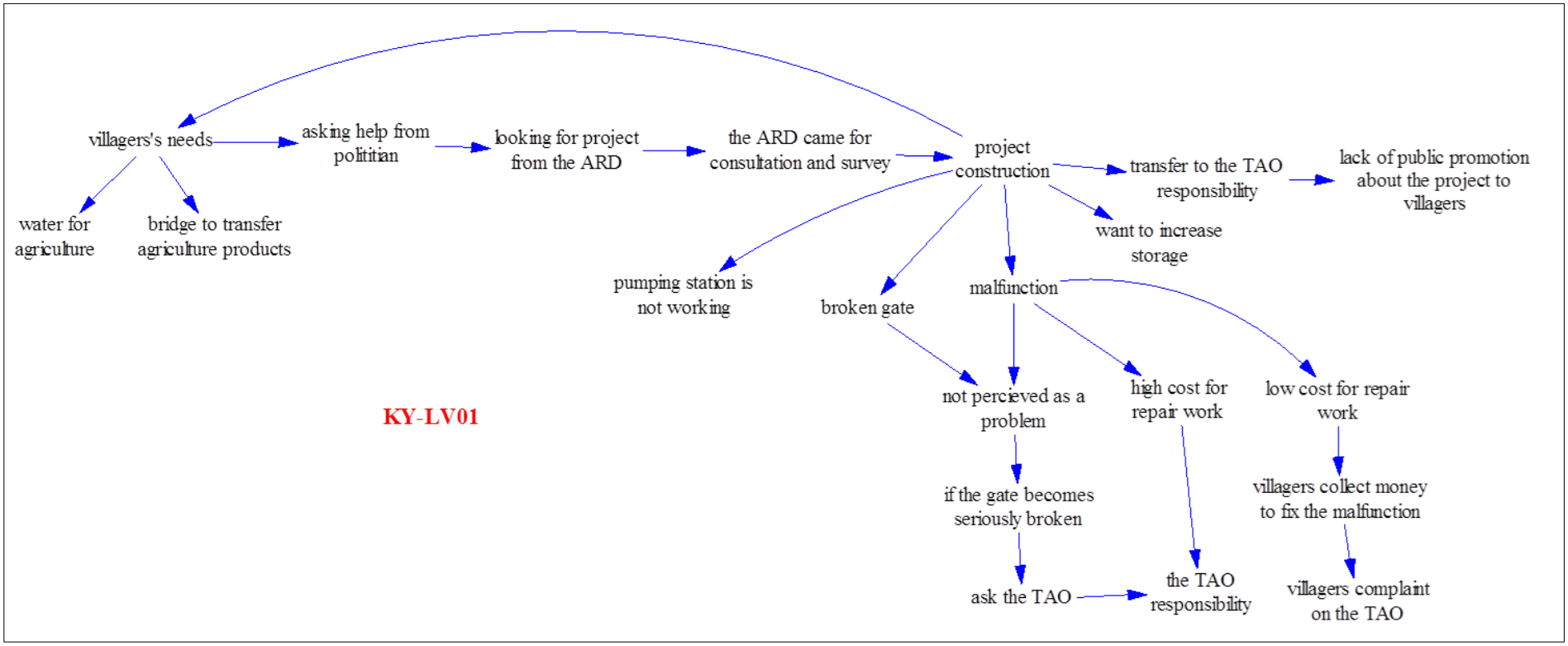


Figure 33 An illustrative example of local villager mental models

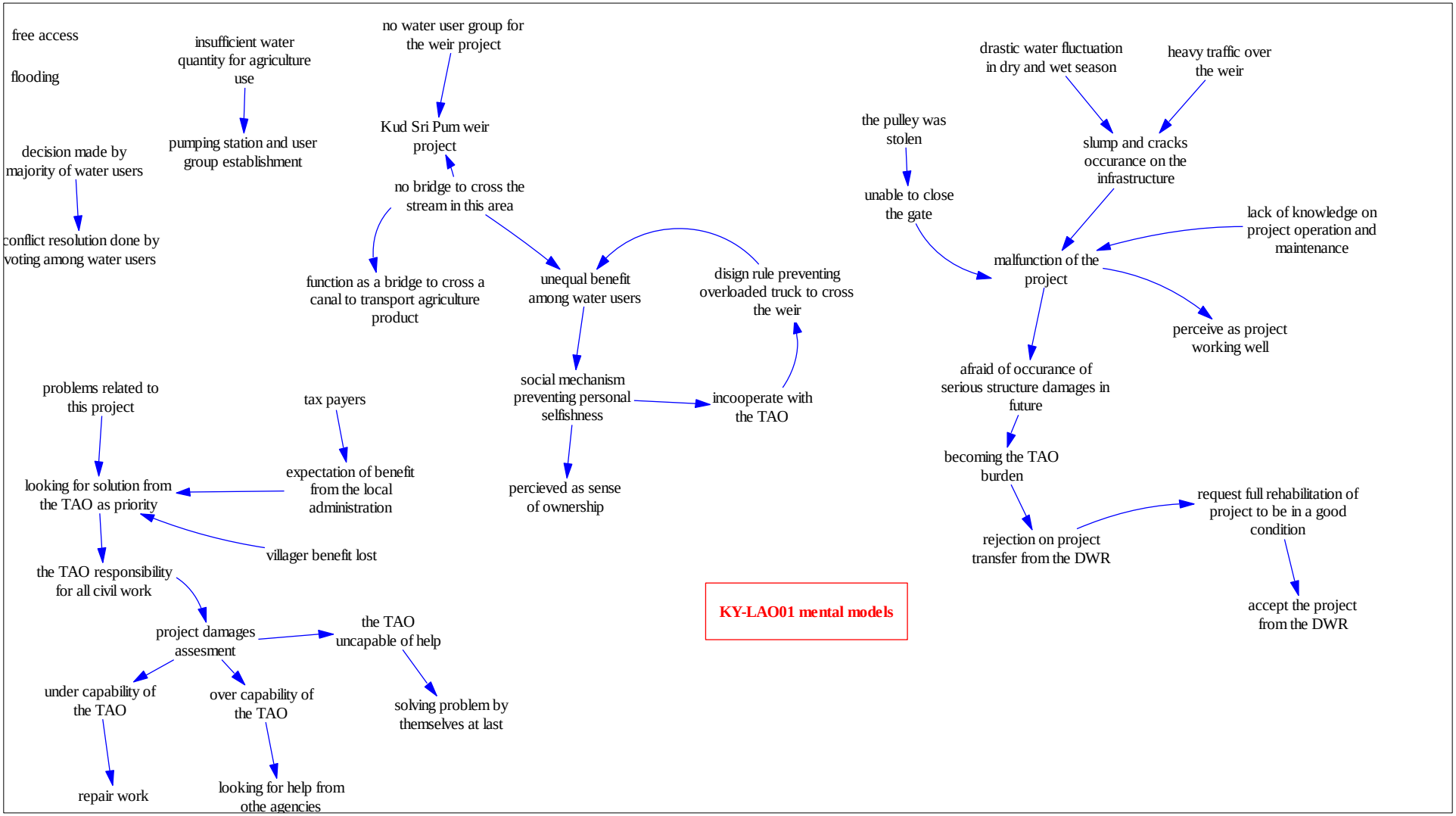


Figure 34 An illustrative example of an officer of local administration office mental models

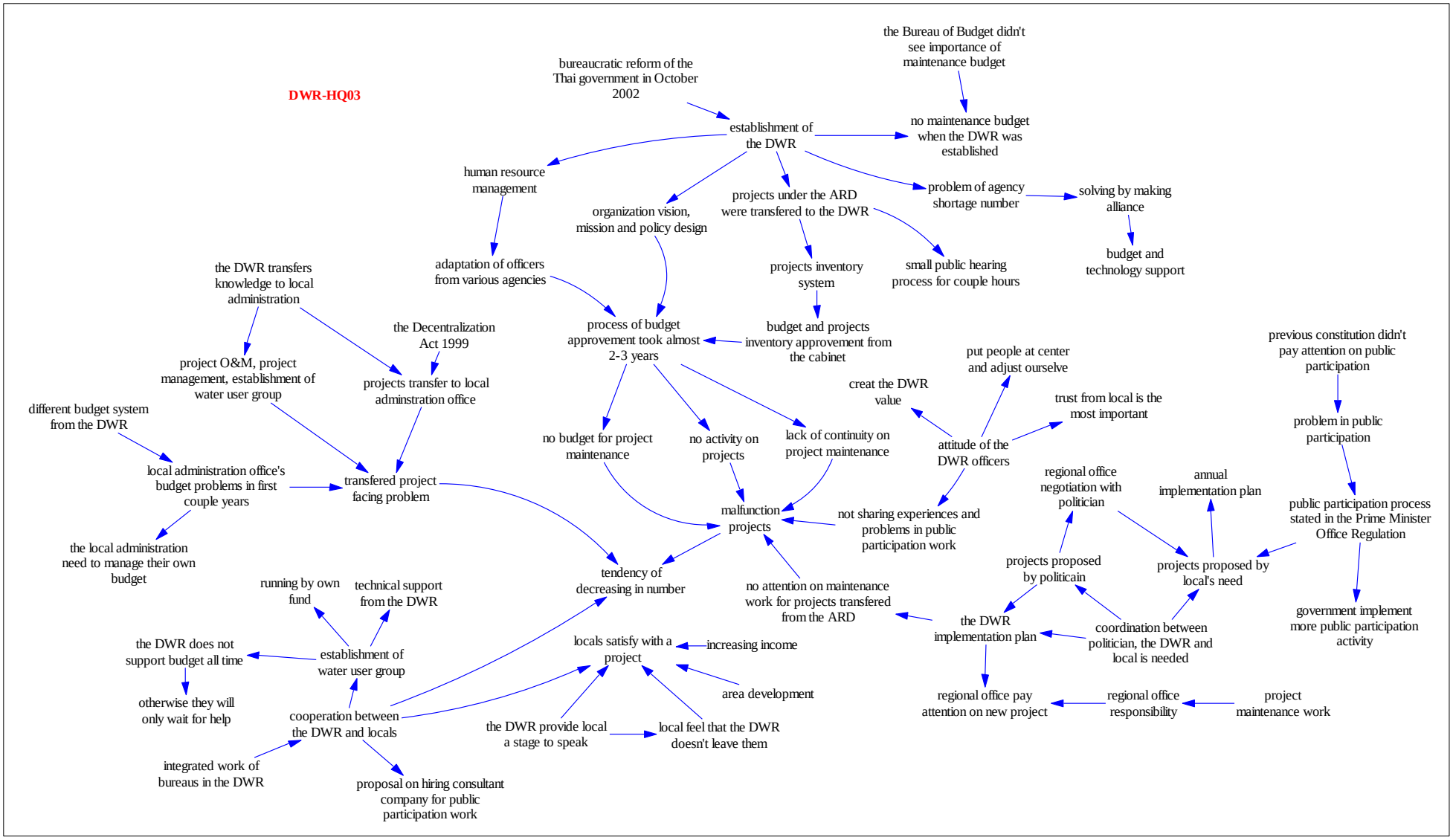


Figure 35 An illustrative example of an officer in the Department of Water Resources mental models

Stakeholder's mental models influence diagrams were analyzed and clustered for their structure to determine supporting or preventing mindset in malfunction projects. The cluster of mental models categorized by stakeholder group is presented in Table 11.

Table 11 Supporting and preventing mental models

Stakeholder group	Supporting mindset	Preventing mindset
Officer in the Department of Water resources	- Decreasing tendency of project malfunction - Maintenance Emergency Funds - Establishment of water user group - Knowledge and technology transfer to local administration office and water user group - Integration management of all related bureaus - Strengthen cooperation between agency and stakeholders - A change of government officers' attitude toward people at the center - Local water management plan based on river basin management plan - Subsidy from the central government to local administration office - Project initiated by local needs	- No clear mandate on maintenance budgeting - No maintenance budget - No operation and maintenance plan - Unclear maintenance and repair policy - Lack of continuity of the Department of Water Resources (DWR) operation due to the Bureaucratic reform in 2002 - Political interference in project development - Corruption - Focus attention on new construction project rather than maintenance existing project - Not sharing experiences and problems in public participation work - Project development on area based approach - Politics influence over the DWR executive

Stakeholder group	Supporting mindset	Preventing mindset
	- Develop trust and confidence in relationship - Negotiation with politician for projects in river basin plan - Monitoring system from the third party - Implementation of river basin plan as a master plan	- Unsystematic vision of the executive management - Skilled manpower shortage in the DWR - Lack of knowledge to properly execute the project maintenance and operation - User's lack of maintenance awareness of a project - Budget limitations on the local administration office - Risk avoidance strategy for the local administration office - The spoils system and materialism in Thai society - Unwillingness to pay for project maintenance of users - User's lack of self-help initiative - User's disregard of project operation and maintenance procedure - No obvious water user group establishment and no strong leader

Stakeholder group	Supporting mindset	Preventing mindset
		- The DWR's lack of continuity to follow up project after construction complete - Weak relationship between the DWR and project user - Low sense of sharing responsibility and sense of ownership - Absence of civic sense toward public project - Ignorance of minor damage which later develop to major damage - Low stakeholder involve in project development process - No benefit of users from a project - Poor quality in the construction - Corruption in construction work - Local leader 's lack of willingness to share information to others - Project unable to solve problem - Absence of cooperation between units in the regional office and the

Stakeholder group	Supporting mindset	Preventing mindset
		DWR headquarter office - Political interference in project development - Negative image of the DWR from locals - Rejection of project proposed by river basin committee from the DWR - User's perception of low quality construction better than no project
Officer in Local Administration Office	- Project operation and maintenance training to users after a project repair work finish - Annual inspection and maintenance budget - Participation of local administration office in the beginning of a project - Establishment of water user group	- Unexpected event, contingency - Project owner's responsibility for a project maintenance - Limited number of workers in the organization - Unbalanced number of workers and work amount - The local administration budget limitation - Seeking for budget support from other sources - Villagers' disregard of maintenance - Fear of burden from a

Stakeholder group	Supporting mindset	Preventing mindset
		malfunction project - Fear of losing-face - Prefer to accept good condition project from the DWR - Acceptance of public opinion to make decision - No water user group - Free water - Social mechanism preventing personal selfishness - Local's lack of project operation and maintenance knowledge - Misperceived image on malfunction project as well function - Local wants the local administration office to take care of everything - User self-interest in priority - No involvement of local administration office at the beginning of a project - No benefit of users from a project - Absence of project public participation - Duplicated budget and work on the same project

Stakeholder group	Supporting mindset	Preventing mindset
		- Disregard of maintenance - Acceptance of malfunction - Error in survey, design and construction - Local administration office not responsible for project management - Local happy to have a new project
Project user	- Project from local's need - Sufficient management in severed case - Assign person to task in a project maintenance - Community conflict management - Subsidy from local administration office - Cost sharing (Pumping station water user group) - Need of project operation and maintenance budget - Perception of self-help - Difficult to get a project - Acknowledging the value of a project - Understand limitations of the local administration office budget system - Waste of budget for	- Desire to use water - Unexpected event, contingency - No project public participation - No project maintenance plan - No water user group - Observing project structural damages - Acceptance of malfunction project - Local administration office responsibility for project maintenance - When severed damages occur, local administration office will look for help from others - Misperceived image on malfunction project as

Stakeholder group	Supporting mindset	Preventing mindset
	failure project - Acknowledging the value of water - Expectation of benefit from a project after land donation for construction - Pride of dedication for others' convenience	well function - Self-interest in priority - Ignorance after a project becomes malfunction - Unwillingness to pay for project maintenance/ cost avoidance - Unable to repair serious structural damages - Belief in politician's power - No advices and suggestions on project operation and maintenance from the DWR - Water is free - Contractor's disregard of procedures - Absence of responsibility sharing - Inadequate caring attitude (keep using until it's broken) - Different attitudes of villagers in project management - Enjoy using a project and not upset by malfunction - Income is main driving force - Lack of communication

Stakeholder group	Supporting mindset	Preventing mindset
		and cooperation between the DWR and local administration office - Maximization of personal benefit rather than public benefit - Benefit from a project is perceived as sense of ownership - Error in survey, design and construction - Un-seriousness of the local administration regarding the problem - Stuck with the idea of "it's government money, it's not my money" - A leader self-interest - Being blamed from others if reject a project - Land acquisition for project construction - Thai culture of following the local leader - Misunderstanding about project responsibility after land donation for a project construction - Malfunction project has no effect to daily life

The multi-stakeholder mental models analysis provides evidences that:

I. Each stakeholder group did not blame their behavior for cause of malfunction project as much but more often attributed them to link malfunction project to their limitation and other stakeholder responsibility.

II. Importance of malfunction project varied by stakeholder's objective and interest. Differences in perception of malfunction project embodied various interpretations of the malfunction definition, causes, effective management policies, and responsibility attribution. This leads to significant obstacles in reaching a common understanding in project management.

III. The Department of Water Resources (DWR) has their own interest focusing on delivery project side which is hierarchical and low respond to project operation and maintenance management demand coming from local administration and project users. The DWR was perceived by local administration office and project users to be following the procedures with lack of taking other stakeholder participation into consideration. On the other hand, the DWR perceived budget limitation in maintenance work and political interference as internal obstacles leading to collapse of project operation and lack of maintenance and repair management. In addition, user's attitude of "It's government property, it's not mine", user's lack of maintenance awareness of a project and lack of self-help initiative to a water resources project were perceived by the DWR as underlying causes of malfunction project. The primarily functions of the DWR regional office include project management, improvement of operation and maintenance. Staffs in The Department of Water Resources Regional office identified that low stakeholder participation in project development was anticipated malfunction project although public participation in public project was clearly stated in the Office of Prime Minister Regulation. The problem appeared to be with the response from project users that project was unable to solve their problem. There were also a problem with absence of cooperation between units in the regional office and the DWR headquarter office due to conflict on rejection of project proposed by river basin committee and lack of communication between units.

IV. Local administration office recognized their limitation of budget and low capability for water resources project operation and maintenance resulting to make decision to avoid

or transfer burden may occurred from malfunction project to the project owner (the DWR), as well as seeking for budget support from other sources. The officer in Local Administration Office exhibited willingness to improve a project function but refused to take responsibility for project management.

V. Project users can be seen as very sensitive, and income is main driving force. Small contribution from project users in the case of project minor damage was perceived as a sense of ownership and responsibility sharing in their attitude and behavior. The problem appeared with disregard of maintenance and ignorance after project became malfunction and made no benefit, and then later the project was abandoned. Water user's mental model analysis revealed that users enjoyed using a project and not upset by project malfunction. It was also noted that for project users, tradition and local culture were very important, sometimes more important than economic incentive. Project users perceived project maintenance as a responsibility of Local Administration Office since they were tax payer and a project was government property.

VI. Multi-stakeholder mental models analysis showed diverse and differences in concepts driven by substantially different mindset. The main similarities and differences between mental models are summarized in Table 12.

Table 12 Overview of the main similarities and differences between stakeholder mental models

	Department of Water Resources	Local Administration Office	Project Users
Priority of project goals	Delivery of construction project	Responsibility for all infrastructure project	Water needs and water usage
Main driving force	Organization missions and regulations	Community development	Economic incentives
Timescale of implementation	Short term	Long term	Long term
Ownership of the project	Authority from law and regulation	Local authority and organization capability	Based on benefit from a project
Responsibility of operation and maintenance	Central authority and available budget	Local authority and available budget	Based on benefit from a project
Obstacles	- Budget constraint - No project life cycle management plan - Politician interference - Corruption - Lack of coordination between units in the organization - Low quality control in construction work	- Budget constraint - Limited number of skilled-workers - Fear of burden from a malfunction project	- Self-interest in priority - Lack of knowledge in operation and maintenance - Absence of responsibility sharing - Ignorance of malfunction project - Belief in politician's power

5.3.5 Application of integrated multi-stakeholder mental models and project life cycle

Comparison of the stakeholder groups and their mental models influence diagrams

(in section 5.3.4) show complementarity of mental models of the stakeholder groups. In order to understand obstacles that hinder success of a project and the pathways of malfunction project in holistic view, the integrated multi-stakeholder mental models and project life cycle diagram of two cases study were developed with a focus on impact from different behaviors to project function. These diagrams appear to provide a basis for discussion on differences in mental models, problems solving from a current management scheme and grasping some new opportunity. The integrated diagrams are illustrated in Figure 36 and Figure 37.

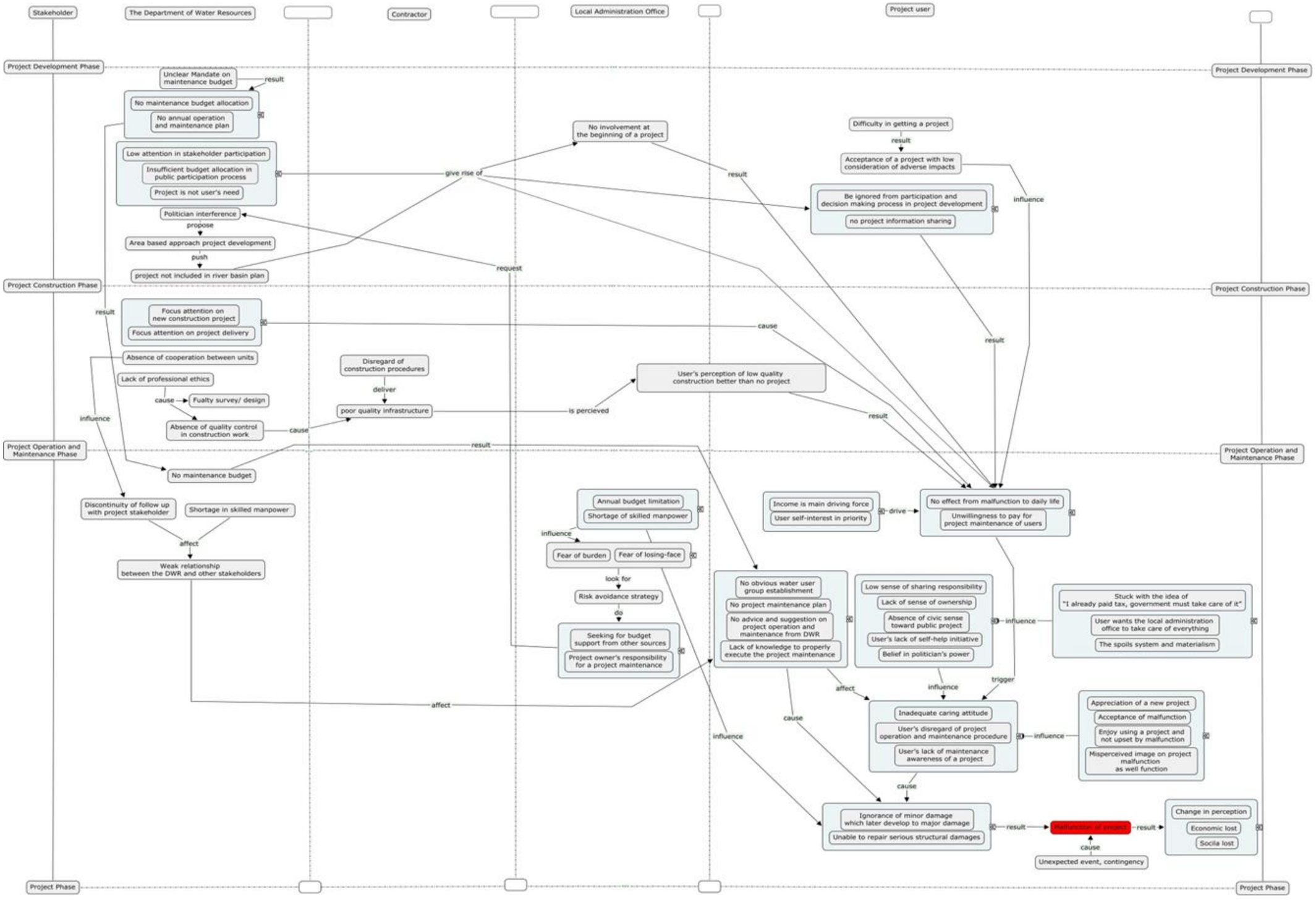


Figure 36 Malfunction influence diagram: Case I

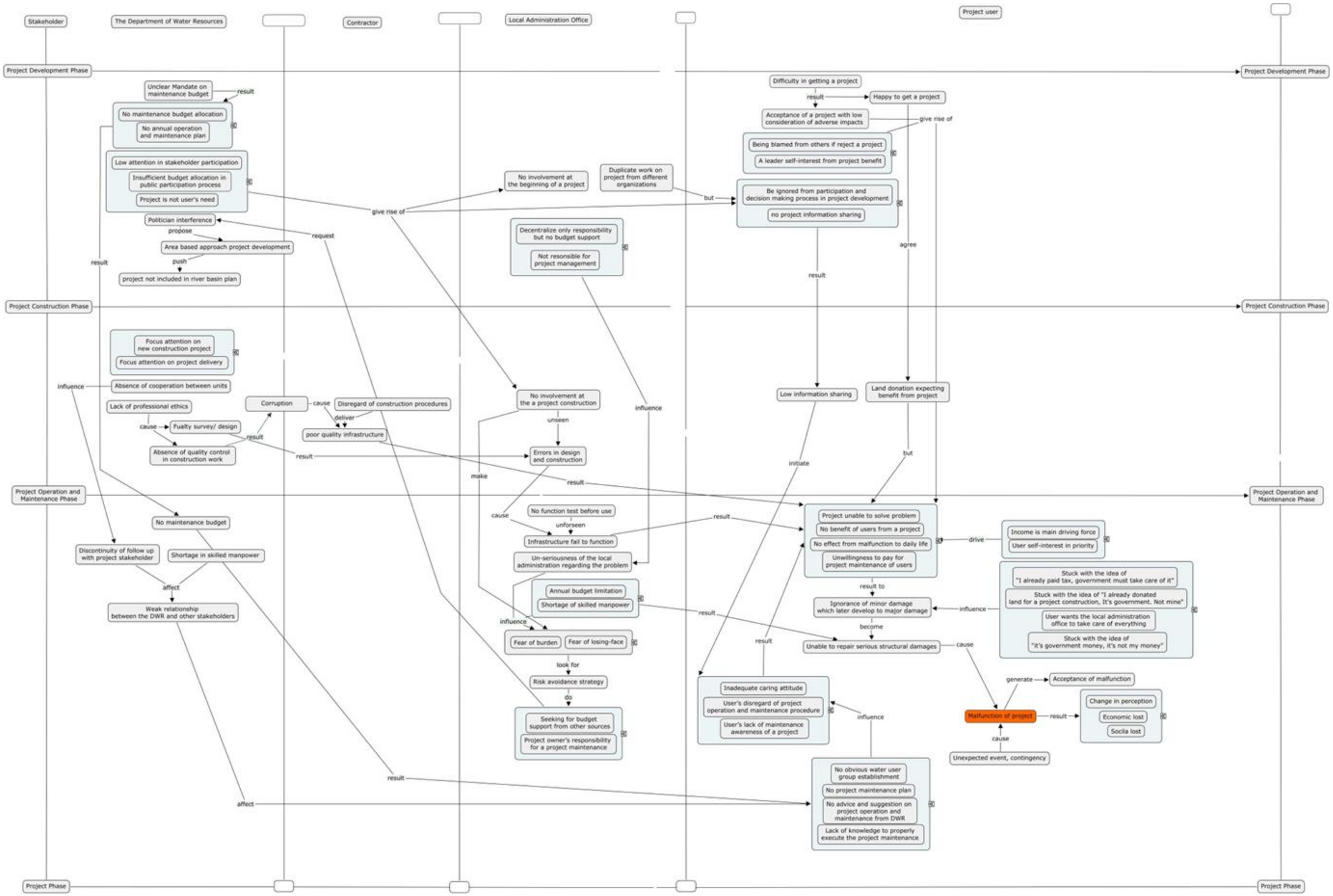


Figure 37 Malfunction influence diagram: Case II

5.4 Summary

This chapter presents analysis of 21 semi-structured interviews with three groups of stakeholders related to malfunction of small-scaled water resources project in the Northeastern Thailand. Development of integrated stakeholder mental models and project life cycle was introduced to identify stakeholder mindset associated with project phases and analyzed differences in action situation. The study investigated how different groups of stakeholder perceived and responded with malfunction of small-scaled water resources project.

A number of mental model influence diagrams were illustrated to represent concepts and causal relation that hinder success of a project. The majority of acute response occurred at the Local Administration Office and project user level, although this may be due to the failure of project planning and management scheme. The analysis suggested that each stakeholder group perceived the malfunction project as being caused their limitations and other groups of stakeholder's responsibility. In addition, differences in perception of malfunction project embodied various interpretations of the malfunction definition and causes lead to significant obstacles in reaching a common understanding in project management.

Chapter 6: DISCUSSIONS AND PROPOSED MEASURES IMPLICATIONS

6.1 Introduction

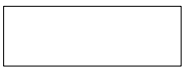
In this chapter, the central aspects and conclusions of the empirical study are taken up and discussed with regard to the research questions. The objectives and major constraints of each group of stakeholders linking to current management scheme are also examined. In order to reduce the number of malfunction projects, the proposed measures (the beneficiary contribution scheme and project life cycle management), the implication and action plans are introduced.

This section deals specifically with analyzing issues that arise from current project management scheme (empirical study results from Chapter 5). In analyzing the evidences emerged from multi-stakeholder mental models and action situation associated with malfunction of water resources project, there is need to be rationale for analyze it.

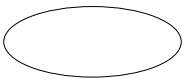
6.2 Identified constraint from integrated multi-stakeholder mental models and project life cycle

Having established the approach and procedure for deriving proposed measures as mentioned in section 4.7.1 of Chapter 4, there are three key areas to consider: 1) Root causes identification derived from multi-stakeholder mental models and action situation analysis in project life cycle, 2) Derivation of measures from identified constraint, and 3) Assessment of proposed measure.

The root causes of malfunction project is developed from detailed integrated multi-stakeholder mental model and project life cycle of two cases studies (Case I and Case II). It is an attempt to analyze behavior of groups of stakeholders and sequence of actions that describe the events leading up to an occurrence of malfunction project and the conditions surrounding these events. As a result, constraint can be identified. Identified constraint is combination of stakeholder's mental models and action helping to answer questions about why particular failure occurs. In order to identify constraint, results from two case studies (Figure 36 and 37) can be compiled and organized in simplified form of integrated table as shown in Figure 38.



: action situation for each stakeholder group



: mental models of each stakeholder group

: causal relationship (cause is at one end of the arrow and result is at another end)

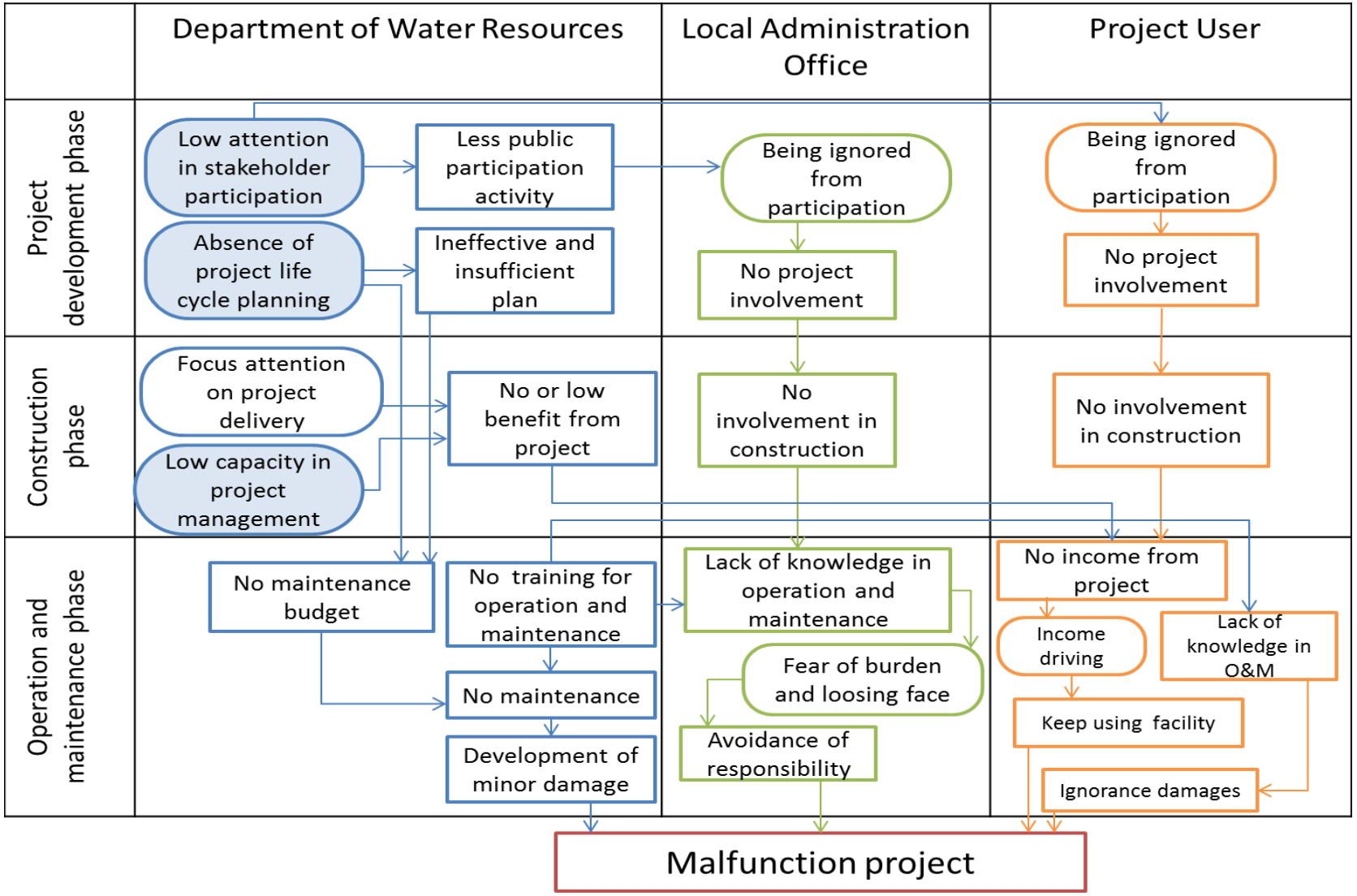


Figure 38 Constraint identified in integrated mental models and project life cycle

In Figure 38, result from root causes analysis suggests the most visible causal factor identified as the constraints may be characterized into: (a) Lack of planning for implementation of the Department of Water Resources (DWR); (b) Capacity of the DWR and staff in project planning and management; and (c) Absence of stakeholder participation and stakeholder capacity building. None of these constraints is considered as a dominate factor over others, but reinforce each other. Each constraint is elaborated as following.

6.2.1 Lack of planning for implementation of the Department of Water Resources

The DWR's objectives stated in the organization document (Department of water resources, 2007) includes

1) Formulation of policy and IWRM plan in river basin context system with participation,

2) Promote, support and increase capacity for stakeholders and river basin networks,

3) Accelerate water resources development for consumption, and

4) Improve water infrastructures

As identified from the analysis, however, problems in planning and implementation are evidenced from the differences between objectives and achievements in a project. The study result shows that the Department of Water Resources was being blamed for failed or poor strategy on project implementation (operation and maintenance). Weakness in the planning and implementation process and focus on delivery of an infrastructure have been identify by other stakeholder group from the interviews as one of the key issues that should be addressed to facilitate decreased malfunction of project. It is apparent that the DWR is lack of vision in detail planning after deliver the project to project user at the beginning of project planning process. Otherwise, the organization may have prepared an adequate effective mechanism for Local Administration Office and project users when it comes to implementation phase. This has contributed to the unclear mandate on operation and maintenance budget between the DWR and the Bureau of Budget. Inadequate budgets caused by inadequate management have influence on operational problems in small-scaled water resources project. Indeed, lack of planning for implementation can create the conditions that can lead to a malfunction project which refrain the DWR from achieving the organization's objectives.

6.2.2 Capacity of the DWR and staff in project planning and management

The Department of Water Resources (DWR) was established under the Ministry of Natural Resources and Environment after the Thai government reorganization in 2002. Staffs in the DWR were recruited from various organizations with different background and specialist to reorganize and establish bureaus/ divisions and units under the department as well as offices in regions. This implied that the DWR needed to strengthen its management powers and sufficient and qualified staff to support the organization in order to achieve the objectives as stipulated in the department's policy and plan proposal. To cope with the inadequacy of qualified staff in the department, the DWR put efforts in training, human-resources development and capacity building in water resources management and in introducing and implementing the IWRM concepts in first couple years of the organization establishment. However, it is apparent that the DWR is handicapped by a shortage in qualified staff in terms of technical and/or professional ethics as well as weakness in effective collaboration among units in the organization.

In addition, it is acknowledged that whilst a project is transferred to other management authorities; for example Provincial Administration Office, Local Administration Office or project users, after the construction completed, there is the need to strengthen the DWR's capacities in developing a specific policy framework contributed to project management, guidelines for both technical and public participation issues, project implementation indicators, monitoring and evaluation mechanisms. At the moment such capacities have not well developed.

6.2.3 Absence of stakeholder participation and stakeholder capacity building

"Participation in planning refers to opportunities for stakeholders to contribute to and influence planning processes and outcomes" (The Office of Urban Management, 2007). One of the DWR's objectives is to promote, support public participation and increase capacity for stakeholders. However, it is evident from the study that Local Administration Office and water user group were ignored from being invited to participate in project planning process. This indicated that the DWR was lack of a commitment to use the process to inform the actions, but aimed at completing the process stated in the Office of Prime Minister Regulation on public participation in public project B.E.2548. In order to ensure effectiveness of stakeholder participation and decision making in planning process, the DWR needs the transparency of the process, collaborative problem formulation and process design, and

good-faith communication between related stakeholders (Dietz & Stern, 2008). This constraint is influenced by the previous mentioned constraint.

Diversity in experience, knowledge, values and perspective is considered as important factors that can pose a challenge in implementing principles of public participation and collaborative problem formulation. The diagnose of project user's mental models identified particular perception of absence of sense of ownership and responsibility sharing which can constitute serious barriers to a productive public participation process and can form the conflicts among stakeholders and the DWR. There is notable evidence in which low-income have mobilized very ineffectively when they can't see their vital interest from participation in the project planning and development. Special efforts will require establishing strategy which suitable for related stakeholders for capacity building, awareness and widening the knowledge base including public education with substantial scientific content.

6.3 Proposed alternative factors or strategies to cope with the possible project malfunction

Results from multi-stakeholder mental models analysis suggest that there are debates about the reality of the project malfunction problem for different stakeholders. The underlining cause of malfunction project is the focus on infrastructure delivery with low consideration of project life cycle management by the Department of Water Resources. This causes a tension and burden to Local Administration Office and project users due to time scale of implementation project and responsibility of operation and maintenance. As indicated in the analysis, stakeholders shared little common understanding and no cooperative objective among groups of stakeholder was established in a project. In addition, differences in mental models indicate blocking in communication among stakeholders which stakeholders are reluctant to reveal their models when a satisfactory social relationship is not established.

In recommending suitable measures for preventing malfunction project developed by the Department of Water Resources, it is important to recognize the limitations of the existing condition in terms of both involved stakeholder and management scheme. In addition, the recommended measures may address the long-term requirement for increased reliability and applicability of the measures as well as allowing stakeholder to change their mental models (previously mentioned in section 4.7 in Chapter 4). In order to deal with complex challenges of malfunction project in a systematic way, the following proposals (Figure 40) is structured

into three thematic which is correspondence with identified constraints. Further details of the proposed measures are elaborated in the following section.

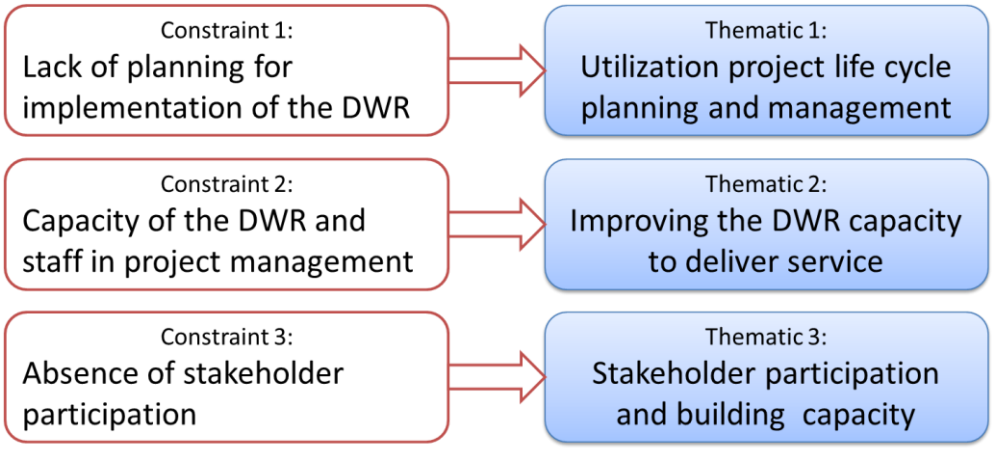


Figure 39 Proposed thematic and cross-sectional modules

6.3.1 Thematic 1: Utilization project life cycle planning and management

Disappointing results from the Department of Water Resources (DWR) water resources project development efforts in the past have often been associated with poor planning and implementation and failure to incorporate with project stakeholder groups. Many projects were developed in Top-down paradigm with low consideration on participation of stakeholder in designing and implementing project. Emphasize on deliver project, poor implementation, lack of maintenance-rehabilitation cycle and absence of project monitoring have caused negative returns on subsequence collapse or malfunction of infrastructure and negative image of the DWR to stakeholder groups. To cope with these problems, practical measures to improve project planning and implementation should be addressed to facilitate and enable group of stakeholder to use the infrastructure productively and sustainably. Special attention will be paid to the project life cycle management in terms of the process, roles and responsibilities that the different group of stakeholder may have with respect to achieving the stakeholder's objective and the project goals.

Project cycle management approach is recognized as a logical sequence or cycle of activities to accomplish the project's goals or objectives in which provides a structure to ensure that stakeholders are consulted and informed the relevant information (European Commission, 2002). The phases of project cycle management are presented in Figure 41.

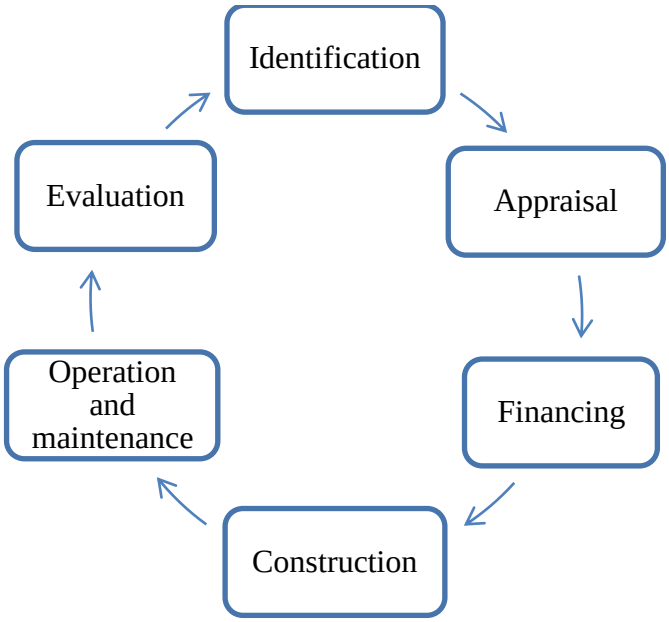


Figure 40 Project cycle

At a project level, project's beneficial area is suggested as management unit which covers management options over engineering, economic and social aspects in a period of four years. In particular, all related stakeholders shall be involved in the project planning, construction and operation and maintenance. It is needed to guarantee that the management plan takes the various perspectives into account. The following sections introduce practical measures to improve project planning and implementation for the DWR through a series of stages during the project life.

1. Project identification

This stage aims at defining problems and needs of stakeholder groups and identifying realistic and judicious activities to implement in response to the problems and needs. In the project identification stage, the DWR should conduct *situation and problem analysis and stakeholder analysis.*

Situation, problems and needs analysis is mandatory activity that the DWR must carry out in a participative manner. The problem represents the gap between the current situation and the desired situation in which the expression of needs. The purpose of participative problem identification is the DWR can gather information about stakeholder's opinion and feeling about their living conditions and expected results as well as difficulties during focus group discussions. Stakeholder analysis aims at identifying the expectations and

interest of related stakeholder using technique such as focus group discussion and interview. Each stakeholder group carries different characteristics leading to a multitude of different objectives and expectation. Therefore, hierarchical cooperative goals or objectives of stakeholder groups (Figure 42) should be incorporated in the project identification process. Stakeholder analysis is closely link to the problem analysis.

By implementing the participative approach, the stakeholder groups are encouraged to share and analyze their knowledge and living conditions as well as the DWR can evaluate the feasible plan and project idea.

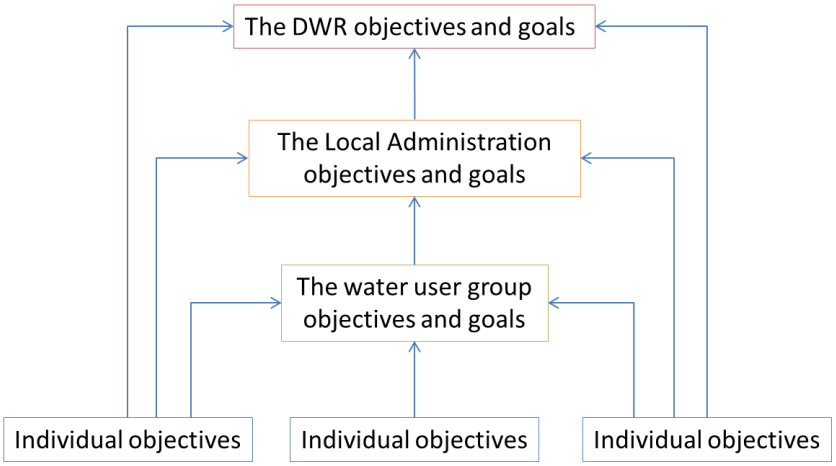


Figure 41 Hierarchical cooperative objectives

After completion of situation and problem analysis and stakeholder analysis, the synthesis results should raise the issues that appear to be the most important among group of stakeholder and the determined project theme. In practice, this process is time consuming and requires extra cost to conduct which it has been neglected by the DWR. Nevertheless, it is essential to conduct situation and problem analysis and stakeholder analysis and present the results to the related stakeholder groups in order to facilitate their participation in the decision-making concerning the project and avoiding the negative consequences that may be imposed from being neglected in participation process. By sharing information, the different aspect of the analysis is complemented, adjusted and verified.

2. Project appraisal

Once the project theme and objectives have been determined, the project planning and design should be discussed in relation to the project form and type based on key findings during the project problem analysis and stakeholder analysis. During the design period, the

DWR should concern on the sustainability aspects of the project formulation. The project sustainability aspects include technical sustainability, organization sustainability, social and culture sustainability, economic and financial sustainability and environmental sustainability (European Commission, 2002). Once the multi-stakeholder mental models study result suggest that project user has emphasized on income and self-interest, it is vital that the project should have capacity to continue and become sustainable without external support. This can be possible if the DWR conduct a project economic and financial assessment, not only the benefit/cost ratio but the projected profit and loss account (European Commission, 2002). In addition, estimation the life cycle cost over the whole life of the project or at least first four years is needed. Excluding the design and construction costs, it is very important to include adequate operating costs, management and maintenance cost for the project life planning.

3. Project financial management

The financial management is one of the most critical issues for water resources project management and this skill is required for the executive level of the DWR in order to secure funding for the department's projects. The active role of the DWR's executive, particularly negotiation with the Bureau of Budget on operational and maintenance fund, is considered to be a compulsory element to achieve project life cycle management.

4. Project construction and quality control

Project construction phase is where the structure is actually built and where the interface among the DWR, the contractor, the Local Administration Office and project users occurs. All stakeholders have vital stake in the project. It is expected that contractor prepares the plans needed to complete the structure according to the quality and functionality specifications and within the specific of time (Kunishima & Shoji, 1996). The DWR is expected to work on their best ability in accordance with the plan to ensure the quality of the project within the prescribed time. The Local Administration Office and project user are looking for a well function structure that can fulfill their needs and objectives. However, the mental models elicited from related stakeholders revealed that some defects and low quality of structure occurred in the construction phase. It is assumed that emphasize of quality control in construction phase is required. To assure the structure quality, the primary control areas that the DWR should be called into attention (Ritz, 1994):

- The project budget

- The project schedule
- Quality standards
- Material resources and delivery
- Labor supply and productivity
- Cash flow projections

Regarding scope of responsibility of the DWR, the construction quality standard is considered as the urgent concerned area. It was evident that the DWR failed to exercise proper management control over field activities in construction phase. In small-scaled water resources project construction, the quality of the field work is monitored by the engineers or technicians from contractor under supervision of the DWR staff following the established construction quality control program. In fact, the DWR is intermittently on the site to observe construction operations or usually at the critical stage of the work. In participative manner, it is proposed to formulate the construction quality control committee composed of representatives from the DWR, the Local Administration Office and project. This committee can make its own inspections as the construction reach the 90 percent complete stage to determine what is left for it to finish and to ensure that all contractual requirements have been complied with. Testing and adjusting the instrumentation system, for example sluice gate, valves, water distribution system, etc., requires detailed inspection and calibration before the system can be accepted as operational.

In addition, in order to maintain quality issues in project construction, it is essential to foster a proper sense of professional ethics in the DWR staff of pride in the work and the value of the job (Kunishima & Shoji, 1996). Therefore, various forms of continual education, training and monitoring system are necessary.

5. Project operation and maintenance phase

Once the construction is completed and delivered to project user or water user group, operation and maintenance can start. Simultaneously, partnership arrangement among related stakeholders is expected to be established according to the stakeholder analysis process. It is recommended by the European Commission (2002) that the preconditions for establishing a good partnership include participation, task sharing, clearly formulated specific and concrete partnership agreements, and good conflict management.

The provisional operation plan and maintenance schedule should be established in the beginning of a project for medium term and will be able to adjust along the project period. The DWR should take a role of a facilitator to facilitate the technical issues in operational plan and maintenance schedule for the Local Administration Office and water user. This operation plan and maintenance schedule should clarify the responsibilities, functions, tasks and commitments of each stakeholder group including the financial source of the plan.

To ensure operational adequacy during the operation and maintenance phase, the DWR and related stakeholder groups should determine to maintain operation and maintenance policies and regulations and maintain a performance database including maintenance records, condition assessment data and other items. In addition, periodic inspection in project performance is needed in order to enhance and extend the service life of the project. To achieve the operation and maintenance plan, adequate funding and resources must be secured. Additional proposal is to establish the emergency maintenance fund at the central office of the DWR which will be available for emergency repair work occurred from contingency or natural disaster.

6. Project monitoring and evaluation

For the last couple years, the DWR have utilized the Performance Assessment Rating Tool –PART to assess the organization performance. However, this current effort of DWR's evaluation system is to answer specific questions on direct output (for example, number of construction project, number of stakeholder who participate in the project, the DWR accounting) rather than efficiency, effectiveness, impact and sustainability of the project (in terms of quality of work delivered to stakeholders, activities and process relevant to achievement of the project, adverse impact from the project, and long-term benefit produced by the project) (European Commission, 2002). In order to provide a means for identify, measure and assess the results of the project, a development of preliminary framework for the DWR project assessment is needed.

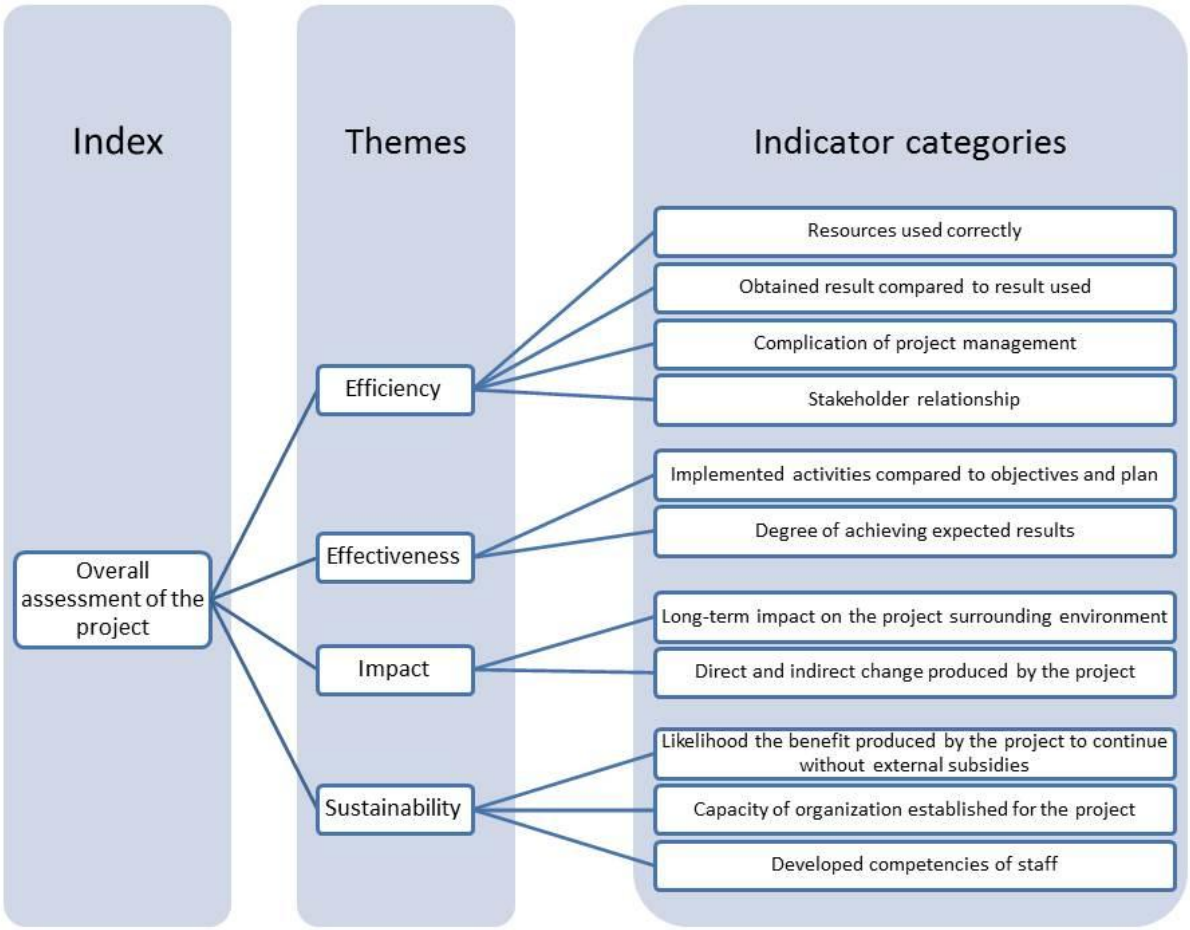


Figure 42 Framework of the project assessment system

As shown in Figure 42, the framework consists of three layers; index, themes and indicator categories. Methods for selecting specific features in indicator categories in accordance with local constraint must be further developed. The assessment can be conducted by 1) the internal evaluation by the evaluator belongs to the organization, 2) the external evaluation from external consultant with no connection with the organization, 3) mixed evaluation which is carried out by a consultant acting as a facilitator to gather information then pass the collected information to the project team for analysis, and 4) participative evaluation from the project stakeholders to enhance collective competencies, facilitate ownership and transfer knowledge.

6.3.2 Thematic 2: Improving the DWR capacity to deliver service

The Department of Water Resources needs to continue the improvement of organization performance and to strengthen the staff capacity capability to ensure that it maintains the sustainable and equitable water resources management. A capacity building

program for the DWR staff needs to be urgently addressed. To this end, *the capacity building unit* is proposed to provide training, technical assistance and management support service to the DWR staff in order to strengthen the staff capability to deliver service to public and related stakeholders. Training courses should be developed to address the capacity issues identified in the project assessment system (see section "*6. Project monitoring and evaluation"* above).

Another key area for the DWR to improve capacity relates to the basic documentation of water resources planning, methodologies and process (Hussey & Dovers, 2007). At minimum, there is a need to identify and develop a series of practical guidelines for operational staff and stakeholder use. The examples of practical guidelines include:

- Review process of project planning, designing, construction and implementing
- Checklist of operational policies related to the DWR project
- Guideline of trade-off analysis in water resources project development
- Manual on performance auditing, monitoring, supervision and evaluation of project plans and their implementation
- Guideline for appropriate and effective public participation

These manuals and guidelines can be done by developing multi-disciplinary teams from either in-house specialists or external consultants to develop the materials. Also, it is a need for the DWR staff's increasing appreciation of their potential role in the water resources management.

6.3.3 Thematic 3: Stakeholder participation and capacity building

Ultimately, the transparency in public participation and engagement in the project development process will play a key role in acceptability and sustainability of the project. Therefore, considerable effort on public participation process in the Department of Water Resources project must be focused. Promoting public participation process could be achieved through supportive reasonable budget in public participation activities and continuity training for related stakeholders. Although public participation may appear to be time-consuming and costly at first, the long-term benefits for the DWR is may be far exceed initial cost and may prevent adverse impacts that may occur. Stakeholder participation and stakeholder capacity

building program is a repetitive activity which ideally take place throughout of the project life cycle.

Public participation is often constrained by the DWR's contexts; for example shortage of budget and skilled manpower, unrealistic timetable of participation process, which affect their ability and willingness to user the results of the participatory process. To cope with those constraints, it is suggested that the DWR needs to diagnose and identify particular factors that can make public participation difficult to implement, describe the difficulties and identifies practice that have been used to address them. The DWR must be carefully in adopting a process for selecting best techniques and tools for the situation which is informed by evidences (Dietz & Stern, 2008).

6.3.4 Recommendation and action plan

Drawing on the multi-stakeholder mental models analysis and constraint analysis, the three thematic were developed in response to malfunction project in the Northeastern Thailand (as presented in section 6.3.3). This section described the recommendations to reduce a number of malfunction projects and strengthen the capacity of the Department of Water Resources (DWR) to supply sustainable water resources development. For each of these recommendations, the specific actions are identified for the DWR consideration to reduce malfunction projects. A table summarizing four recommendations and supporting actions based on three thematic is provided in Table 13.

Table 13 Summary of recommendations and supporting actions based on proposed thematic

Recommendation 1: Utilize project life cycle planning and management
Action 1: Review current legislations and engender policies
Action 2: Initiation of "Code of practice for project life cycle management" and incorporating risk management
Action 3: Initiation of "Maintenance management systems" (3R's = repair, rehabilitation, and replacement)
Action 4: Integrated "local's livelihood" into water resources project objectives and incorporate stakeholder 's objectives into planning and strategies to achieve these objectives
Action 5: Negotiation and build commitment on finance securing between the DWR and the Bureau of Budget
Action 6: Set the realistic and specific schedules and timeline
Recommendation 2: Improving the DWR capacity to deliver service
Action 7: Identify competencies required for the DWR staff positions and roles (related to recommendation 1)
Action 8: Establish and maintain training program for the DWR staffs: The capacity building unit
Action 9: Ongoing assessment of staff's competency and relate the assessment with annual staff promotion
Action 10: Alignment of the staff capacity improvement planning and budget plan
Recommendation 3: Establish project effectiveness monitoring and review
Action 11: Initiation of project evaluation framework by evaluation not only "Output-outcome" but also "Process" and "Cost effectiveness"
Action 12: Evaluate values that project creates rather than number of project implemented and financial balance of the DWR account (Efficiency in Achievement of Outputs and Purpose)
Action 13: Evaluation from the third party
Recommendation 4: Strengthen Stakeholder relationship and stakeholder participation and build capacity

Action 14: Active participation in making project objectives regarding stakeholder demand options by ensuring opportunities for participation early enough in process
Action 15: Specify responsibility / commitments for project stakeholders in form of agreement or memorandum of understanding
Action 16: Establish/ strengthen water user group by employing outsources under supervision of the DWR staff
Action 17: Promote “Beneficiary contribution scheme”

Introduction of measures in the recommendations and supporting actions (Table 13) developed from the thematic (Figure 39) are expected to contribute to reducing the malfunction project and enable stakeholder and enhance group of stakeholders to achieve the objectives or to satisfy the constraints.

6.3.5 Introduction of beneficiary contribution approach

This approach is a combination of stakeholder management, responsibility sharing and technical matters. Small-scaled water resources project development scheme should be considered as demand driven and identified by the local stakeholder based on water related problem. In Thailand, it has been recognized that the water resources project users or beneficiaries do not appreciate in the projects since the projects are provided by the government for free of charge. This leads to lack of a sense of ownership and sharing responsibility to the projects and gives rise to project failure (UN-WATER/WWAP, 2007). In addition, it was previously believed that efficient water resources project management would be possible if the water user group is established. However, it was evidenced that it is important not only to have a water user group established, but also long-term commitment of users or beneficiaries for sustainable use of resources and project are sought at present. In order to establish a sense of ownership and achieve sustainable use of resources and project, it is necessary to revise some regulations to avoid “free ride” and establish rules for responsibility sharing in small-scaled water resources project. In this section, beneficiary contribution approach and sound project development process and timeframe are proposed.

Small-scaled water resources project is defined as a project where beneficial area is smaller than 3,000 Rai (4.8 km2), and construction duration is within 1-2 years with approximate cost of 10-15 million Baht (0.3-0.5 million dollar) (Royal Irrigation Department,

2009). The Thai national government bares total expenses for water resources project because most local governments (Provincial level and sub-district/ Tambon level) cannot afford to make this investment by their own financial resources. On the other hand, operation, maintenance and management cost of existing facility are borne by water users or Tambon Administration Organization (TAO) from water charges or TAO financial resource. However, in case of large scale maintenance work due to severe facility damage, the maintenance cost is also borne by the national government.

As stated in the cabinet's resolution on 17th March 1991, 11th May 1992 and 15th June 1998, in order to develop small-scaled water resources project for the purpose of alleviation immediate suffering and increasing quality of life, there is no compensation for land acquisition in small-scaled water resources project. This regulation has been driving water related government agencies toward implementation of the landowner donation for a project construction. However, negative impacts form a land owner donation scheme have been witnessed including lack of the project appreciation, no enthusiastic in the project operation and maintenance and no sense of ownership. In addition, several high potential projects were canceled due to conflicts on land acquisition during a project reconnaissance phase. In an attempt to solve the problems, beneficiary contribution system is introduced to ensure stakeholder participation. The beneficiary contribution is adopted from the small-scaled water resources development sector project in rural Bangladesh (Hossain & Islam) and subsidies for water resource development in Japan (World Bank, 2006).

This approach is a combination of stakeholder management, responsibility sharing and technical matters. Small-scaled water resources project development scheme should be considered as demand driven and identified by the local stakeholder based on water related problem. Moreover, it is required that project stakeholders must be involved in all stages of a project development. The basic principles of beneficiary contribution approach in this research are:

1. Scheme is identified by local with technical supports and construction work from the DWR
2. Beneficiaries and related stakeholders must be involved in all stages
3. Scheme must produce sufficient benefit for project life cycle management
4. Beneficiaries contribute equivalent to *the cost of first year of Operation and*

maintenance

5. Monitoring and evaluation system must be applied to project

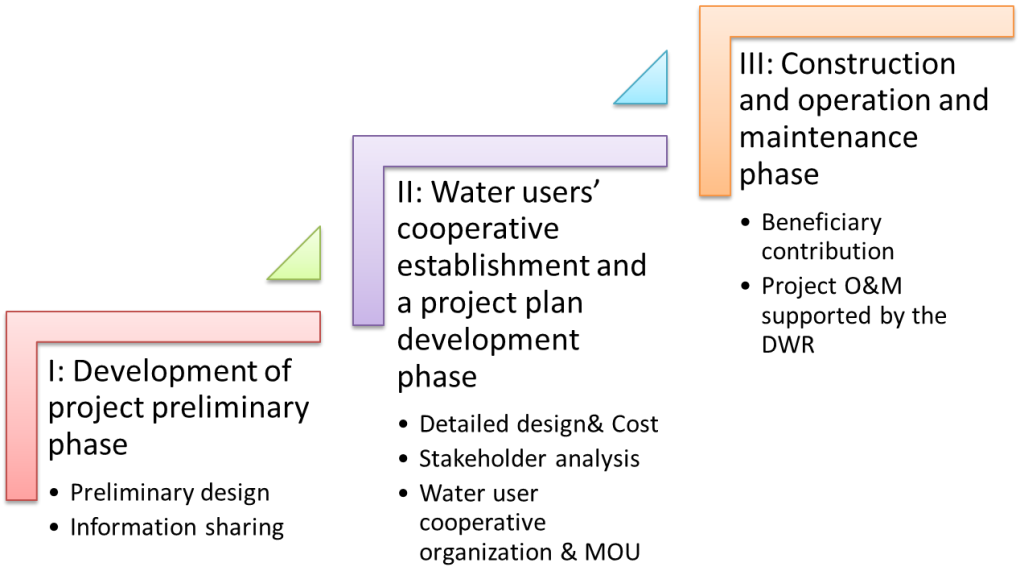


Figure 43 Phases of proposed beneficiary contribution scheme

Three phases of development process, as presented in Figure 47, are summarized as following:

Phase I: Development of project feasibility phase

At the beginning of this stage, problems and needs are identified by locals and proposed to a Local Administration or known as "Tambon Administration Organization (TAO)". The TAO will consider a proposed scheme based on available technical and socio-economic information and present to concerned agency (in this paper the concerned agency is referred to the Department of Water Resources). The DWR will conduct reconnaissance study (Project identification phase in project life cycle management), project stakeholder analysis and further preliminary design for the propose scheme that pass all DWR's criteria for project development. After the proposed scheme approval, the DWR will prepare to discuss with TAO. At the end of this stage, the output will be a preliminary design of the proposed scheme, the stakeholder analysis result, and the project information sharing among locals, the TAO and the DWR. The development of project feasibility will take between 3 to 6 months.

Phase II: Water users' cooperative establishment and a project plan development phase

Once the preliminary design of proposed scheme is approved, the DWR will present them to locals and the TAO for detail design discussion including project cost-benefit and operation and maintenance cost for the first year. After detail design and compensation for land acquisition issue is decided, a water user cooperative will need to be formulated by coordination between the project beneficiaries and the TAO. For the formulation of the water user cooperative, the beneficiaries will be listed along their amount of contribution and signing of agreement, which can be in form of Memorandum of Understanding (MOU), between the water user cooperative, the TAO and the DWR. It was recommended by Hossin and Islam that the beneficiary contribution is calculated to be equivalent to the cost of operating and maintaining the infrastructure for a year approximately 10% of the construction cost. However, the amount of contribution can be suggested by appropriateness and final agreement among stakeholders. In this research, the beneficiary contribution equivalent to the cost of first year of operation and maintenance is recommended.

Simultaneously, the DWR cooperated with the TAO begins to reconfirm a project stakeholder analysis in order to identify and asses certain related stakeholders. The DWR will conduct final design and cost estimation then propose the project to River Basin Committee (RBC) in the basin area for river basin plan approval. The final cost estimation for a project budget approval is the project cost subtracted from the beneficiaries' contribution. After the river basin plan approval, the project will go through budget approval procedure to allocate the budget to the proposed project. In this stage, an operation and maintenance plan and a monitoring and evaluation system is prepared. The final outputs of this stage are project detail design and cost estimation, stakeholder management plan, water user cooperative organization establishment, a project operation and maintenance and monitoring plan and Memorandum of understanding (MOUs). This stage may take about between 4 to 6 months.

Phase III: Construction and operation and maintenance phase

If the budget for the proposed construction is approved by the cabinet, the DWR will proceed to the contractor selection and awarding as per the Thai government procurement. As soon as full beneficiary contribution is fulfilled, the DWR can release funds for work. After the project construction is completed and starts to operate, the DWR will take a role of supporter to assist the water user cooperative in operating and maintaining the project as well

as resolving conflicts of interest that may occur. Figure 44 illustrates process flow in the proposed beneficiary contribution scheme. This proposed scheme may facilitate responsibility sharing and sense of ownership to related stakeholder and encourage multi-stakeholder management scheme to the government official which could eliminate malfunction of small-scaled water resources project in Thailand.

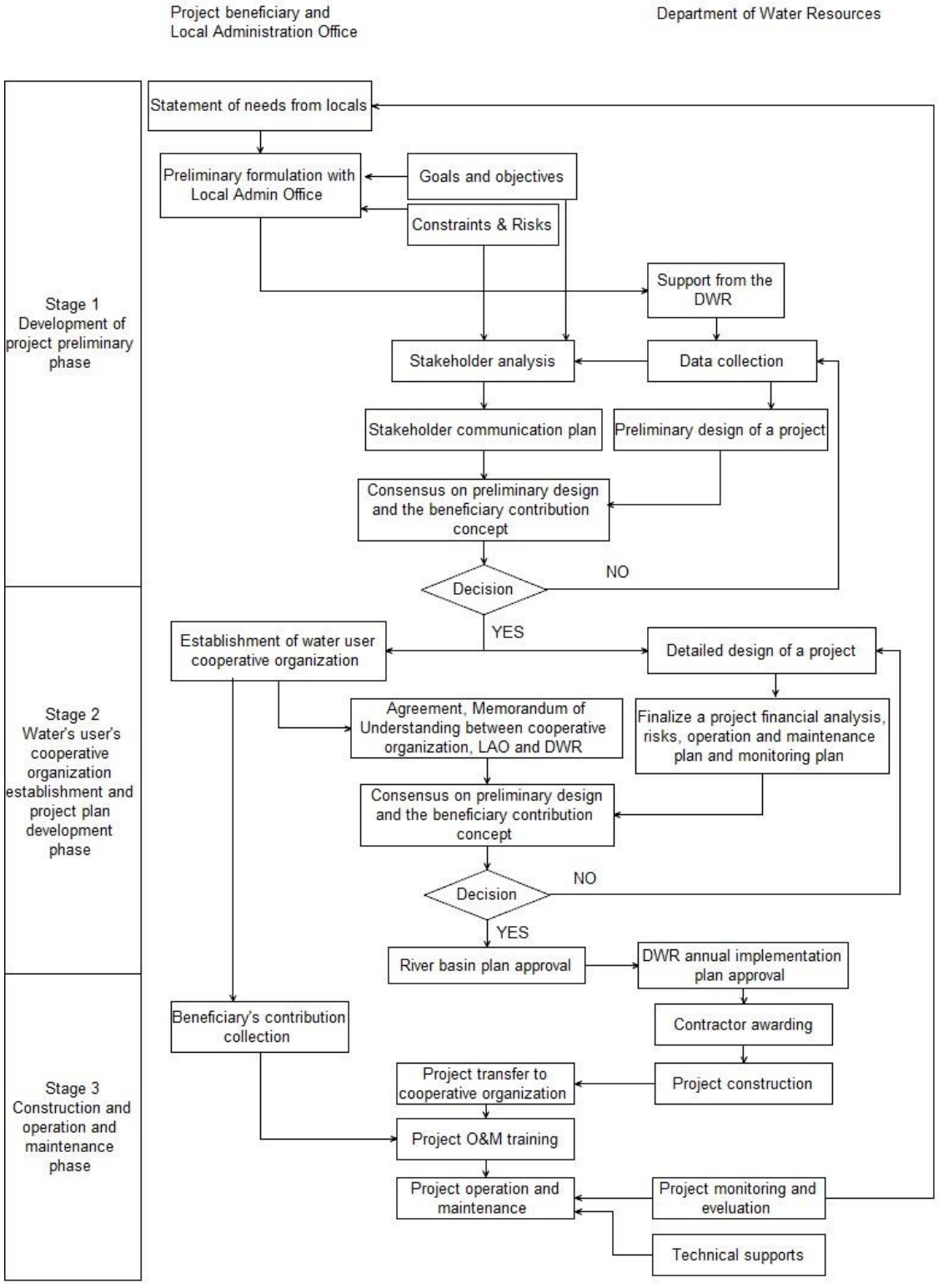


Figure 44 Flow in the proposed beneficiary contribution scheme

6.3.6 Cross-Impact Balance Analysis for the beneficiary contribution approach

Scenario analysis is a tool that often selected to enhance the understanding of long-term planning. Cross-impact balance (CIB) analysis is a systematic form of qualitative

system analysis to generate consistence scenarios using a balance algorithm (Kosow, 2011). A typical application of CIB is to analyze scenarios and determine consistent configuration of impact networks using a pair-interaction system approach based on the concept of mathematical systems theory (Weimer-Jehle, Cross-impact balances: A system-theoretical approach to cross-impact analysis, 2006; Kosow, 2011; Weimer-Jehle, 2012).

In this section, an illustrative application of the cross-impact balance analysis for the beneficiary contribution approach is described. The purpose of this exercise is to examine the consistency of assumptions about the proposed beneficiary contribution approach as well as constructing consistent images of the network behavior. The *ScenarioWizard*, free software designed for applying cross-impact balance analysis developed by ZIRN, was used in this study (Weimer-Jehle, 2012). The scenario analysis by CIB consists of four steps:

1. Identify a list of the most relevant system factors ("descriptors"). The descriptors for this scenario analysis were extracted from relevant concepts emerged from multi-stakeholder mental models analysis.
2. Define a set of variants (qualitative alternative) which characterize the possible state of the descriptors.
3. Asses the interactions of the impact of state x of descriptor X on the state y of descriptor Y based on appropriate investigation.
4. Determine consistent scenarios. Consistent scenarios are determined via the influence balance of the impact network. The consistent scenarios are reported in "scenario report" generated by the ScenarioWizard software.

6.3.6.1 Constructing consistent scenario using Cross-Impact Balance Analysis

As a result from multi-stakeholder mental models associated with malfunction project analysis, the eight descriptors have been identified. These eight descriptors are believed to represent the relevant factors influencing the malfunction of water resources project in the Northeastern Thailand, as shown in Table

Table 14 Descriptors of scenarios

A. Financial	B. Public participation	C. Local poverty
D. Policy and regulation	E. Corruption	F. Stakeholder relationship
G. Political interference	H. Project management	

In further step, the interdependencies between the descriptors were identified and constructed in constructing of the form of cross-impact balance matrix (Figure 49). The assessment of the internal consistency of a scenario was calculated by its impact balance delivered by inserting the scenario assumptions into the cross-impact balance matrix. If there are no contradictions between the scenario assumptions and the scenario can be assessed to be internal consistent.

	A1	A2	B1	B2	B3	C1	C2	C3	D1	D2	E1	E2	E3	F1	F2	F3	G1	G2	G3	H1	H2	I1	I2	I3
A.Financial																								
A1 Uncertainty in budget			-2	-2	-2	0	-2	-2	-1	-1	0	0	0	2	0	-2	0	1	3	-2	-2	-2	-2	-3
A2 Budget line commitment			2	2	2	0	2	2	1	3	0	0	0	-2	2	3	3	1	0	1	2	1	2	3
B.Public paricipation																								
B1 Inform- Lowest	0	0				0	0	0	2	1	-3	1	3	2	0	-2	-2	2	3	-3	-3	-3	3	-2
B2 Involve-Moderate	0	1				0	1	1	-1	1	1	0	-1	0	3	1	2	-2	-3	3	3	1	0	1
B3 Collaborate and empower-Highest	1	3				0	3	2	-2	3	3	-2	-3	-2	3	3	3	-3	-3	3	3	3	-1	3
C.Local poverty																								
C1 income not increase and lower than average	0	0	3	-2	-3				0	-3	-1	1	3	1	1	1	-2	2	3	-2	2	-3	3	-3
C2 Income increase but lower than average	0	0	-1	2	3				-1	2	-1	2	-1	0	1	1	-1	2	2	-1	1	0	3	1
C3 Income increase to higher than average	0	0	-3	3	3				-2	3	-1	-2	-1	-1	1	1	2	-1	-2	0	3	0	3	2
D.Policy and regulation																								
D1 Command and control	1	0	3	1	-2	0	0	0			-3	2	2	3	2	-3	-2	2	2	2	-2	-3	2	-3
D2 Collaborative decision making	0	0	-1	1	2	0	0	0			3	-3	-3	-3	2	3	2	-2	-2	-2	2	1	2	2
E.Corruption																								
E1 None	0	-2	0	0	0	0	0	0	-1	-1				1	-1	0	0	1	-3	-1	-1	0	0	0
E2 Moderate	1	-2	0	0	0	-1	-1	-1	-2	-2				2	-1	2	-2	0	1	-2	-2	0	0	0
E3 Strong	2	-2	0	0	0	-2	-2	-2	-3	-3				2	-2	2	-3	1	0	-3	-3	0	0	0
F.Stakeholder relationship																								
F1 Conflict	0	0	2	-1	-1	0	0	0	-1	-1	0	0	0				0	1	1	-2	-3	-3	2	-3
F2 Consult	0	1	1	2	2	0	0	0	2	0	0	0	0				1	-1	-1	1	2	1	1	1
F3 Collaborate and Engage	0	2	-1	1	2	0	0	0	0	2	2	-2	-2				2	-2	-2	2	3	2	1	2
G.Political interference																								
G1 None	0	0	0	1	2	0	-1	-2	0	0	0	-1	-2	-2	2	2				0	0	0	0	0
G2 Moderate	1	-1	1	-1	-1	1	-1	-2	-1	0	1	0	-1	1	-1	-1				-1	-1	0	0	0
G3 Strong	2	-2	2	-1	-1	2	-2	-3	-2	-1	1	1	2	2	-2	-2				-2	-1	0	0	0
H.Project management																								
H1 Business as usual	0	0	0	2	-2	1	-1	0	2	-2	0	1	1	1	1	-1	-2	1	1			-1	2	-1
H2 Life cycle management	-1	1	-2	0	1	-1	1	1	-2	2	1	-1	-2	-1	1	2	1	-1	-1			1	1	1
I.Economic tools																								
I1 Charge for use	0	0	1	0	0	0	0	0	-1	0	0	0	0	0	1	-1	0	0	0	-1	0			
I2 National and local govenrment grants	1	-2	-1	-1	0	1	1	1	1	-1	0	1	1	1	1	-1	0	1	2	2	1			
I3 Beneficiary contribution and government grants	0	1	0	1	2	1	1	1	-1	2	1	-1	-1	-1	1	2	1	-1	-1	-1	1			

Figure 45 The cross-impact matrix

6.3.6.2 Scenario Report

The consistent scenarios were reported by the automatic generation of a scenario report. The results indicated two strong consistent scenarios of CI matrix analysis as shown in Table 15. The discussion of plausibility of the scenario assumptions and compilation of the pros and cons for the each assumption are reported as following.

Table 15 Consistent scenarios

Scenario No. 1: Current scheme Consistency value : 1 Total impact score: 54	
A.Financial B.Public paricipation C.Local poverty D.Policy and regulation E.Corruption F.Stakeholder relationship G.Political interference H.Project management I.Economic tools	A1 Uncertainty in budget B1 Inform- Lowest C1 income not increase and lower than average D1 Command and control E3 Strong F1 Conflict G3 Strong H1 Business as usual I2 National and local govenrment grants
Scenario No. 2: Beneficiary contribution approach Consistency value : 2 Total impact score: 97	
A.Financial B.Public paricipation C.Local poverty D.Policy and regulation E.Corruption F.Stakeholder relationship G.Political interference H.Project management I.Economic tools	A2 Budget line commitment B3 Collaborate and empower-Highest C2 Income increase but lower than average D2 Collaborative decision making E1 None F3 Collaborate and Engage G1 None H2 Life cycle management I3 Beneficiary contribution and government grants

The attention is paid to detailed report of the beneficiary contribution scenario. It was reported that the scenario shown in Tab. 1 is perfectly consistent, i.e. the elements of the scenario form a set of mutual supporting assumptions.

Table 16 The elements of the scenario

A.Financial:	A2 Budget line commitment
B.Public paricipation:	B3 Collaborate and empower-Highest
C.Local poverty:	C2 Income increase but lower than average
D.Policy and regulation:	D2 Collaborative decision making
E.Corruption:	E1 None
F.Stakeholder relationship:	F3 Collaborate and Engage
G.Political interference:	G1 None
H.Project management:	H2 Life cycle management
I.Economic tools:	I3 Beneficiary contribution and government grants

In the following sections the descriptors are discussed based on the cross-impact judgments.

Descriptor 'A.Financial'

Concerning descriptor 'A.Financial' the assumption 'A2 Budget line commitment' is selected (Figure 50). This assumption is supported by the following scenario elements:

- B.Public participation: B3 Collaborate and empower-Highest (weight 3)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight 2)
- H.Project management: H2 Life cycle management (weight 1)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight 1)

The following scenario element contradicts this assumption:

- E.Corruption: E1 None (weight -2)

In summary, the assumption shows the impact balance + 5. So, the arguments in favor of this assumption are predominant.

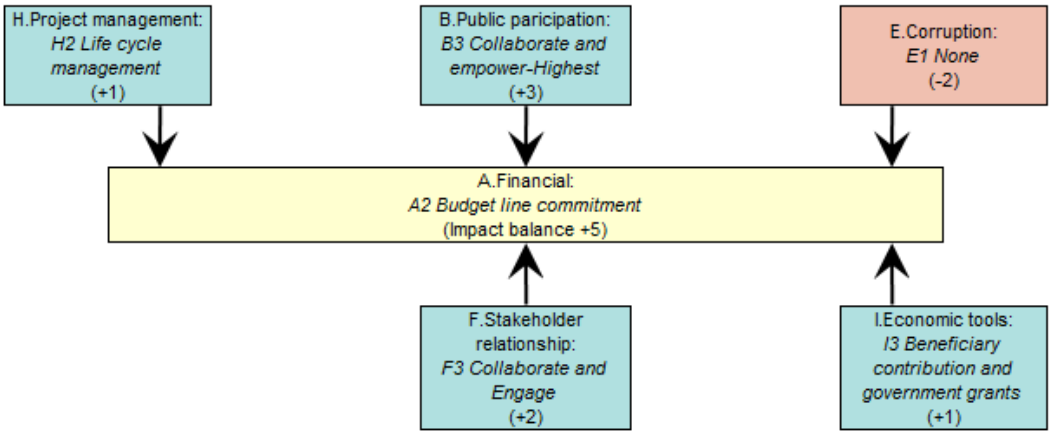


Figure 46 Influences on the scenario element 'A.Financial: A2 Budget line commitment'

The alternative assumption of the descriptor isn't able to produce a better balance of pro-s and con-s, as revealed by the following consideration:

The alternative assumption 'A1 Uncertainty in budget' is supported by the scenario element:

- B.Public paricipation: B3 Collaborate and empower-Highest (weight 1) and contradicted by the scenario element:
- H.Project management: H2 Life cycle management (weight -1)

Conclusion: The balance of pro-s and con-s of this assumption amount to 0. This result isn't better than the balance of the selected assumption 'A2 Budget line commitment'.

In summary, the alternative assumption isn't more plausible than the selected assumption 'A2 Budget line commitment'. Thus, the selected assumption can be assessed as being consistent.

Descriptor 'B.Public participation'

Concerning descriptor 'B.Public participation' the assumption 'B3 Collaborate and empower-Highest' is selected (Figure 51). This assumption is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 2)
- C.Local poverty: C2 Income increase but lower than average (weight 3)

- D.Policy and regulation: D2 Collaborative decision making (weight 2)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight 2)
- G.Political interference: G1 None (weight 2)
- H.Project management: H2 Life cycle management (weight 1)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight 2)

None of the other scenario elements contradicts this assumption. In summary, the assumption shows the impact balance + 14. So, the arguments in favor of this assumption are predominant.

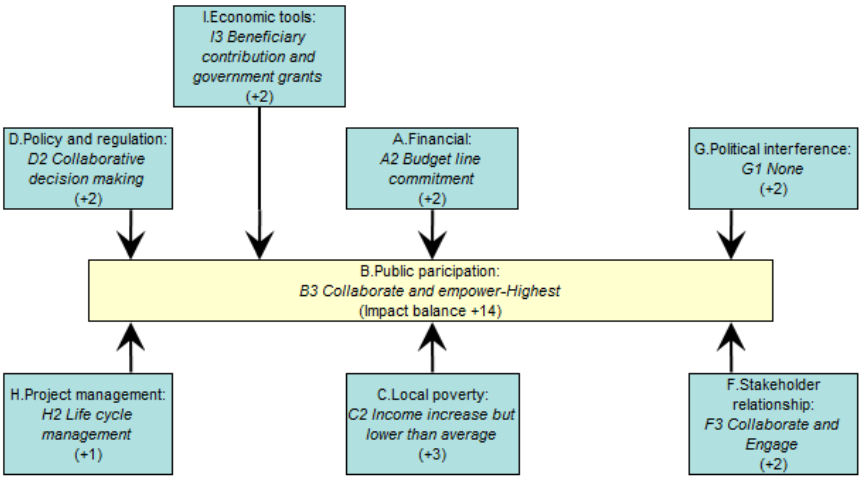


Figure 47 Influences on the scenario element 'B.Public participation: B3 Collaborate and empower-Highest'

None of the other possible assumptions shows a better balance of pro-s and con-s, as revealed by the following consideration:

The alternative assumption 'B1 Inform- Lowest' is supported by the scenario element:

- A.Financial: A2 Budget line commitment (weight 2)

and contradicted by the following scenario elements:

- C.Local poverty: C2 Income increase but lower than average (weight -1)
- D.Policy and regulation: D2 Collaborative decision making (weight -1)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight -1)
- H.Project management: H2 Life cycle management (weight -2)

Conclusion: The balance of pro-s and con-s of this assumption amount to -3. This result isn't

better than the balance of the selected assumption 'B3 Collaborate and empower-Highest'.

The alternative assumption 'B2 Involve-Moderate' is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 2)
- C.Local poverty: C2 Income increase but lower than average (weight 2)
- D.Policy and regulation: D2 Collaborative decision making (weight 1)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight 1)
- G.Political interference: G1 None (weight 1)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight 1)

And contradicted by none of the other scenario elements.

Conclusion: The balance of pro-s and con-s of this assumption amount to 8. This result isn't better than the balance of the selected assumption 'B3 Collaborate and empower-Highest'.

In summary, none of the alternative assumptions is more plausible than the selected assumption 'B3 Collaborate and empower-Highest'. Thus, the selected assumption can be assessed as being consistent.

Descriptor 'C.Local poverty'

Concerning descriptor 'C.Local poverty' the assumption 'C2 Income increase but lower than average' is selected (Figure 52). This assumption is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 2)
- B.Public participation: B3 Collaborate and empower-Highest (weight 3)
- H.Project management: H2 Life cycle management (weight 1)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight 1)

The following scenario element contradicts this assumption:

- G.Political interference: G1 None (weight -1)

In summary, the assumption shows the impact balance + 6. So, the arguments in favor of this assumption are predominant.

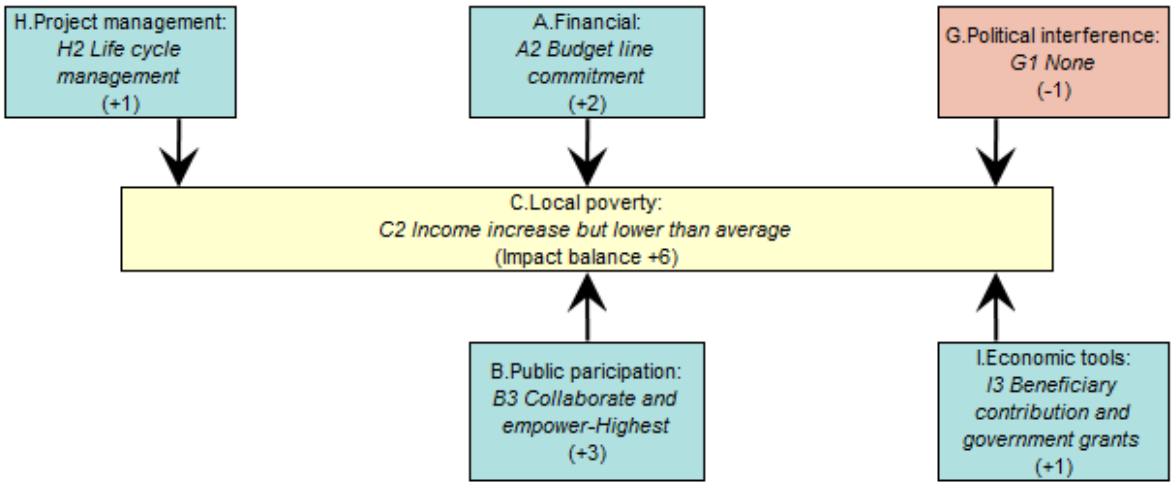


Figure 48 Influences on the scenario element 'C.Local poverty: C2 Income increase but lower than average'

None of the other possible assumptions shows a better balance of pro-s and con-s, as revealed by the following consideration:

The alternative assumption 'C1 income not increase and lower than average' is supported by the scenario element:

- I.Economic tools: I3 Beneficiary contribution and government grants (weight 1) and contradicted by the scenario element:
- H.Project management: H2 Life cycle management (weight -1)

Conclusion: The balance of pro-s and con-s of this assumption amount to 0. This result isn't better than the balance of the selected assumption 'C2 Income increase but lower than average'.

The alternative assumption 'C3 Income increase to higher than average' is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 2)
- B.Public paricipation: B3 Collaborate and empower-Highest (weight 2)
- H.Project management: H2 Life cycle management (weight 1)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight 1)

and contradicted by the scenario element:

- G.Political interference: G1 None (weight -2)

Conclusion: The balance of pro-s and con-s of this assumption amount to 4. This

result isn't better than the balance of the selected assumption 'C2 Income increase but lower than average'.

In summary, none of the alternative assumptions is more plausible than the selected assumption 'C2 Income increase but lower than average'. Thus, the selected assumption can be assessed as being consistent.

Descriptor 'D.Policy and regulation'

Concerning descriptor 'D.Policy and regulation' the assumption 'D2 Collaborative decision making' is selected (Figure 53). This assumption is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 3)
- B.Public participation: B3 Collaborate and empower-Highest
- C.Local poverty: C2 Income increase but lower than average (weight 2)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight 2)
- H.Project management: H2 Life cycle management (weight 2)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight 2)

The following scenario element contradicts this assumption:

- E.Corruption: E1 None (weight -1)

In summary, the assumption shows the impact balance + 13. So, the arguments in favor of this assumption are predominant.

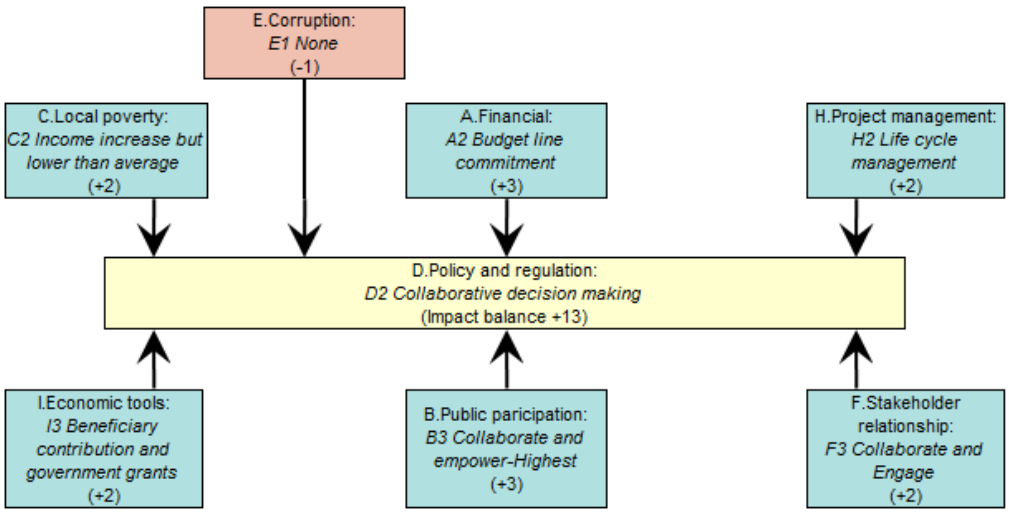


Figure 49 Influences on the scenario element 'D.Policy and regulation: D2 Collaborative decision making'

The alternative assumption of the descriptor isn't able to produce a better balance of pro-s and con-s, as revealed by the following consideration:

The alternative assumption 'D1 Command and control' is supported by the scenario element:

- A.Financial: A2 Budget line commitment (weight 1) and contradicted by the following scenario elements:
- B.Public participation: B3 Collaborate and empower-Highest (weight -2)
- C.Local poverty: C2 Income increase but lower than average (weight -1)
- E.Corruption: E1 None (weight -1)
- H.Project management: H2 Life cycle management (weight -2)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight -1)

Conclusion: The balance of pro-s and con-s of this assumption amount to -6. This result isn't better than the balance of the selected assumption 'D2 Collaborative decision making'.

In summary, the alternative assumption isn't more plausible than the selected assumption 'D2 Collaborative decision making'. Thus, the selected assumption can be assessed as being consistent.

Descriptor 'E.Corruption'

Concerning descriptor 'E.Corruption' the assumption 'E1 None' is selected (Figure 54). This assumption is supported by the following scenario elements:

- B.Public participation: B3 Collaborate and empower-Highest (weight 3)
- D.Policy and regulation: D2 Collaborative decision making (weight 3)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight 2)
- H.Project management: H2 Life cycle management (weight 1)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight 1)

The following scenario element contradicts this assumption:

- C.Local poverty: C2 Income increase but lower than average (weight -1)

In summary, the assumption shows the impact balance + 9. So, the arguments in favor of this assumption are predominant.

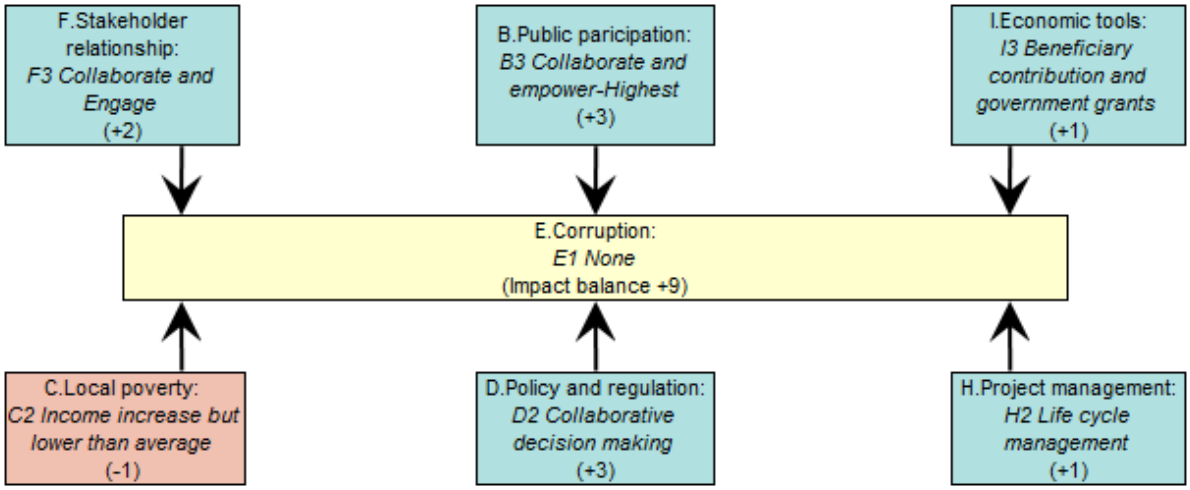


Figure 50 Influences on the scenario element 'E.Corruption: E1 None'

None of the other possible assumptions shows a better balance of pro-s and con-s, as revealed by the following consideration:

The alternative assumption 'E2 Moderate' is supported by the scenario element:

- C.Local poverty: C2 Income increase but lower than average (weight 2) and contradicted by the following scenario elements:
- B.Public participation: B3 Collaborate and empower-Highest (weight -2)
- D.Policy and regulation: D2 Collaborative decision making (weight -3)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight -2)
- G.Political interference: G1 None (weight -1)
- H.Project management: H2 Life cycle management (weight -1)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight -1)

Conclusion: The balance of pro-s and con-s of this assumption amount to -8. This result isn't better than the balance of the selected assumption 'E1 None'.

The alternative assumption 'E3 Strong' is supported by none of the other scenario elements and contradicted by the following scenario elements:

- B.Public participation: B3 Collaborate and empower-Highest (weight -3)
- C.Local poverty: C2 Income increase but lower than average (weight -1)
- D.Policy and regulation: D2 Collaborative decision making (weight -3)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight -2)
- G.Political interference: G1 None (weight -2)

- H.Project management: H2 Life cycle management (weight -2)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight -1)

Conclusion: The balance of pro-s and con-s of this assumption amount to -14. This result isn't better than the balance of the selected assumption 'E1 None'.

In summary, none of the alternative assumptions is more plausible than the selected assumption 'E1 None'. Thus, the selected assumption can be assessed as being consistent.

Descriptor 'F.Stakeholder relationship'

Concerning descriptor 'F.Stakeholder relationship' the assumption 'F3 Collaborate and Engage' is selected (Figure 55). This assumption is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 3)
- B.Public participation: B3 Collaborate and empower-Highest (weight 3)
- C.Local poverty: C2 Income increase but lower than average (weight 1)
- D.Policy and regulation: D2 Collaborative decision making (weight 3)
- G.Political interference: G1 None (weight 2)
- H.Project management: H2 Life cycle management (weight 2)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight 2)

None of the other scenario elements contradicts this assumption. In summary, the assumption shows the impact balance + 16. So, the arguments in favor of this assumption are predominant.

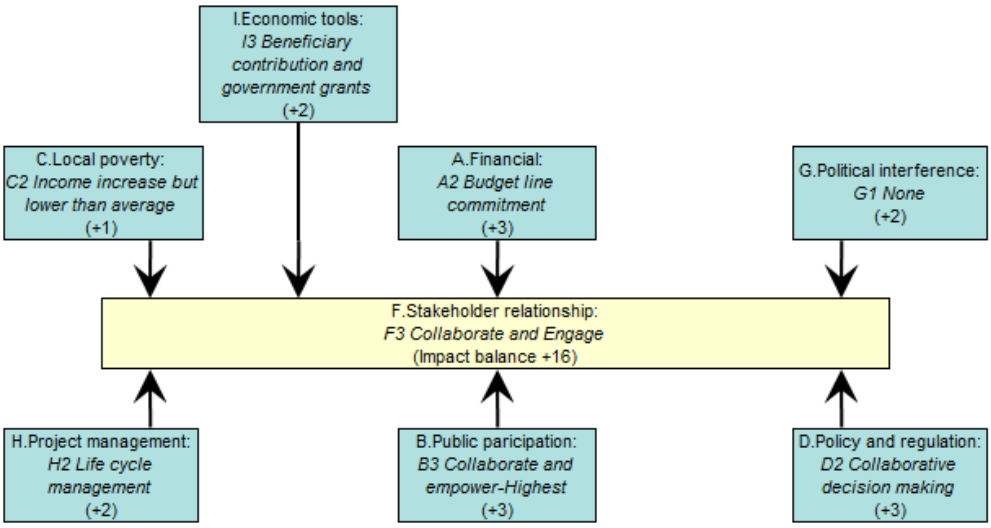


Figure 51 Influences on the scenario element 'F.Stakeholder relationship: F3 Collaborate and Engage'

None of the other possible assumptions shows a better balance of pro-s and con-s, as revealed by the following consideration:

The alternative assumption 'F1 Conflict' is supported by the scenario element:

- E.Corruption: E1 None (weight 1) and contradicted by the following scenario elements:
- A.Financial: A2 Budget line commitment (weight -2)
- B.Public participation: B3 Collaborate and empower-Highest (weight -2)
- D.Policy and regulation: D2 Collaborative decision making (weight -3)
- G.Political interference: G1 None (weight -2)
- H.Project management: H2 Life cycle management (weight -1)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight -1)

Conclusion: The balance of pro-s and con-s of this assumption amount to -10. This result isn't better than the balance of the selected assumption 'F3 Collaborate and Engage'.

The alternative assumption 'F2 Consult' is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 2)
- B.Public participation: B3 Collaborate and empower-Highest (weight 3)
- C.Local poverty: C2 Income increase but lower than average (weight 1)

- D.Policy and regulation: D2 Collaborative decision making (weight 2)
- G.Political interference: G1 None (weight 2)
- H.Project management: H2 Life cycle management (weight 1)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight 1) and contradicted by the scenario element:
- E.Corruption: E1 None (weight -1)

Conclusion: The balance of pro-s and con-s of this assumption amount to 11. This result isn't better than the balance of the selected assumption 'F3 Collaborate and Engage'.

In summary, none of the alternative assumptions is more plausible than the selected assumption 'F3 Collaborate and Engage'. Thus, the selected assumption can be assessed as being consistent.

Descriptor 'G.Political interference'

Concerning descriptor 'G.Political interference' the assumption 'G1 None' is selected (Figure 56). This assumption is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 3)
- B.Public paricipation: B3 Collaborate and empower-Highest (weight 3)
- D.Policy and regulation: D2 Collaborative decision making (weight 2)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight 2)
- H.Project management: H2 Life cycle management (weight 1)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight 1)

The following scenario element contradicts this assumption:

- C.Local poverty: C2 Income increase but lower than average (weight -1)

In summary, the assumption shows the impact balance + 11. So, the arguments in favor of this assumption are predominant.

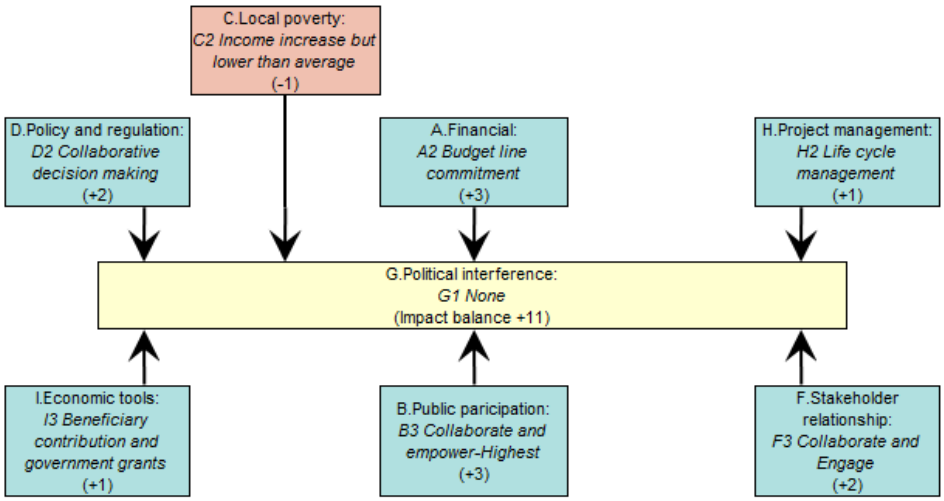


Figure 52 Influences on the scenario element 'G.Political interference: G1 None'

None of the other possible assumptions shows a better balance of pro-s and con-s, as revealed by the following consideration:

The alternative assumption 'G2 Moderate' is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 1)
- C.Local poverty: C2 Income increase but lower than average (weight 2)
- E.Corruption: E1 None (weight 1)

and contradicted by the following scenario elements:

- B.Public participation: B3 Collaborate and empower-Highest (weight -3)
- D.Policy and regulation: D2 Collaborative decision making (weight -2)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight -2)
- H.Project management: H2 Life cycle management (weight -1)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight -1)

Conclusion: The balance of pro-s and con-s of this assumption amount to -5. This result isn't better than the balance of the selected assumption 'G1 None'.

The alternative assumption 'G3 Strong' is supported by the scenario element:

- C.Local poverty: C2 Income increase but lower than average (weight 2) and contradicted by the following scenario elements:
- B.Public participation: B3 Collaborate and empower-Highest (weight -3)
- D.Policy and regulation: D2 Collaborative decision making (weight -2)

- E.Corruption: E1 None (weight -3)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight -2)
- H.Project management: H2 Life cycle management (weight -1)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight -1)

Conclusion: The balance of pro-s and con-s of this assumption amount to -10. This result isn't better than the balance of the selected assumption 'G1 None'.

In summary, none of the alternative assumptions is more plausible than the selected assumption 'G1 None'. Thus, the selected assumption can be assessed as being consistent.

Descriptor 'H.Project management'

Concerning descriptor 'H.Project management' the assumption 'H2 Life cycle management' is selected (Figure 57). This assumption is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 2)
- B.Public paricipation: B3 Collaborate and empower-Highest (weight 3)
- C.Local poverty: C2 Income increase but lower than average (weight 1)
- D.Policy and regulation: D2 Collaborative decision making (weight 2)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight 3)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight 1)

The following scenario element contradicts this assumption:

- E.Corruption: E1 None (weight -1)

In summary, the assumption shows the impact balance + 11. So, the arguments in favor of this assumption are predominant.

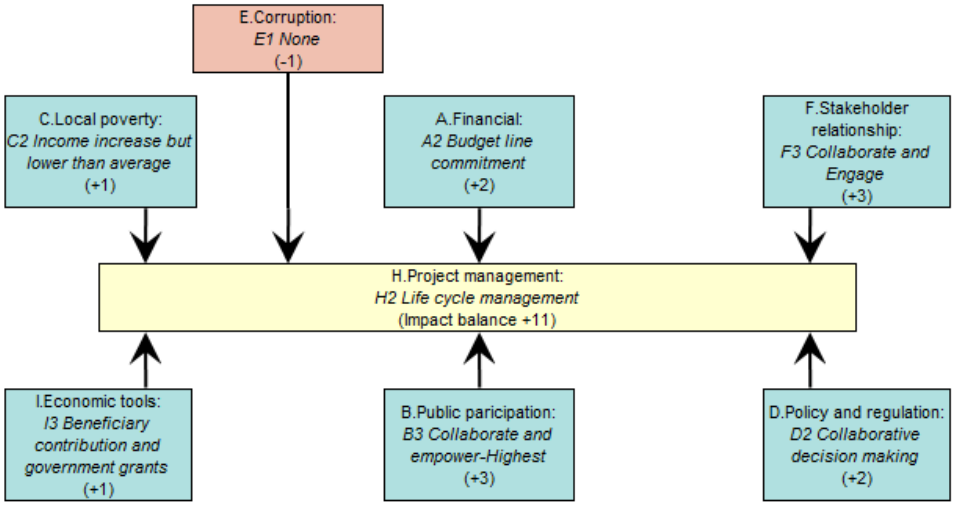


Figure 53 Influences on the scenario element 'H.Project management: H2 Life cycle management'

The alternative assumption of the descriptor isn't able to produce a better balance of pro-s and con-s, as revealed by the following consideration:

The alternative assumption 'H1 Business as usual' is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 1)
- B.Public participation: B3 Collaborate and empower-Highest (weight 3)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight 2) and contradicted by the following scenario elements:
- C.Local poverty: C2 Income increase but lower than average (weight -1)
- D.Policy and regulation: D2 Collaborative decision making (weight -2)
- E.Corruption: E1 None (weight -1)
- I.Economic tools: I3 Beneficiary contribution and government grants (weight -1)

Conclusion: The balance of pro-s and con-s of this assumption amount to 1. This result isn't better than the balance of the selected assumption 'H2 Life cycle management'.

In summary, the alternative assumption isn't more plausible than the selected assumption 'H2 Life cycle management'. Thus, the selected assumption can be assessed as being consistent.

Descriptor 'I.Economic tools'

Concerning descriptor 'I.Economic tools' the assumption 'I3 Beneficiary contribution and government grants' is selected (Figure 58). This assumption is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 3)
- B.Public participation: B3 Collaborate and empower-Highest (weight 3)
- C.Local poverty: C2 Income increase but lower than average (weight 1)
- D.Policy and regulation: D2 Collaborative decision making (weight 2)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight 2)
- H.Project management: H2 Life cycle management (weight 1)

None of the other scenario elements contradicts this assumption. In summary, the assumption shows the impact balance + 12. So, the arguments in favor of this assumption are predominant.

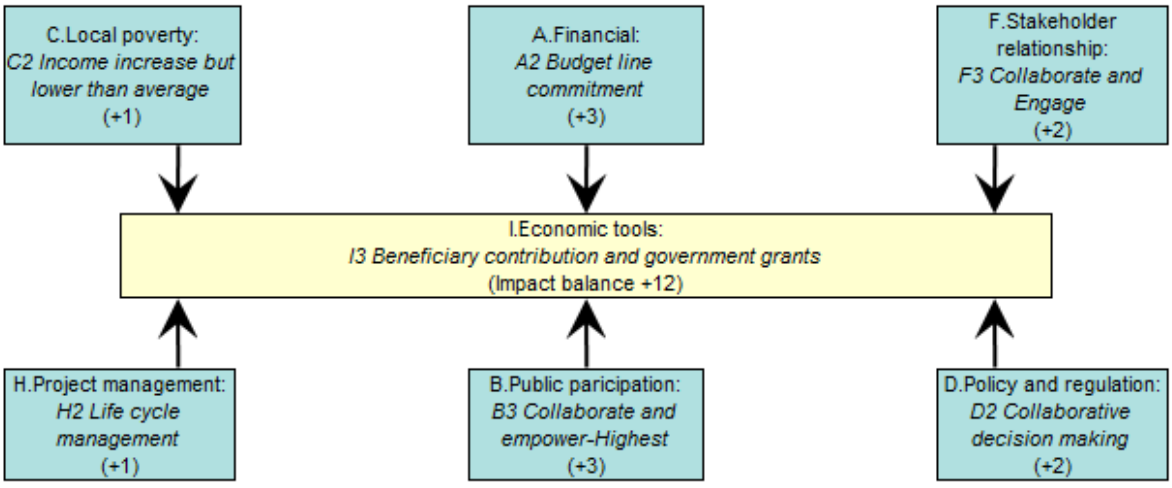


Figure 54 Influences on the scenario element 'I.Economic tools: I3 Beneficiary contribution and government grants'

None of the other possible assumptions shows a better balance of pro-s and con-s, as revealed by the following consideration:

The alternative assumption 'I1 Charge for use' is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 1)

- B.Public participation: B3 Collaborate and empower-Highest (weight 3)
- D.Policy and regulation: D2 Collaborative decision making (weight 1)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight 2)
- H.Project management: H2 Life cycle management (weight 1) and contradicted by none of the other scenario elements.

Conclusion: The balance of pro-s and con-s of this assumption amount to 8. This result isn't better than the balance of the selected assumption 'I3 Beneficiary contribution and government grants'.

The alternative assumption 'I2 National and local government grants' is supported by the following scenario elements:

- A.Financial: A2 Budget line commitment (weight 2)
- C.Local poverty: C2 Income increase but lower than average (weight 3)
- D.Policy and regulation: D2 Collaborative decision making (weight 2)
- F.Stakeholder relationship: F3 Collaborate and Engage (weight 1)
- H.Project management: H2 Life cycle management (weight 1) and contradicted by the scenario element:
- B.Public participation: B3 Collaborate and empower-Highest (weight -1)

Conclusion: The balance of pro-s and con-s of this assumption amount to 8. This result isn't better than the balance of the selected assumption 'I3 Beneficiary contribution and government grants'.

In summary, none of the alternative assumptions is more plausible than the selected assumption 'I3 Beneficiary contribution and government grants'. Thus, the selected assumption can be assessed as being consistent.

Firmness of assumptions

In general the assumptions of a scenario are supported with unequal firmness. The degree of firmness can be expressed by the 'consistency value'. It measures the difference between the assumption's impact balance and the impact balance of the best alternative assumption. In the following list the descriptors are ranked in order of descending firmness:

Table 17 Firmness of descriptors

Descriptor	Assumption	Consistency value
D.Policy and regulation	D2 Collaborative decision making	19
E.Corruption	E1 None	17
G.Political interference	G1 None	16
H.Project management	H2 Life cycle management	10
B.Public participation	B3 Collaborate and empower-Highest	6
A.Financial	A2 Budget line commitment	5
F.Stakeholder relationship	F3 Collaborate and Engage	5
I.Economic tools	I3 Beneficiary contribution and government grants	4
C.Local poverty	C2 Income increase but lower than average	2

Conclusions:

The elements of the reported scenario constitute a perfect set of mutual supporting assumptions. The scenario can be assessed as being internal consistent, therefore.

6.4 Summary

Result from constraint analysis suggests that the identified constraints may be characterized into: (a) Lack of planning for implementation of the Department of Water Resources (DWR); (b) Capacity of the DWR and staff in project planning and management; and (c) Absence of stakeholder participation and stakeholder capacity building. In order to deal with complex challenges of malfunction project in a systematic way, the following thematic proposals is structured into 3 thematic:

- Thematic 1: Utilization project life cycle planning and management
- Thematic 2: Improving the DWR capacity to deliver service
- Thematic 3: Stakeholder participation and capacity building

In response to thematic and cross-sectional modules, introduction of measures in the recommendations and supporting actions (Table 13) were developed and expected to contribute to reducing the malfunction project and enable stakeholder and enhance group of stakeholders to achieve the objectives or to satisfy the constraints. In addition, the beneficiary contribution system was introduced to ensure stakeholder participation and project sustainability. The beneficiary contribution approach is a combination of stakeholder management, responsibility sharing and technical matters. The consistency scenario of the beneficiary contribution approach was tested by using cross-impact balance analysis.

Chapter 7: CONCLUSIONS AND RECOMMENDATIONS

7.1 Summary and deliverables of research

The background of this research started with the attention to identify the root causes of malfunction projects occurred in small-scaled water resources project especially in the Northeastern Thailand. With respect to different mindset and behavior of multi-stakeholder related to a failure project, there is a need for making analysis in framing explicit and constructively dealing with multi-stakeholder's mental models. The present thesis aims to fill this gap, parting from an assessment of group of stakeholders mental models in small-scaled water resources project management practice in case studies.

The primary effort of the present thesis was to understand how similarity and differences between groups of stakeholder mental models affect the project function in project management practice. The rational was that understanding of differences in groups of stakeholder mental models would make it possible to identify factors that hinder success of project management and to develop more effective and efficient measures to improve a project management in practice. In this research, mental models play an important role in order to link the organizational and individual perspective and consequently bridge some of the gaps still left open in the current water resources project management scheme. For that purpose dealing with multi-stakeholder mental models in water resources project, two case studies were conducted and analyzed.

The empirical research was designed to answer three main research questions:

1. What are factors which cause an ineffective/failure water resources project?
2. What are behavioral objectives and factors for each key stakeholder that hinders an achievement of a water resources project management?
3. What would be a methodology or mechanism to loosen constraints in small-scaled water resources project in the Northeastern Thailand in order to improve water resources project management through the collective identification, and water institution adaptation?

The three research questions were addressed in succession as they related to each other. Research question 1 was the starting point of the empirical research to diagnose

relevant factors associated with the malfunction projects. In order to answer the second research question, two case studies were conducted to elicit multi-stakeholder mental models for causes of failure projects assessment. The integrated multi-stakeholder mental models and project life cycle analysis approach was introduced to identify stakeholder mindset associated with project work phase and analyzed sequence of failure based on stakeholder's mental models and actions situation. Research question 3 was answered by applying constraint analysis on the basis of the results from research question 2, i.e. the introduction of three thematic and the beneficiary contribution approach. The key findings to the three research questions are summarized in Table 18.

Table 18 Summary of findings

Research question	Summary of findings	To find in
1	From the result of analysis, it is suggested that insufficient knowledge of project user, disregard of procedure in project operation and maintenance and narrow outlook of the Department of Water Resources staff are causes described by individual responsibility. Causes described by organization responsible include inflexible management structure in the government processes, poor staffs, poor authority structure and poor strategy or concept in project planning and management. The action level in Failure Knowledge Database refers to action taken by individual or organization that leads to project failure. Given the causes of failure project, poor planning and poor hardware production are action on project implemented to cause project failure. In addition, inadequate maintenance and repair, nonobservance of instruction, inaction of stakeholder, corruption and no sense of ownership are described as human action leading to failure project. The contents of results from related causes and actions are economic loss, negative organization perception from project user, social loss, structure damage and property damages caused by structure damage.	Section 5.2

2	Two case studies were explored to asses multi-stakeholder mental models associated with malfunction project. It is apparent that similarities and differences perspectives or mental models were presented which indicated possibly a lack of common understanding in project and lack of communication between stakeholders in project life cycle. It is considerable differences in beliefs regarding the concepts that led to the malfunction project. Regarding differences in mental models among stakeholder groups, it might be assumed that the most efficient action for each stakeholder group decision-making is not only a technical issue but also the type of values that stakeholder wanted to protect or the main objectives of stakeholder. The majority of acute response occurred at the Local Administration Office and project user level, although this may be due to the failure of project planning and management scheme. The analysis suggested that each stakeholder group perceived the malfunction project as being caused by their limitations and other groups of stakeholder's responsibility. In addition, differences in perception of malfunction project embodied various interpretations of the malfunction definition and causes lead to significant obstacles in reaching a common understanding in project management.	Section 5.3.3 and 5.3.4
3	Result from constraint analysis suggests that the constraints identified may be characterized into: (a) Lack of planning for implementation of the Department of Water Resources (DWR); (b) Capacity of the DWR and staff in project planning and management; and (c) Absence of stakeholder participation and stakeholder capacity building. In order to deal with complex challenges of malfunction project in a systematic way, the following thematic proposals is structured into 3 thematic: - Thematic 1: Utilization project life cycle planning and management	Section 6.2, 6.3, and 6.4

	- Thematic 2: Improving the DWR capacity to deliver service - Thematic 3: Stakeholder participation and capacity building In response to thematic and cross-sectional modules, introduction of measures in the recommendations and supporting actions (Table 13) were developed and expected to contribute to reducing the malfunction project and enable stakeholder and enhance group of stakeholders to achieve the objectives or to satisfy the constraints. In addition, the beneficiary contribution system was introduced to ensure stakeholder participation and project sustainability. The beneficiary contribution approach is a combination of stakeholder management, responsibility sharing and technical matters. The consistency scenario of the beneficiary contribution approach was tested by using cross-impact balance analysis.	

The approach presented in this research on the basis of the multi-stakeholder mental models advances the challenge of improving project effectiveness and efficiency from the perspective of project life cycle management practice.

7.2 Contribution of research

The application of integrated multi-stakeholder mental models and project life cycle perspective provides a number of contributions for water resources project management in practice. The utilization of the integration is shading some lights on insights from case experiences and additional literature reviews to identify explanations of malfunction in water resources project in the Northeastern Thailand. The contributions associated with the findings from this research are:

7.2.1 Introduction of alternative approach for project failure analysis

The integrated multi-stakeholder mental models and project life cycle perspective has been developed and proved to be practical and useful for the project management. The approach captured similarities and differences in groups of stakeholder's view and elaborated views for assisting stakeholder communication in order to gain mutual understanding among

stakeholders toward other's views through the project cycle. The finding from this research proved that this approach was considered to be a supportive tool for developing improvement options in participative approach for the water resources project management in Thailand.

7.2.2 Utilization for learning on policy adaptation and stakeholder mindset change

The findings from this research can be used as input into establishment of change or adaptation of existing water resources project management policy. Although it is difficult to link the findings from this research to national policy maker to a establish changes on the national water policy and water resources project management scheme, it does offer an indications for some degree of change to both government agency and other group of stakeholders.

The output from this research can also be used to establish a change in mindsets of related stakeholders, making them more aware of other's view and roles in the project. For instance, the finding indicated that the Department of Water Resources should take the basic objectives of Local Administration Office and project user for consideration to link a project to related stakeholder and focus on costs and benefit options. Taking other's view for grants, the participative approach can enable stakeholders to learn and update their knowledge on the perception of the others.

7.3 Recommendation for further research

The focus on this present research was on the use of multi-stakeholder mental models as a mean to identify root cause problem in malfunction of small-scaled water resources project in the Northeastern Thailand and to introduce measures to cope with identified problems. Regarding consideration of future research, areas for further research include 1) Incorporating multi-stakeholder risk and uncertainty elicited from mental models into project life cycle management, 2) Application of multi agent system for the beneficiary contribution approach and 3) Institution adaptation

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Appendix

Appendix I: Assigned interviewees name code

No.	Organization	Name	Name code
1	Department of Water Resources	Mr.DWR-HQ1 Niyomrat	DWR-HQ01
2	Department of Water Resources	Mr.Yudthana Chomwong	DWR-HQ02
3	Department of Water Resources	Ms.Chadaporn Unhapanee	DWR-HQ03
4	Department of Water Resources, Regional Office 4, Khon Kaen province office	Ms. Nualyai Tangkosol	DWR-RO01
5	Department of Water Resources, Regional Office 4, Khon Kaen province office	Ms.Areerat Namwanta	DWR-RO02
6	Kud Yom Local administration office	Mr.Pitikorn Plangsatra	KY-LAO01
7	Kud Yom Local administration office	Ms.Montra Musopin	KY-LAO02
8	Kud Yom Local administration office	Mr.Nattapong Kwanyeun	KY-LAO03
9	Kud Yom local villager	Mr.Chana Rassamedauen	KY-LV01
10	Kud Yom local villager	Mr.Kerd Mupram	KY-LV02
11	Kud Yom local villager	Mr.Rob Sornwaing	KY-LV03
12	Kud Yom local villager	Mr.Prakob Chaimeekhaew	KY-LV04
13	Kud Yom local villager	Mr.Somboon Pratumkul	KY-LV05
14	Kud Yom local villager	Mr.Thongleang	KY-LV06
15	Wang Ta Ke Local Administration Office	Mr.Pornpipat Primpleechai	WTK-LAO01
16	Wang Ta Ke local villager	Mr.Pleam Rassamedauen	WTK-LV01
17	Wang Ta Ke local villager	Mr.Prasit Youngnontad	WTK-LV02

No.	Organization	Name	Name code
18	Wang Ta Ke local villager	Mr.Prasit Kannok	WTK-LV03
19	Wang Ta Ke local villager	Mr.Thongkam Boontoon	WTK-LV04
20	Wang Ta Ke local villager	Mr.Sawang and Mrs.Buddee Petkaew	WTK-LV05
21	Wang Ta Ke local villager	Mr.Mangkorn Chanachai	WTK-LV06

Appendix II: Interview transcripts

Interview with Mr.Adul Niyomrat: DWR-HQ1

Q: What are causes of these malfunction projects?

A: These malfunction projects didn't follow theory, didn't follow river basin planning system. They considered constructing by needs from locals. In that time (15-20 years ago), we had request from locals, and then we went for surveying, designed and constructed a project. We concerned only to construct a project in response to area by area. We didn't study in terms of river basin or sub-basin. We looked at a project in one dimension. When we looked at them only for one dimension, some of these projects were in good condition while many were not. In period of the government reorganization (2002), some of these projects were transferred to local administration and the rest of them were transferred to the Department of Water Resources (DWR). After the reorganization, we didn't have budget for maintenance because the Bureau of Budget didn't provide us an annual maintenance budget. Even now, we don't have this budget.

Q: Why the Bureau of Budget didn't provide an annual maintenance budget?

A: Because, for a small-scaled water resources project, the Bureau of Budget misinterprets law (regarding budget issue) with the Decentralization act B.E.2542 (1999). We have been transferred small-scaled projects (capacity under 2 million cubic meters) to local administration every year, and this decentralization act has its own timing. However, the Bureau of Budget understands that when this act is promulgated we already transfer all small-scaled projects to local administration which is not correct!! If a project, which the department transfer a project to local administration, is not in good condition, the local administration will not accept the project.

Q: Why the Bureau of Budget doesn't understand this problem?

A: They (the Bureau of Budget) don't understand. I have been fighting for this maintenance budget for longtime since we establish the department, and finally they gave us some budget in specific description; "budget for water infrastructure improvement for each project". It means that this budget is for a severe damage project. Then we can use this budget.

Q: So this kind of malfunction project is not categorized for this budget?

A: No. These malfunction projects won't get it. When we were the Office of Accelerated

Rural Development (ARD), we provide specific annual budget for this kind of maintenance work. For example, we had 20-30 million baht and distributed to regional offices to do maintenance work from this budget.

Q: In that period, there was no river basin committee organization?
A: No. There was no such a committee. When there were some damages on a project, locals requested for repairing, and regional staff went to examine then repaired those damages from this budget. But in nowadays, it has to be serious damages. Otherwise it won't get a budget for repairing. After big rehabilitation, a project will be ready for transfer to local administration.

Q: Does it mean these malfunction projects are caused by unclear law/ regulation regarding maintenance budget?
A: For these projects, it is caused by lack of maintenance budget. We couldn't defend budget because of this ambiguous of budget law/ regulation.

Q: Why locals don't fix these damages by themselves?
A: They don't fix it because there is some cost!! Locals' behavior in Thailand is waiting for help even though they get benefit from water. It's different from developed country. Poor people are very poor. For water infrastructure, it needs money. Like this project (pointed to picture), this radial gate is mechanic. Locals can't fix this. If it is small damage like weir is broken, they can add some rocks. Everything is costly. They do what they can do.
But there is a way to solve this malfunction project problem. After completion of decentralization (projects transfer), the central government will subsidy for 35% of total local administration budget. However, this is just a plan. It hasn't announced as a law yet. Now the central government subsidize local administration only some percentage of the budget plan. In addition, local administration doesn't want to spend their budget for water resources project. They want the central government to be responsible for this and local administration wants to work on road or some other easier projects. So water infrastructure was not well maintained due to this reason.

Q: What is a project development process?
A: In the past, project proposal was requested from local's need. Then the government agency assigned agents to conduct preliminary study, design and later construct a project. However,

in that period we considered those projects as project by location. Where there was available water we constructed at that location. Later on, we begin to consider project in basin area by utilizing body of knowledge in project planning and management.

Q: You meant that from now on there will not be such malfunction of water resources project?
A: We have to continue working in basin management. The department must realize how important of this work. However, now we are short of people who work on this issue. This planning and management paradigm was agreed among technician and publics through communication in order to improve project management. But, still we don't get budget support anyway.

Q: Budget is main problem for water resources project management?
A: Budget and awareness in importance of basin planning. In fact, nowadays local politician is so powerful which influences basin planning back to spot (area base) planning again with no academic and technique support.

Q: Even a project was proposed through basin plan or pushing from local politician, if locals doesn't want to take care of a project, sooner or later it will became malfunction again?
A: If they don't take care of a project, it's over. But for a medium scale project, we have public participation promotion in parallel with construction work, for example, water user group establishment, project operation and maintenance training.

Q: This public participation process is done before a project design?
A: No. If we establish a water user group before a project construction, there is no advantage from doing that. A water user group will be established to manage a project that will be constructed. Before now, we transferred a project to the local administration for project maintenance, but are not the project owner. We (the department) are the project (infrastructure) owner, and we are responsible for a project budget. However, the department transferred a project to a local administration to take care and maintain a project, but they (local administration) are just take care but not spending their budget for repairing when a project becomes damaged!! It is the department who has to provide maintenance or repairing budget. When a project becomes damaged, local administration call the department to repair. But the department doesn't have budget, then local administration just leave a project damaged. So, it becomes the same loop. Even many projects, which we already maintain in a

good condition before transfer, if local admins does not take a good care or does not pay attention to a project, it will collapse again. In fact, with small budget in local administration, they don't want to spend on water resources project. They (local administration) want to spend for a road project!! Wherever road passes by, the land price becomes high while water resources project is a source of income but no attention is paid. They want other agencies to support on water resources project.

Q: Successful of water resources project in each area depends on attitude of local administration on water resources project management?
A: Right. It depends on how they realize the importance of a project management such as water user group, etc.

Q: In some projects, water users really take a good care of their project. Why did they do that?
A: They need to manage water from available amount. Our structure is a tool for their water management. When we start construction work, we help them to establish water user group. One of the issues is local culture. People in the northern region look at water as important resources, and they well maintain for their water structures. On the other hand, people in the northeastern tend to wait for help (under hand). Another point is that it doesn't matter large organization or small organization, they don't realize significance of water resources project maintenance work. Every item needs clarification from the Bureau of Budget. There is no budget for water infrastructure repair!! But what we are doing is from remaining budget (extra budget that left from annual budget)

Q: Why the Bureau of Budget doesn't provide budget for repair work?
A: They haven't mention reason. Thai people like to have a new project but never prepare budget for repair work.

Q: Why the Royal Irrigation Department can have this kind of budget?
A: They have a maintenance unit and it's in their job scope. They can set up annual budget for this.

Q: Excluding budget issue, what are other causes for malfunction problem?
A: I think vision of organization management level is important issue. The organization leader (Director General) must think systematically which concerns project construction,

maintenance and public participation. Nowadays, the executive come from political influence. Also, human resource management is very important. The direction of our work is strongly influenced the executive attitude and viewpoint. It soon will be returned to the old time that projects are requested from politician. The executive vision must be the same direction of the central government vision.

Q: What about the river basin committee or working group?

A: River basin committee proposes projects for basin plan, but they are not authorized by any law!! They keep proposing project, but only few are implemented. That means there is no legal support for the river basin committee proposal. The Bureau of Budget should define or designate rule for a project that come from river basin committee. It's not like a project that come from politician request is put in the annual budget plan. This is not right! It must have a rule for this. For this reason, our alliance is decreasing because they are tired of this phenomenal. The department is doing water resources integrated plan every year, but there is no outcome. It's just a plan. So we fail in this dimension. Our bureau changes a plan. We are doing a water management plan for every local administration which considers as a basin planning. The local administration job is to look for budget. But, again it depends on vision of the executive.

Q: How can we solve this problem?

A: I don't know how to solve this problem. Every time the same discussion appears; need public participation, need capacity building. But whenever people are easy to induce by money, it is difficult. First thing to do is make them learn how to help themselves (self-help); no sense of survivor only waiting for help. This is Thai culture; patronage system. That's all. It's difficult to change and wide spreading everywhere from national level to local level. This is not only in water management but in every system. Sometime we make a pond close to their house, but people don't try to take water from the pond. They are waiting for help from us, waiting for new budget to buy a pump.

Q: If the department has sufficient budget for project maintenance and repair, this malfunction project can be eliminated?

A: It is prohibited to say insufficient budget!! In fact the budget is insufficient. Small-scaled water resources project can be well managed if the local administration has mechanism to support their own area. This is sympathized for people in the northeastern of Thailand. They

have been facing poverty problem for longtime. They are same Thai. When they see people in Bangkok taking shower from shower stand, they want to do the same.

Interview with Mr.Yudthana Chomwong: DWR-HQ2

Q: Do you think what cause project failure or malfunction project?

A: Part of the problem stems from a lack of maintenance and partly due to ignorance or misuse of the project equipment. For example, users don't need a gate and when it is broken, they don't fix it. Instead, they made a wall to seal the gate. That means a weir that has an operated gate becomes straight drop structure. Sometime operated structure is farm turnout with gate to control water, but users remove the gate because they need to use water all year long. One day when they don't need water, they put sand bags to close as a gate which is not good performance. In another case, users stop lock to block water underneath a channel bridge using as a weir, then water is overflow and scour the channel banks.

Q: Why these problems occur? Why local users didn't pay attention to maintenance project?

A: Because lacks of continuity to follow up the project from the government owned the project and lack of training and education in the care of the project, or how use it correctly. The first may have been told. At first time right after the project finish, it may have some training and explanation for local users, but after a time of change, responsibility is passed to different persons and they forgot about it already. They think that "that I will do what I know, what I understand what I can do.

Q: How long does it take until a project becomes malfunction? How many years?

A: From my experience with the steel gate cases, if it is possible that most of the problems occur in the first three to four years on a side seal of a radial gate. When there is no operation for three to four years, a side seal of a radial gate gets old, and it's difficult to lift the radial gate up. Or when the radial gate can be lifted up, the seal is torn and cannot close the gate again. In case of no use of radial gate for about ten years, there is the rust on the radial gate.

Q: who are stakeholders in a water resources project?

A: Mainly it is the water user groups of the project, and there may be a leader or not. Some projects water user groups are established formally among villagers with the formal leader. It is clearly assigned of a person who operates water. Or when there is problem, a leader will be contacted first then the leaders will contact the related agency. Nowadays in many projects, water user group leader position is overlapped with the board members of the local administration meaning that it relates to local politics.

Q: Water user group is set up after the project is completed? Who set up a water user group?
A: yes. But it was not official. In the time of the Office of Accelerated Rural Development, the agency gave a project to local users after construction complete. Then the local leader gathers who will benefit from the project to set up a group. This is not formal or official group.

Q: Who set the rule among water users? Are there water right designation? How to take care or maintenance of project?
A: Users sit together, talk and select a water user group committee. Later on the committee will have a meeting and design a water use rule. In the northern part, there is a punishment. For example, if farm turnout in one person farm is broken, that person is prohibited from usage. It's social punishment as well. In the Northeastern part, water user group is weak, but they know who are in their group.

Q: What is impact from malfunction project to the Department of Water Resources?
A: when there is a report or complain on project broken, the regional office of DWR goes to see the project first. In many cases, locals complain to their local politician then the politician request to the DWR to go fix the broken project. But it may or may not solve the right problem, no one guarantee. For budget issue, it will need to get through that channel. If there is a push from politician, it will go to the budget plan easier. But if it's not that way, the regional office will put the project in annual regular plan. When there is complain, the regional office put it (complained project) into an annual plan. However, it doesn't mean every complained project will be fixed. If the damage is small, the regional office will not touch it. Now there is an issue of maintenance project to transfer to local administration (decentralization), and it is obligation. Problem is we can't finish all drawing (for maintenance project) since every project requires drawing and cost estimation. When there is a drawing, then we can go to ask for budget.

Q: What was a project development process in the twenty years ago?
A: As far as I know, project was proposed from locals through sub-district council then submitted to provincial plan. We didn't direct them that much. Parts of those projects came from the Royal initiative projects. Not so many influences from politics.

Q: So why many literatures claim that projects are not from real locals' needs?
A: May be time has changed means that we (the department) sometimes made decision for them in term of development, sometime some effects from flooding. But most of projects came from locals.

Q: The department plan only to construct a project first? Did the department have plan for operation or maintenance after a construction complete?
A: I am not sure about this. I think we didn't plan for operation. We plan to have a project here (at this location) then we go to construct here. In design process, our concern is a project location should locate to a village because it more convenience to put the operate gate. If a project locates far from a village, no one come to operate gate. In this case, we think for locals.

Q: Why did the department think like that?
A: Main issue is that we don't have an officer to do this task. We need locals to take care a project. When water comes, the locals need to operate a project.

Q: So in planning process, only think about to initiate a project and construction work. No thought about maintenance?
A: No, because we will not take care of it for sure. No officer to operate. We construct then give it to locals to take care from that time until now.

Q: the department can't tell whether a project will have a good care?
A: Right. This is difficult to evaluate right after project start. It is very difficult.

Q: How much locals participate in a project planning process?
A: First, they must agree to have a project. Second, if we have a project affecting some land or property, we have to see where or which level that the locals agree. For example, if no one donates their land within two kilometer of a project location, we will not put a project there.

Q: Nowadays, there is no land acquisition compensation?
A: No, this is an Office of Prime Minister Regulation. Can we change it? It's very difficult because it has to be approved by the cabinet to change the Regulation. Purpose of this regulation is to encourage locals to participate with the government. If locals don't donate

their land, it means they don't need a project. But if they donate, it means they want a project.

Q: Is it possible to have a water user group prior to the construction and collect the funds for the construction of about ten percent?
A: It is difficult. Let's assume the project cost is ten millions, ten percent is one million. Locals have no money.

Q: Nowadays, how locals request for a new project?
A: There are several channels. One is their local administration office (Tambon). Others are including the Department of Water Resources (DWR), the Royal Irrigation Division (RID). However, the DWR and the RID can't ask for budget to construct new small ?scaled water resources project due to the decentralization of water resources project to local administration law. But if we have a medium scale, like reservoir which capacity is larger than two million m3, we can do it.

Q: For this medium scale project, is it going to be a same cycle: construction, transfer to locals and become malfunction project again? Same problem in next 20 years?
A: It should be better because we have better water user group. We have learned to establish water user group.

Q: What about money for operation and maintenance (project in future)?
A: I proposed to a bureau of water resource policy and planning for a simple project operation and maintenance budget especially in case of without drawing and cost estimation. If we get this budget, any project request maintenance such as mow grass, repaint, change gate valve, repair riprap, they can ask for this budget. Then we will approve the budget for those small tasks. But there is large repair work like dredging, drawing and cost estimation is required for annual budget approve. Now I don't know whether we will get this budget for next fiscal year. This is what the previous Office of Accelerated Rural Development used to do. Advantage of this system is those minor repair project were repaired. Even this year a project doesn't get fix, but it will in next year. So it will be in a good maintenance system. And when it fulfill with a water user group, the user group will monitor a project. For example, one water user group was established and trained by the department last year on how to take care of a project. This year, when I visit that project, they take a good care of the project, like cut down all trees on the bank.

Q: Do you think what make them (water user group members) change their behavior?
A: they start to see….first, our good intention to tell them, pay attention to them which increase cooperation between the department and locals. We go to see them more often. We don't leave them alone.

Q: Was this kind of relationship disappeared?
A: It has disappeared for long time, since established the department of water resources. But one day locals see us go talk to them, and not so long after that we go to survey, have meeting with them. I go almost every month.

Q: part of the problems comes from lack of project operation and maintenance knowledge on the local's side, but another part is from lack of attention from the department. What made the department don't pay attention to a project operation and maintenance? Because the department didn't have money or any policy?
A: This is my understanding. I am not sure this is because of misunderstanding of executive or not. The executive claimed that the bureau of budget did not approve budget for repair and maintenance constructed project because a project was transfer to locals to take care of it. That's what I heard about three years after the department was established. But recently, one day someone went to ask the bureau whether the department can set up budget regarding repair and maintenance cost, and the bureau of budget said that "because you didn't ask for it, so we didn't provide it (budget)".

Q: What is the law said?
A: We can go to fix it because a project is property of the department. The department can do maintenance. It is registered as a property of the department of water resources which transferred from the ARD. As long as it (a project) belongs to the department, the department has right to maintenance it. But the process and method to go to maintenance is another issue. In principle, we can do this just this kind of repairing needs drawing.

Q: Can locals repair a broken project by themselves?
A: They can take care a project in simple way. What they can do is cutting grass, small trees. But if it's more than that like broken road surface; this work should be done by the local administration office because the local admiration is capable of doing this, painting or

changing the guideposts as well.

Q: It seems like there is no clarification is legal term for a project maintenance; Who can do what?

A: I think it relates to knowledge and understanding of Thai people on how to take care of public property. People think public property is property that the government has to take care of only, even though Locals (people) can do it or fix it. For example, there is a small hole on a street in front of their house where the house owner can cover the hole by themselves, But they (locals) claim that this is public property. One of the problems that we are facing is that in pervious time locals can help themselves first. When there is storm and tree branches fall over the power line, locals remove those trees by themselves. But they don't do it now…they said "it's local administration work. The local administration has to do this. We already voted for you. It's your job". This is what's going on.

Q: Are they (people) are not in trouble?

A: No, they go to get the local administration to fix it while prior time they help each other to cut the tree and remove it. And this kind of phenomenon occurs in everywhere.

Q: So whose fault?

A: It's Thai society fault. Thai society doesn't teach to care public property, to use public property as a public use. We are taught to use public property as it's not our property. So when public property has a problem, no one wants to take care of it. People think the property owner has to take care of it instead of everyone help to take care of it. This is different from developed countries.

Q: Local users didn't take care of a project because they didn't really need a project?

A: It's different issue. Do they need a project? Yes they need it, but they ignore to do it because this is not my business. Some example of Thai behavior is usage of footpath. Footpath is public property, but if I want to have a shop in front of my house, I will put it on the footpath or parking my car on a footpath. On the other hand, people in developed country think public property is public property. No one can use it as a private property. This is not in Thailand. Similar to a water resources project, do I need to use water? Yes I do. Take care of it? Not really. It's more like awareness. Sometime village's rule can help on this.

Q: Even a water user group is established, still government has to be responsible for a project?
A: Yes.

Q: Is Technical aspect a problem?
A: In water resources project, local can help to monitor a project in a simple way. But in more technical aspect, it has to be the department. If they help to monitor and they see a problem and inform us, we can repair it. But if they don't inform, we can't know about it. In Utaradit province, a local man could repair a gate valve by himself. He thought it simple and he could fix it.

Q: Why he did it?
A: He said he liked to try this. He found that it was leaked, but he thought it can be repaired and he said he was happy that he could fix it. I checked it and I found that this valve doesn't have part. To fix this valve, it has to change to the new one even just small leak. In this case he fixes it by himself. It's not 100% but better than leaking. They can do it by themselves. Another case is water distribution system in Lampoon. Water distribution system has water outlet, but their farms is far from this out let. So they connect the outlet with PVC pipe and carry water to their farm. One outlet provided by the department is connected about 10 PVC pipes to their farms without waiting for help from the department. They (farmers) said they can do this by themselves on their own cost.

Q: Why they can pay (invest) for this?
A: It's worth of it. For example, one farmer told me that his longan farm is fruitful, and it's only small size. Merchandiser came to buy this 500,000 baht for his entire farm. So I ask him that for this 500,000 baht what (how much) he invested. He said that he invest for pipeline, water fee, pesticide and fertilizer for total about 20,000 baht per year to gain 500,000 baht. So if he invests for 20,000 baht for pipeline, and he can use it for about 10 years…it worth of doing this. In this project, water user group can buy a pickup truck. This is interesting. The water user group charge for water fee of 10 baht/Rai/month. They collect money for maintenance valve and mow grass on reservoir dam. They bought a pickup truck to operate a water gate and they have money to buy a truck and gas for a truck. Income of this group comes from water fee and fishing fee. Annual income is more than 200,000 baht.

Q: This kind of project can run because it generates income, but in many failure projects don't

have this income.

A: There is no obvious water user group, no strong leader. When I told this successful story to other projects, they are interested in this story.

Q: that means when the department first developed a project, the department realized that a project has potential to store water and benefit from water usage. What about realization of water value and how to use water wisely?

A: In term of engineering, there is no problem. For value of water usage, this comes from their awareness. Like that project (previous mentioned), this area can grow only longan. When they get water from our project, they use water for their farm.

Q: Do you have any other comments for causes of malfunction project?

A: I think it's mainly from knowledge and understanding in project operation and maintenance.

Q: What about regulations or laws?

A: I think law or regulation is not a problem. Problem is implementation of the government agency. For locals, law doesn't affect. It used to have a question that after is establishment of water user group necessary to be approved or to have recommendation from the administration. The answer is no need. Even though it's approved by the administration, the locals don't agree with it. It's over. If the water user group is established by locals and leader is selected by them (locals), the department just get involve by making it on paper work. This group will work out. One case in Utaradit province, we tried to set up a water user group, but it failed at first time. We tried again.

Q: Why did it fail?

A: The facilitator, who facilitates a meeting, was not skillful in my opinion. So it couldn't have conclusion and elect the group leader. In the second time, we tried to have small group discussion among leaders before meeting (lobby) in issues that locals didn't understand and not cooperate in advance and asked these leaders to have mutual understanding among locals.

Q: Who made appointment with those leaders?

A: Sub-basin working group. We cooperated among our bureau, sub-basin working group and the bureau of mass promotion and coordination. Each unit answers questions that they are responsible for. There were problems asked by locals, but the answers were not clear for them.

This time everything was clear. Then we could establish the water user group.

Q: What do you think about tendency to have malfunction project in the future?
A: If the department is using the same mechanism, establishment of water user group but lack of attention to follow up those groups, it will collapse again. But if we go to do repeatedly for water usage, project operation and maintenance, it will work. Some locals' leader said that those rules were mentioned, when time goes by, we (locals) forgot. One day government came to warn, but the locals didn't listen to it. But if the government officer goes to repeat these rules every year, locals would care on this issue with respect. Many places are waiting for hope from the government.

Q: From problems that we discussed, do you think how to solve these problems?
A: It needs follow up every year by the government. One day we need to repair a project. Locals are happy to talk with us about their problem. And we can answer their questions. Sometimes they (locals) can solve the problem by themselves. Most of problems are management problem rather than engineering problems. I think water resources project has two main problems; management and engineering. Engineering problem, we can solve it. But management problem (misunderstanding, misused of tool) can cause engineering problem. If we go to see them more often, it encourages locals to work as a group. They can participate in project maintenance and see how we care them. Also, update their activity through media such as the department news which make them feel that they are important. These activities can prevent project failure, but it has to be consistence and continue.

Interview Ms.Chadaporn Unhapanee: DWR-HQ3

Q: In your opinion what caused malfunction projects?

A: In my opinion, first of all, this is a result from the government reorganization in 2002. Before reorganization, those projects were constructed and managed by the Office of Accelerated Rural Development. But when there was reorganization, there was no continuity when the department of water resources was established. It was necessary to identify how many projects were transferred to the DWR which required inventory system. After establishment of the DWR, there was no project inventory data. This inventory would go to the Cabinet for approve and assigned budget for maintenance. This period is a vacuum period. It was too long without action. It took many years to set up budget for project maintenance, wasn't it? It was about year 2002-2003. Because of this problem, I couldn't start up water user group network.

Q: Why you couldn't start up your water user group network?

A: First, the Cabinet didn't approve budget because there was no project inventory data. So there was no water user group to maintenance project, to allocate water, to manage water from reservoir. We couldn't touch this since there was no approve from the Cabinet. So this is my opinion.

Actually problem regarding project repairing (maintenance) is a regional office responsibility. They didn't pay attention to this problem because when it became the DWR, a new construction project had to follow implementation plan coming from publics need. I am not sure if I can say this….politicians also wanted project in their area. The department has to follow implementation plan. I am not sure how many projects that transferred from the ARD which approved by the Cabinet. Bureau of water resources development knows this. There are many of them. This is first step. We (the DWR) has never had maintenance budget, so it took time for the budget bureau to see how important of project maintenance budget. Until in term of the general director Dr.Siripong, he proposed that we could request for project maintenance budget. Then we could try to propose maintenance budget. This is what we lack of…not continue. It's because of government reorganization, project inventory, cabinet approved for transferred project to the DWR responsibility. (5.43)

But in coming future I think this phenomenon won't happen and the bureau of water resources development have to push the cooperation among government and locals forward. For

example, three projects that I worked on it with the bureau, Locals were very happy with the projects. Local administration also supported the projects, so I think we can solve this problem in the future. Now we are working on it, but it was interrupted by flooding again.

Q: In that period, what caused delay in the project inventory and budget approve?
A: In that period, to become the department of water resources, it required manpower and human resources management integrated from various organizations which was very busy. In addition, we needed to work on the department vision, missions, water policy, and etc. It took about one year for those tasks. First two years of the department establishment was a time for adaptation of officers who came from various organizations with different background and knowledge to understand role and responsibility of the department. I remember that it took two years to finish this process. After that it was to do project inventory, cooperation with regional office and propose to the cabinet. That was not simple and time consumption. So this period is transition period for the department. But I think numbers of successful project will increase because now we keep working on it. This year we will have another three projects. However, we have few people for this task. We are thinking about hire Consultant Company to work on this water user group establishment work and the consultant will work under our supervision. We will responsible for public participation because this is important. If the consultant doesn't do well on this, it will cause problems. Locals may not want to work with us anymore.

Q: Any other opinion regarding to causes of malfunction project?
A: Actually the department's projects are small-scaled project and it came from locals needs. From this year, a project scale will get bigger due to the decentralization law. Most of them come from local's need only very few parts come from politician. For this kind of projects (politician request), regional offices have to deal with it by negotiation with politician whether those project should come from local's needs. Our annual plan proposed to get budget as a package and we have to revise plan and prioritize project every year. And to revise plan, it is a need to consult with locals. Why do I do this? Because it is stated in the Prime Minister Office Regulation B.E.2548 (2003) that every project must have public hearing before construction.

Q: So projects constructed before 2003 didn't have public participation in project development?
A: I asked some previous ARD staffs about this issue and they said they did but in local scale.

It was just small discussion, not like procedure that designated by law or regulation. They went to listen to locals for couple hours, but most of projects are from local's need.

Q: If most of projects come from local need, why those projects became malfunction?
A: because of the transferring period. The period took almost three years. One project in Li district was constructed in the ARD period (couple years before reorganization), and after about ten years there was landslide into the reservoir and then local came for dredging. The project was left out for long time. Moreover, there was no water user group at that time and no one support them also no budget. Now I am trying to encourage water user group to have their small fund for their own group be themselves. If government get involve with this kind of fund too much, it won't grow up. If we support budget all the time, they will only wait for help from us. When I go to meet them I gave example on how to manage the group fund. For example, in Li project, the projects set up committee and promoted fishing in the reservoir through internet then collect the fishing fee from fishermen. Income from fishing fee goes to the project fund.

Q: Did they listen to you?
A: Yes, they did listen to us.

Q: Why?
A: They are happy for having us to be there for developing their area. They (locals) are doing lychee and longan farms. So if the reservoir has problems, it will affect their economic

Q: If a project doesn't have economic value to user, will they take care a project?
A: A project from the department should have a water user group. In some area they want to have many groups which more than we can support. We are taking care of those established water user group by supporting knowledge and budget to them. It's just like we provide them a stage, not just leave them in their group quietly. When we have activity, we ask them to join our activity which they (locals) like to do especially when there is a media to promote their project, this will help to increase their income.

Q: Why did they (locals) change from not so interesting to very interesting in project participation?

A: This comes from the water management policy to manage water in river basin. We have to encourage people to participate to bring them in. For what? I they are in, in the economic area, it can't stop development, it needs to continue. We provide budget for this activity. If they are doing well, it can continue to tourism. It means more income. Everybody needs to eat. I look at it from this point of view. If we are doing well on this, it can solve poverty problem for them.

Q: Are there projects that people not interested in participation?
A: No, I don't see it. Most of them come to join more than I expected. We just provided a meal and some transportation fee for them. Many of locals wanted to attend our meeting to present their problems, what they need and what they want. The bureau of water resources development that came with us can listen to those problems and be able to see how to fix those problems. This is a part that the bureau that is in charge of engineer issue couldn't have chance to know it. We invited the locals and they came to us to give information and tell the problems.

Q: Why did locals come?
A: They need water. They need development. It doesn't mean that the economic situation is good, so they can stop here. Thailand is agriculture country also.

Q: We will not have malfunction project in the future?
A: I mean we may have some malfunction project in the future, but the percentage will be decreased. The percentage of malfunction is high because of that transition period.

Q: Is the government officer behavior a part of malfunction project causes?
A: I think it is. Officer's behavior, especially who are working in public participation part, needs to share experiences and problems that they have faced.

Q: what is a problem in public participation?
A: I think in previous time the Thai constitution didn't focus on public participation, but later public participation has been emphasized by the constitution especially environmental issue. Whatever we do, it's a must to ask people first. Construction project is also controlled by the Office of Prime Minister Regulation on National Water Resources Management B.E.2550.

Q: Why public didn't participate in this activity before the constitution or regulation related to public participation was promulgated?
A: It's from the constitution. After the constitution stated about public participation in the government project, the government agencies implemented more public participation in their work.

Q: What about the locals' side?
A: Locals also need to participate. They want this kind of activity. They want government sector to come to listen to them.

Q: Does it mean that locals want to participate, but the government mechanism doesn't support local to be able to participate?
A: It can be said like that….before revising of the constitution regarding to public participation. I have been working for the government for very long time, but public participation hasn't been emphasized until this constitution. Then after that it (public participation) has been improving.

Q: What do you think about small-scaled water resources projects that will be transferred to local administration according to the government decentralization?
A: For project transfer, the department responsibility is knowledge transfer to local administration in term of project operation, maintenance, project management, and water user group establishment. We need to support and encourage them on these issues. If they face any problem, the department is welcome to support (help). In first couple years, there may be a budget problem for local administration. Maintenance budget for local administration is different from our budget system which I don't understand. We can't interfere their system, but after they (local administration) accept project, they will need to manage their budget. We can support them on water user establishment. We also provide them an operation and maintenance manual. So I think it will gradually improve. If project is not in good condition, locals will blame them (local administration office). This water resources project needs to be maintained and required group to operate and maintain. So water user group must be established.

Q: Any other issue that you are worried about?
A: It has to do little by little because each area has their problem. Each basin has different

people, different lifestyle. When they have problem and ask for help, government agency go out there to help. They are very happy for this.

Q: Do the department have enough number of agent/ officer?
A: If we have a good management, it's enough. It's not about shortage number of agent. I heard many complain on lack of agents and lack of budget, but I have done this before. I know it can be done. I look for alliance. Who else are sharing water with us? Private sector, organization or network, this groups already exist in the area. We need to go to talk to those private sectors and invite them to join us even budget (money). For example, in Pa-Sak basin, cement factory (Siam Cement Group) and electricity power plant also support us.

Q: Why did they (private sector) want to support the department?
A: They wanted people to have water. They want people to participate. They thought that they sometime destroy environment/ natural resource, so they want to pay back.
I also emphasize on IWRM when I went to meet locals to realize in water resources management. In fact, IWRM is not only planning, but also public participation that is emphasized in IWRM.

Q: It's not about human resource, and it's not about budget?
A: It's about management. This is based on my experience. I need to get alliance from private sectors.

Q: What is situation of river basin committee?
A: They want to keep their duty. There is rumor that river basin committee will be eliminated, but it's not. It has to go forward, and we need to support them. Also, in process of non-government committee selection, this committee will come from various sectors; agriculture, industrial, commercial, tourism, and service. However, it depends on location and area. Total is nine members.

Q: Projects came from river basin plan didn't implement, but many projects which were not in river basin plan were constructed. What is the problem?
A: I know this problem which those projects were proposed by politician. Regional office has to cooperate with bureau of planning before propose projects for budget consideration. Regional office has to negotiate with politician that projects must be in river basin plan, so

that it won't be a problem for budget consideration. Also, river basin plan will not necessary to be revised. Cooperation between politician, the department and people is needed. I think it will be better. Negotiation and mutual understanding is only way to solve this problem. Also, small-scaled projects will be transferred to local administration which will reduce number of project will be constructed by the department.

This malfunction project problem may occur but in small number. It will take time to solve this problem. The percentage of good condition project will increase. We are government officer. We need to put people at the center and adjust ourselves to them.

Q: What is attitude of other officer in the department?

A: Trust from local is the most important. Officers who work with locals in the basin level really care those people because officers have to work with locals. All plan come from locals. Officer's attitude is getting better in term of working with locals and public participation. They care each other. The department also creates its value, not only finish construction work.

Interview with Ms. Nualyai Tangkosol: DWR-RO1

Q: What are locals' responses from the project assessment?

A: People around a project location don't get benefit from a project, but people who get benefit are in a different area.

Q: Why?

A: I don't know. One of the weak points of our project is there is no water distribution system. Beneficiary is person who lives around the project, except benefit from fishery. In term of agriculture, a project is benefit for people around the project location. Second, the side slope is too steep which a water user can't put their water pump because the pump will fall on the side slope. If we ask people who lives close to water, they would say they are satisfied. But, if we ask people who live far away from the water, they are not satisfied because they can't use water. Those are comments on a project usage.

Q: What are comments on public participation?

A: They said they don't know much about a project. Villager chief and leaders know project information. This is a big problem because there is no public hearing before a project starts.

Q: Why there is no public participation or public hearing before a project construction?

A: This is a long story. First is lack of integration between units in the regional office. Planning is secret. They (no mention) don't want anyone to know the plan, and they go to construct a project right away. And the unit who go for public hearing will take a complaint from locals/ villagers like "why don't you come to ask me first for what I need". The low quality of work is another factor because there are many sub-contractors. Let me ask this if a project cost is one million baht, how many percent is a real work. They do it less than one million baht. Sometimes locals think that I am satisfied with what they got, better than no water. But, in some places people are not so satisfied. The point is we didn't ask them what kind or what type a project they need. We should go to consult with locals first that what they need and in which way the need. In some case, there is river trespassing by locals for private benefit like doing rice farm. Some locals complain that those projects don't solve any problem. Simply speaking, it is lot of corruption which makes locals get very low benefit from a project. But the locals/ people say that it is better than nothing.

Q: Don’t people complain on corruption problem?

A: Some place, they do. For example, people in Phu Pha Man reject the project, and they (locals) claimed that this project is related to political issue, not their need. As a result, a project has to relocate. Probably, they know this from local NGO which provides locals with information. It’s large-scale dredging project which cost about 40 million baht. But, people reject it.

Q: What is a problem of a project management?

A: Our problem is no integration. For example, a plan which proposed by basin was rejected because of limited budget on survey and design. Or, we propose a plan to the department, but when the plan returns to us it is different project. Then our office needs to be hurry in survey and design to catch up with annual fiscal budget.

Q: Why the proposed plan is changed by the department?

A: Politician, politics and money.

Q: How can we solve this intervention in the project development from politician?

A: We need to shoot those politicians (laughing). In Srakaew province, they wrote a book of water resources project plan by cooperation with the Royal Irrigation Department and university. If anyone wants to construct water resources project, the project must be stated in the book. The governor also needs to know their area. The executive level needs to get involve.

Workers don’t look at data and information. Plan should come from data and information. We need to identify problem and which problem is in urgent and how to tackle a problem. Our organization follows order with no considering problem. After a project finish, satisfaction assessment is done from selected project meaning that select only good project to asses. How can we know a problem from selecting a case with no problem?

Interview with Ms.Areerat Namwanta: DWR-RO2

Q: When you went to evaluate a project, what was your approach?
A: I just went to interview a project user directly and introduced myself.

Q: What was a reaction from a user?
A: They asked me if I came to repair or to improve a project after I introduced myself. Or, somebody said that what else you wanted to do. So I told them that I came to evaluate a project implemented from last year (2011).

Q: What do people say about project public participation?
A: Most of the answer is they were informed only, not fully participation in presenting their ideas or comments. In some projects, there was a comment that they didn't know why the department constructed the project because it didn't benefit them, or whether it's worth of money for doing this. In addition, the users said that the implemented project was not really beneficial. They want a project in a different place/ location. One comment is that they want the department to work not for one spot in the channel. Instead, the department work should cover the whole channel. Oh, another comment is that beneficial area is only the project location, but downstream area doesn't have water because the water was blocked. Before a project was constructed, water flowed naturally to downstream. But when project is constructed, there is no water. So, people in the downstream are in trouble.

Q: Are all projects you evaluated the wet-crossing type structure?
A: No, it includes dredging, ponds and wet-crossing structure.

Q: What are comments from user regarding pond or dredging project?
A: The contractor dredged only the pond's rim and making a berm from those soils, not at the middle of the pond. The locals said that the pond was still shallow, and the contractor should dig all pond area. So, the pond can store more water.

Q: How the locals know that it is shallow?
A: They get in there. I have a picture when the locals do fishing. The depth is just about his knee.

Q: Most of the comments are lack of project information sharing in the project development phase?

A: Yes, lack of public participation. Locals were informed that it would be a project, but no detailed information for them, for example, no drawing or image of project introduction before construction according to the Office of Prime Minister Regulation B.E.2548.

Q: Why?

A: I don't know. There are few projects conducting project public participation, but only village chief and leaders are invited to join project public participation, not all stakeholders.

Q: Normally when the department conduct public participation or public hearing, is there budget provided by the department?

A: Yes, it does. It's 3,000 baht for a project.

Q: Is it enough?

A: It can be shared among projects.

Interview with Mr.Pitikorn Plangsatra: KY-LAO01

Q: what is situation of malfunction project (Kud Sri Pum weir project)?
A: There are some cracks on structure and problem with the gate. The pulley was gone. There are some damages on channel blank from flooding sometimes. In rainy season, large amount of water overflows the channel bank and damages the channel bank. But the weir structure doesn't have a problem. The weir itself was flooded and overflowed by flooding. But, the road next to the weir was totally damaged by flood.

Q: How long for flooding period?
A: Less than seven days. Inundation doesn't last long, but flooding occurs often.

Q: What are problems in a project management?
A: I think open space to drain the flow is not enough. If we can increase open space, water can flow easier and drain faster. Inflow comes from several tributaries, so only this open space is not sufficient.

Q: Any problem regarding water users, for example, water allocation, conflicts?
A: I think there is no problem between users. Problem is flooding over agriculture areas and some roads are damaged from flood. We can repair those roads for temporary due to our budget. Our budget is limited. When road (bank) is damaged, water goes out everywhere. We can't store water in rain season, and then become a water shortage problem in dry season. Villagers pump up water for their consumption. Now we have pumping stations which will be transferred from other organization to our management soon. But there is no plan for water distribution system and water user group yet. It will be in the local administration plan for next year. There are many details for this.
A problem is upstream has difficulty to use water because there area is high elevation. There is no problem in downstream area. In Kud Yom, there is proposal to increase a storage level to increase storage amount. I suggested them to have public hearing first in order to have consensus among villagers. If there is argument among villagers, everything is stop. One main advantage of this weir is that it is used as a bridge to cross between two sides of the channel.

Q: What is a management plan for the weir after it is transferred from the Department of Water Resources?

A: It has to be repaired into a good condition. Then we will accept the project to our responsibility. In fact, I don't want to take this project into our responsibility because our budget is small. We can't take a project with some damages. If it's fail or damage, we don't have budget to fix it. We need to ask the department of repair the project anyway. In case we accept the project and villagers know that this is a local administration responsibility, the villagers will come to us. And we don't have budget, so what should we do? As long as we don't accept this project, we can say to villagers that this project belongs to other organization and we try to contact that organization, please wait. We will do what we can do. We have only 500,000 baht per year, and this is not for one project. If this project collapse, this 500,000 baht is not enough. We will be death.

I want to accept a project which is in a newest condition. Most of the time, other organizations inform us after a project construction complete not before or in construction process. When we recheck with drawing, it seems not correct and no benefit for village. How can we accept this kind of project? I asked to correct some part to make it (project/ tool) really work.

Q: What about the technical skill in water resources project for local administration?

A: I asked the villagers and they needed to widen the open space for bigger flow, or either bridge or box. We try to solve the problem based on our budget, for example, instead of making 3.0 meter high bank, we can make only 1.5 meter or 2 meter from our budget. Sometimes we ask the politician for help or budget, but we don't know if we can get it or not.

Q: Which channel that you ask for budget support?

A: I ask from other organizations and politicians. It depends on connection. We keep asking every year. Asking to the department is difficult and many times it was rejected for the reason of there was not under the department or organization responsibility.

Interview with Ms.Montra Musopin: KY-LAO02

Q: What are problem related to water in this area?

A: Problem for household water consumption is acid water and corrosive water. One village has salty water, high pH value. Water quality for agriculture is in acceptable condition. There is no problem according to report from villagers. Also, there is no factory in this area. Our location is downstream of Chulaporn Dam. However, water quantity is not sufficient for agriculture use. I have been working here for seven years, and there was no problem on agriculture water in my first three years. Problem on agriculture water began in 2008, water shortage. And there was big flooding in 2009 affecting three villages.

Q: What is solution for agriculture water shortage?

A: We have two pumping stations. We take water from Chulaporn dam, and when farmers need water, they go to ask for water from the dam. The Chulaporn dam provides data for water distribution from the dam operation and reports to water user group in this area. The Chulaporn dam reports us about three to four times per year. Probably there are large agriculture areas along the stream, so less water come to us. After the dam releases water, villages upstream take most of water. So water amount we receive is not enough for total agriculture area.

Q: Is there any solid water allocation among villages?

A: User group from the Chulaporn is ok. In fact, the villages at the upstream locate on the high level, no need to use pump. Those villages have easy access to take water. There are some critics on the issue that why few amount of water has left for our village. Now we are doing dredging, retention pond to store water and small check dams. We started this in 2009.

Q: Regarding a Kud Sri Pum weir project, it was constructed before you come to work here?

A: Yes. It was constructed long before I came. You need to check with the project name plate. The Department of Water Resource came for public hearing on a project transfer to the local administration in 2008.

Q: What is a project management for this weir? Is there any water user group established?

A: As far as I know, there is no water user group for this weir. It's just a daily use. In 2006-2007 many farmers planted sugar cane, so they used this weir as a bridge to cross a

canal to transport their sugar cane product. In this area, only way to cross a canal is this weir. Some trucks carry lot of sugar cane products which makes villager leader worry whether this weir will be collapse soon. The villager leader asked us (local administration) to put a sign showing maximum load and punishment for one who break the rule.
This weir can store lot of water especially after dredging. For a weir management, you need to ask a village leader. Nowadays, when locals or villagers have problems related to this weir, they come directly to us. We go out to see the situation, and then we will repair it.

Q: Why do they (villagers) request to the local administration directly?
A: It's our responsibility to be in charge of all civil work.

Q: Who else benefit from this weir?
A: Of course the local administration office is in charge. There is also pumping station taking water for some villagers. There is a beneficiary group for this pumping station as well. Water users are about four villages in our administration boundary. There are three weirs in this stream. Anybody can use it. It's open for everyone. Everyone who does farming use water from this weir even uphill farm because there is water distribution system from pumping station.

Q: Who has right or make decision on the project use and water use?
A: The local administration does not make decision in any case! We do public hearing. Water user satisfaction (agreement) is priority.

Q: Is there any conflict among villagers (water users)?
A: It's common to have some conflicts. But we take votes for decision.

Q: Don't they have a fight?
A: Yes, they do. But there is not a serious fight because everyone can use water equally. Villager is responsible for gas (by personal pump) in order to take water from a canal. It depends on individual potential. But in case of overloaded truck passing the weir, it is one person fault. It is pointed out that this behavior causes problem to the weir structure. If someone has a selfish behavior from other, the rest will try to find solution to prevent that selfishness. It's not accepted when someone get higher benefit than other from one selfishness.

Q: Does it mean that villagers have a feeling of ownership for this weir?
A: Right. Everyone preserves the weir for public use. They share the benefit, but if one has higher than others and disturb other, again they will find mechanism to stop this.

Q: Regarding a malfunction of the project, what cause this project become malfunction?
A: For the sluice gate, the pulley was stolen. In some years, there is lots of water while some year there is water drought. There is slump and cracks on the infrastructure. May be, it is caused by too much water for the weir. Some villagers claim that this slump and cracks didn't occur when there was less traffic on the weir. Previously farmers grow rice on the other side of the weir. When water became scarce, they changed to sugar cane. In some year, large amount of water damages some streets or banks then flood into farming area. It's lots of water but we can't store it for long time. I think this is a problem. I could say it (the weir) works well. The gate keeps opening, no way to close it.

Q: There are some infrastructure damages, obviously pulley, concrete slump and cracks, sediments.
A: Right. Indeed, we don't want to accept this project from the Department of Water Resources. If the department transfers this project about five years after construction completed, I will take it. This is my opinion. With structure aging and other factors, we are afraid that some serious structure damages may occur after we take it from the department. It will be our burden!! So I want the department to repair a project to a good condition before transfer to us. Then, it will be possible for us to take this project from the department.

Q: What is villager opinion regarding a weir usage and management?
A: Since villagers pay tax, they expect benefit from the local administration. However, when they lose their benefit and the local administration can't help them, they will try to help themselves at last. Another issue is that the villagers not exactly know how to operate and maintain a project and also they don't know what advantages of this weir. People here can't accept if someone is gaining more advantage than others with their selfishness. If everyone is in the same trouble, it's ok. One more important fact is if they accept that there is a problem with a project, they are afraid that they will not get a new one. If everything seems good, more projects are coming.

Interview with Mr.Nattapong Kwanyeun: KY-LAO03

Q: Why the villagers leave a project broken like this?

A: They can use water as usual. When water comes, it just overflows the weir. People use pump to take water to their farms. The office doesn't come to take care of this project, and also there was no complaint from locals. They keep using water, but when the pulley was stolen, they just ignored. Just lets it go.

Q: Do the villagers feel that they face problem? Or what do they think about this?

A: I can't say anything about this because I've never seen any letter regarding this weir problem at the local administration office. You need to ask from their leader. It was not our responsibility, so I have no data about this.

Q: What is impact to the local administration office from this malfunction project?

A: I have been here for three years and I have never seen any complaint from the villagers. They may talk about this weir among themselves, but it hasn't been to the local administration office. What I know about this project is that it was in the process of transferring from the Department of Water Resources. My boss asked me to come to see this project whether the local administration office should accept this project from the department. That's how I know that the pulley was disappeared and some cracks on the structure. My opinion was the local administration office could accept this project if the department already fix everything because the local administration office has limited budget. Transfer only infrastructure but not budget is not good. This area has small budget but many requests. Some urgent problems in this area are water for agriculture and household consumption and road to transport agriculture products.

Q: Can locals manage water by themselves?

A: There is user group for pumping station up there. They collect water fee and electricity fee. When water is shortage, people in three villages get together and go to ask for water from the Chulaporn dam. They have a leader mainly villager leader.

Q: How to solve this lack of maintenance problem?

A: The owner of this project must be responsible for maintenance and do public participation and capacity building for the project. They should explain after finish repairing that what

advantages of this project, how to operate and maintain a project. In fact, the local administration office doesn't have budget to fix this. This is a main cause. The budget we have is for three villages. And now we are waiting for subsidy from the central government which nobody knows when it will come. The budget is limited, but many tasks to do. The budget has to be distributed. For dredging, I always ask support from other agencies, such as the Royal Irrigation Department or the Department of Water Resources or the Provincial Office. I have to try every channel, go to politician, go to other agencies. Some area receive large budget while some don't get anything.

Q: Why is it different?

A: It depends on the connection and relationship. We try everything. Road work is the one that has support from other agencies. In large project, we propose and then ask for budget through several channels that I mentioned.

Q: How was the flood situation?

A: Last year, the flood last about ten days. The channel bank around here always is torn out from flood. Villagers suffer from flood, and they want water to drain out as soon as possible. But the flooding area is low land, so it takes time. There is a pumping station up there, but the power line was stolen!! It will take a while to fix this. The villagers keep asking the local administration office that why you don't make it quick. But the local administration office needs to precede everything through paper work. The local administration office has only one technician but working on everything; water, electricity, road, etc. If we have more technicians who specialize in each field, it will be good. But I think it will be difficult to get more workers. I am not specializing for water resources.

Interview with Mr.Chana Rassamedauen: KY-LV01

Q: what is a project background?

A: Seventeen or eighteen years ago, I went to talk with a politician to ask for a weir in this area. One day, officer from the Accelerated Rural Development, ARD, (in that time) came to talk me and told me that they are looking for a water resources project which cost more than 10 million baht. I said can I propose a project, but it will be more than 10 million baht, is it ok? I proposed for dredging the channel, construct a weir and bridge. Total cost was 26 million baht. Later on, the ARD came for site survey and design. After the survey, I went to talk to a politician again, and he said that the budget was approved, and the construction would start at the end of the year. Soon after that, the project was constructed.

Q: Was it a need from locals/ villagers for the weir before you went to ask from a politician?

A: Yes, villagers needed it. There was no bridge to transport agriculture products, and locals needed a bridge. After we got the project, villagers were very happy with it.

Q: there was some malfunction on the weir after using, when did the malfunction of this weir start?

A: It wasn't severe damaged. There was dredging in front of the weir as well.

Q: Is there any problem related to this weir?

A: Problem occurs when water comes in rain season. People on the downstream want us to open the gate for their fishery. We don't want to open the gate sometimes, but we can't resist them. I was a villager chief at that time, and I had to compromise for both upstream and downstream people. People came and complained to me many times.

Q: This problem doesn't involve with malfunction of the weir?

A: No, it's not. The broken gate or some malfunction is not a problem.

Q: Is there a conflict on water usage among villagers/ water users?

A: Ahh..Many!! now the pumping station is not working.

Q: Is it possible that villagers will collect money to fix a broken gate?

A: It's not completely broken. If it's broken, they will ask the local administration office to fix

it because it’s the local administration office responsibility.

Q: What if the local administration also doesn’t have budget, what will be?
A: If there is no budget and it’s not bug money, farmers will collect money for it. I think it will be like this.

Q: Why the farmers are willing to pay to fix the broken gate?
A: It’s necessary since the local administration office doesn’t have budget. But of course, the local administration office will be complained. For example, why the local administration office can’t fix this small problem!! In the past, I was the one who went to look for budget to develop the village from local politicians. There was no money!!

Q: Do the villagers have a sense of ownership on this weir?
A: It’s already transferred to the local administration office. For the villagers, it’s lack of public promotion. The villagers don’t know much about the project. Locals/ villagers are using water from this weir. After the transfer, it’s the local administration office responsibility.

Q: What else do you want to improve for this weir project?
A: I want more dredging, so it can increase storage capacity. One big problem is water shortage for agricultures. I am not worry about flood. If it can flood, it can dry.

Interview Mr.Kerd Mupram: KY-LV02

Q: What is benefit from the Kud Sri Pum weir project?
A: I am using water from the weir for my rice farms and some corns. I can make three crops a year.

Q: Are there other users using water from the weir project?
A: Many people are using water from this weir including pumping station up there.

Q: Did you see some malfunctioning parts of the weir?
A: No, I don't see it. It's only the gate which its pulley is stolen. The gate can't operate when flood comes. I install the pulley to the gates and Mr.Prakob is a person who is in charge of gate operation.

Q: Is there a weir management committee/ group?
A: Yes, there is a gate operation committee. Mr.Prakob is a leader for the gate operation and Mr.Lob is a leader of a pumping station.

Q: In your opinion, this weir doesn't have problem?
A: I think it's not really a problem. However, it can't store lot of water. In my opinion, I want to increase storage capacity by raising storage level for 0.30-0.50 meter higher. When there is water stored in the weir, the pumping station keeps taking water, and water will dry up within five days of pumping.

Q: Is there conflict between pumping station water users and other users?
A: Farmers who have farms next to the channel said that when there is small amount of water, they want the pumping station to stop taking water and start pumping again when there is water. But those farmers, who live in the uphill, don't have water. We need to help them too. If this channel dries up, they will have very hard time.

Q: Problem with budget?
A: It's not really damaged!! The problem is some damages on the road to the weir, but the local administration office can maintain it.

Q: if it becomes severe damaged in the future, what will you do?

A: The village leader and the local administration office will ask for support from the central government agencies. Now the project is in good condition. It will last for many years. What I want is to increase storage capacity. I want to store more water in dry season when the dam release water to downstream.

Q: Is there conflict with the downstream villages?

A: No, there is no problem. They have another weir in their area which was constructed before this project. The Kud Sri Pum weir was temporary dam in the past. People use natural materials, such as woods and soil, to make a dam. It was long time before I moved to here, more than 35 years.

Interview with Mr.Rob Sornwaing: KY-LV03

Q: Were you here when the Kud Sri Pum weir was constructed?

A: I was here and I was one of the group members who went to ask for help on the weir project.

Q: What is a background of the pumping station?

A: It started about 20 years ago, before the establishment of the local administration office.

Q: What is the benefit from weir to you?

A: The weir can't store water well because it's leaking. I am using water for my rice farms by pumping water from the channel.

Q: Is there a water user group for this pumping station?

A: Yes, there is. It is about four to five villages take advantage from this pumping station and distributes water by small canal system.

Q: What is management system for the water user group?

A: The group manages by themselves. They collect money for electricity on hour base. We charge 100 baht per one hour. One day is 800 baht for 8 hours of pumping. Now the raft which supports a pump is old. I am asking for a new raft from the local administration office and they are working on it. The water user will sign up a name, date and how many hours that they need water. Then I will collect the money from them

Q: Is there any conflict among water users?

A: It was an argument on priority, when everyone wants water at the same time. I had to explain the rule again, first come first serve. Another problem occurred between differences on water demand on sugar cane farm and water demand on rice farm. But it was solved after I explained to them. And if the argument wasn't finished, I would turn off the pump.

Q: What is impact from a malfunction of the weir?

A: Water is not enough. The problem is a leaking. I don't know how to fix this.

Q: Since there is no budget for the weir maintenance, if later on it becomes severe damaged, what will you do?

A: Here, this is a problem. The local administration office has limited budget, so they will need to look for someone else to help.

Q: Is it possible to collect money from user to fix the weir?

A: It's impossible. Even the electricity fee is already expensive. I go minus every month!! I can't estimate how much it cost, but it is very expensive. The local administration office is also subsidies for the electricity fee.

Q: Why don't you increase an electricity fee when you already know that it's always short?

A: I have risen the fee couple times from 80 to 90 and to 100 baht per hour. The users keep complaining to me whether there is a corruption on this electricity fee. Another same pumping station project collects 150 baht per hour!

Q: I heard that the main problem is insufficient budget?

A: Yes.

Interview with Mr.Prakob Chaimeekhaew: KY-LV04

Q: What is a background of the Kud Sri Pum weir project?
A: The technician from the Office of Accelerated Rural Development in Khon Kaen came for survey. I was helping them in the survey.

Q: How did the villagers request for the project?
A: There was temporary weir made from soil, and it was broken every year from flood. Villagers asked to a politician (Mr.Chareon) at that time to get a budget for a project.

Q: Are you taking benefit from this weir project?
A: Yes, I am. My rice farm is next to the channel.

Q: How did you take water from a channel?
A: I use a pump to pump water from a channel. This year is drought. If it's not drought, water can be used all year.

Q: How is a malfunction of the infrastructure?
A: The gates can't be operated.

Q: Did you operate the gate before?
A: Yes, I did. But now the gate is stuck.

Q: What cause this gate broken?
A: It was soaked in the water for long time and become rusty.

Q: Was there any introduction on how to operate and maintain a project when it first finish?
A: No. There was no introduction. The gate operation is managed by request from people downstream. It was a request from villager chief.

Q: Is there any problem of a weir project management?
A: So far there is no problem about management. When it is a drought, no one is thinking about the weir.

Q: Why is it like that?

A: There is no water, nothing to do with this. But in the flood season, water just flow through the weir. After flood is gone, water is full in the weir. But the weir is leaking. When the contractor was doing construction, I told them about that. But they said it was a small hole as usual. Water and steel is not getting together well. The steel bars become rusty and gradually ripped out. The contractor was a brother of the politician. They sometimes complained me on what I told them.

Q: If there is no weir, what would be?

A: We can't do agriculture because there wouldn't have water storage especially for those rice farms on the upland.

Q: How the villagers maintain the weir project?

A: No specific maintenance. We just use it because it's working. It's not broken.

Q: Is there any chance that one day the project will be broken?

A: If it is broken, this weir is under the local administration office responsibility. Once, the assistant district officer came to ask me whether the pulleys are still there. I told him that the pulleys are there. Two pulleys were stolen, but I got one back. Total are three. I am getting too old to dive and work on this job. I ask the local administration office for this task. I dived to hook the pulley to the gate. Now, no one wants to do it. It's too dangerous. So the gates will get rusty and gradually broken.

Q: Is there a water user group?

A: No. There is only a user group on electrical pumping station. That group collects electricity fee and they maintain their small canals. But if it is over their capability, they will ask the local administration office.

Q: what will you do with the maintenance?

A: If it's small damage, we will try. If it's big damage, it's the local administration office job. I heard the project was transferred to the local administration office responsibility, so it has to be it. The local administration office installed a sign to prohibit overloaded truck.

Q: If later on the project has severe damages and the local administration office doesn't have

enough budgets, what will you do?

A: I have no idea (laughing). I will look for the way. I will try to help myself first. I think it will be damaged by overloaded truck. The weir itself seems very strong, and won't be collapse.

Q: What is needed to improve this project management?

A: I think we need a project operation and maintenance budget. We don't know when it will be broken. If we had providential funding for this, it will be good.

Q: Is it possible to establish water user group and collect fee for the providential funding?

A: Oh, this is difficult. It has been free of charge, and one day we collect the money. Villagers will complain. In addition, it won't be a lot of money from members. The pumping station collects money for electricity fee, but it seems not quit enough to pay. The local administration office is subsidies on this electricity fee. It's big money.

Interview with Mr.Somboon Pratumkul: KY-LV05

Q: Can you tell about the background of the Kud Sri Pum weir project?
A: This weir was brought by a politician, Mr.Charean, from a request of local villagers. It was constructed by the Office of Accelerated Rural Development at that time.

Q: Do you have benefit from this weir project?
A: Yes. Farmers have benefit from this weir. Farmers carry their products through this weir to the village. It's not only a weir but also a road. I am using water for my rice farm. Also, farmers use water from the weir project for the sugar cane farm.

Q: What are problems related to the weir project?
A: I want to widen the width of this weir to be able to drain water faster when flood comes. Road is always damaged from flood every year, and we have to fix it every year. There is no problem in dry season.

Q: Who maintain this weir?
A: Farmers are maintaining this weir. We ask for help from the local administration office and a politician to widen the weir. In flood season, we can't cross to the other side of the weir.

Q: Regardless of natural disaster (flood), is there any other problem?
A: No. It is only flood problem. No other problems, such as conflict between users. Everyone wants water. The main problem is the damages from flood.

Q: If there is no budget to repair the damages from flood, what will you do?
A: The local administration will fix it because farmers need to carry their products to the village and market.

Q: What if one day the local administration office doesn't have budget?
A: If it's necessary, it will be donation or contribution from farmers. It must be done otherwise we can't transport product to the market.

Q: What make you think everyone will donate?
A: They have to donate!! The product is our income, rice and sugar cane.

Q: Is there any conflict between pumping station and other water users?

A: There is a committee. The pumping must stop when water level reach the specific level. It's not like you can pump as much as you need. The rule comes from the farmers meeting, once a year. We don't have a registration system, but we can recognize who is a member of the group. A user who donates land for making channel will be a first priority to get water. All members understand and agree in this rule. If there is a problem, decision, is made by votes.

Q: Any other problems or suggestions?

A: This weir is ok. It will not be collapse because the farmers are using it. We need to use this so we have to take care of it. If there is a budget, please help us.

Interview with Mr.Thongleang Rassamedauen: KY-LV06

Q: What is a problem related to the Kud Sri Pum weir project in your opinion?
A: There is leaking on the weir and a problem with the pulley. There are four gates, but two of them are not working. Also, the bottom base is leaking. Moreover, the road to the weir is not in a good condition.

Q: What is impact from the malfunction of this weir?
A: There are some impacts to me, especially when the road for transport my agriculture products is damaged from flood. It occurs every year. Last year was three places. When flood overflows into rice farm and damage our rice, this is very big impact for us. I invested a lot of money for rice farm last year, but nothing is returned because of flooding. Once I went to talk to the Chulaporn dam to release water a little by little and from time to time instead of release large amount of water in one time. The dam operator unit just listened and gave us small compensate such as blankets. This cannot be compare to money that we invested to the rice field. One rice crop cost lots of money much more than those blankets. If possible I want the dam to be responsible for our lost caused by flooding. When the dam releases water to our weir, the weir itself is secure due to its structure. What is damaged is a road.

Q: This flooding problem is not caused by the weir project?
A: It's not from the weir. The weir is strong, so water takes the road away. The villagers take water from this weir for agriculture activities, and there is a pumping station as well. It is huge benefit of the pumping station comes from this weir. This pumping station serves probably half of the sub-district area; five villages out of nine villages. We can grow crops all year long by the water from this weir if it's not drought.

Q: What was the background of this project?
A: When I was an assistant to the villager chief, the chief (Mr.Chana) requested this project from a politician then contacted to the Office of Accelerated Rural Development (ARD) at Khon Kaen office for a project construction. Later the ARD had about sixteen million baht budget approved for this project construction and dredging work.

Q: Was it a request from villagers to the village chief to request for a weir project?
A: There was a discussion among villagers about this issue. There was a temporary weir

constructed by locals. The temporary weir could store few amount of water, and it was damaged every year from flood. Most of the time, villager chief or leader is the one who seeks for water resources project. From discussion with locals, the village chief went to ask a politician. Then the politician told us to go to the ARD. Villagers went to the ARD office in Khon Kaen to ask for help. We didn't get it in the first year, but a year later the project was approved. This project came from the local's need.

Q: When the malfunction/ broken of the weir start?
A: It started about three or four years ago. Sometimes the chain of pulley was torn, or sometimes the pulley was stolen. Farmers collected their own money to buy a new chain. Even now, the organization who is the owner of this project is still taking care of a project. I saw they add some ripraps at the downstream. This people didn't cooperate with the local administration. They work directly with the project. This is from my observation. I didn't ask them in detail because I met only some workers not their boss.

People who live downstream need water but we couldn't open the gate. So, we need to help those people by putting together some money to buy a pulley, about two to three hundred baht each. This is because we are the host.

Q: Is there any conflict between this village and the village downstream?
A: Sometime there is a conflict but not a serious one. When water comes from the dam, the upstream was pumping up water while the downstream didn't have water. So, the downstream came to ask for water and there was some argument. Our leader went for negotiation and the problem was solved.

Q: Is there water user group for this weir project?
A: There is no water user group. However, there is a rule for water usage especially for pumping station. We appoint the minimum water level for pumping, and water level can't go lower than this level. Villagers agree and respect on this rule.

Q: Why do people respect this rule?
A: This rule was initiated from the meeting among villagers. If we keep using water, it will be finished. They listen to this. There are some protests for the Chulaporn dam by the villagers, but not for this weir.

Q: What is the maintenance plan for this weir?

A: I haven't proposed any plan. So far we can use it, so it's ok. Last time when someone came to fix the riprap, I told them to tell their boss about the problem with gates. About the leak, if it's leaking every day, it's a lot of water.

Q: Do you think why it's leaking?

A: I have no idea. Maybe the cement is old. I saw water flow under the weir in dry season. Also, rubber seal around the gate is not in a good condition.

Q: Is it possible that villagers will collect their own money to maintain this weir?

A: I think it's impossible because this is lots of work. For pulley and chain is ok. It is small amount of money, and the leader can support for this. When the maintenance cost is higher than ten thousand baht, it's impossible. Since this is a public property which belongs to several villages, it is difficult to get agreement. The more people, the more complicate. Each village is a different. My village doesn't have problem and the project is located in my area. But for others, they complain that they have small advantage so I don't want to pay as much as you pay. When I face a problem, those people sometimes say that "I told you". Those people don't want to share responsibility, but they want the same benefit.

Q: How did you manage the different idea?

A: I take a majority of vote from the villagers meeting. Some leader doesn't have benefit from the weir, so he/she ask someone to join the meeting. I always put a leader as a committee. Nowadays village headman is a leader for water management. In dry season, there is no water and many people come to me. I try to explain and compromise with them and they listen to me. I try to tell them to use water effectively as much as possible since our water is limited.

Q: What do you think about the limited government budget problem?

A: The government budget is not money in my pocket. I propose a project, but I don't know when I can get my project. Our local administration office is small, and they have a limited budget which has to share to all villages. So we will do little by little. Budget is a problem.

Q: If there is sufficient budget, this weir will not get bad?

A: Yes. With leader and villagers, they help to take care of the project, for example, we don't

want an overloaded truck pass the weir. The local administration office also helps us on this. We monitor the truck on day time, but they sometime come at night. This is not only this village, but also others do. It's not a bridge. It is a weir. It's very difficult to get a project. We need to take care of it. When first project was introduced, villagers were worried about flooding on their rice farms, and they would lose their land. I explained them that it was not only a weir, but also road around this area to transport the rice and other products. The road level is higher than your farm and there was a gate to prevent from flood. Then the project was accepted by locals. There are many stories.

Q: Who operate the gate?
A: There are some people who were assigned to operate the gate. But the pulley was stolen!! This is the beginning. Now we operate only two gates. No one can keep watching the pulley for 24 hours.

Q: Before the pulley was stolen, where was it kept?
A: It was kept at village leader house, but later he said that this is public use, let put it at the weir. No one wanted to take it. And it was stolen. There is nothing to say.

Q: Do villagers have sense of ownership?
A: I think they do. Villagers sometimes told me what needs to be fixed because they have benefit from this weir.

Interview with Mr.Pornpipat Primpleechai: WTK-LAO01

Q: Why the local administration office doesn't accept this project from the Department of Water Resources?

A: because when the project was constructed, the local administration office didn't get involve in design the project. The Department of Water Resources designed this project. After finish designing, I don't know whether it was because of construction problem or local area problem. The local administration office didn't know anything about this. After the construction was completed, there was a transferring project to the local administration office. The local administration office didn't know anything in survey and design for this transferred project. After project construction completed, it was transferred to us. This is a reason. (speaking with unsatisfied feeling)

Q: When was a construction completed?

A: In 2008…we may be informed, but we didn't participate in contractor award or constriction process. At best was to inform. This is the problem related to the department work. The department was doing their work (a project) and when the department finishes their task and they get the benefit, taking care of the project for one year. After that, there was a decentralization policy and transfer the project to the local administration office, and the department sent us an official letter. How we can accept this project. If we accept a project and it has a problem with the project, they said, for example a problem with weir at Ban Wang Moung case, when a weir is broken, they said that it is transferred to the local administration office. The maintenance work would be on the local administration office budget. The local administration office has to take care and repair it. In the local administration office, I am a technician on civil work but not specialist in water resources work. When I went to see a broken project, I could do only calculation on simple maintenance work. After that, the department came in and calculated for six million baht of repair cost. Where the local administration office can get six million baht budget to repair the project?

This project is the same (pointing at the project picture file). The local administration office is requested to construct new operation gate (to operate water for water distribution system) in order to function as the department's policy. We don't have that ability (potential).

Design process, we don't know. Construction control process, we don't know. After

construction completed, locals have never had benefit from this project at all, I can say it.

Q: What about after construction finish and start using a project… (The question haven't finished yet)
A: In that process, we weren't informed whether it was a project operation test or not. We weren't informed at all. At best, we were informed by one official letter said that the department was going to construct one project, so the department inform the local administration office to service or facilitate with the construction. That's it. I guarantee we haven't had construction plan or drawing. And to have the local administration or locals to be committee on construction control, we've never know about it. After the construction finished, money was disbursed, then one year later or how many year later of the department maintenance, it was an official letter regarding decentralization. You decentralize the power, but you don't decentralize the budget. For reparation and maintenance, they've never given to us. Where I can get budget to fix it even the subsidy budget from the central government is for 18 villages to develop lighting and road work. So, when the project is not functioned, you want me to take the project. The local administration office doesn't have policy to accept the project because after we take it, the project will be our burden, our problem, same as the example case that I raised. It's right, you transferred a 10 million baht project, but when there is repair work, you (the department) didn't transfer a budget for repair work.

Q: Is the budget issue come from central policy or…. (The question haven't finished yet)
A: the policy from central government is that the local administration has general bursary (budget) and specific bursary (budget). The specific budget has to spend on a designated purpose, and the general budget is decided by the administrator and board to develop villages. It's not to repair those weirs.

Q: Ok, may I stop the budget issue here. What about the project management in the Wangtake project? Do you have a water user group?
A: No, there is not. It was a group, Chi basin group. It was divided into upper Chi and lower Chi. Leader of upper Chi basin is Mr.Pleam. He is in charge of water management for the whole sub-district, not only this project. But right now, local doesn't know anything about it that who is taking care of or who is managing it. I mean it was constructed and then just left it like that. I don't know if Mr.A (example) was assigned to operate the gate or not. Nothing!

Q: You mean users or beneficiary just keeps using it, but the local administration doesn't know information… (The question was not finished)
A: Not it can't use since the lid was constructed (loud voice!!). Until the budget to fix spillway (drain gate?), not the operate gate. The one that they constructed was water operation gate to agriculture activity which the one I mentioned that it was higher than water level. You have to separate between spillways and operate gate.

Q: Which one that you said that it is malfunction?
A: The operate gate.

Q: Can you operate the spillway gate?
A: They didn't make a gate for spillways. They made culvert to drain water. Now the budget is duplicated. The budget came last year with the pushing from a provincial politician, Mr.Surapol. The original channel (water distribution system) which has been a problem is still a problem. It isn't used. It is graveyard.

Q: What is usage of water from the weir?
A: This weir is sometimes used in agriculture.

Q: How?
A: when it's overflow, farmers use a pump by themselves. For the channel, it's no need to talk. It's not in used. When there is a frog season, some of them stuck in the pipe. Since I came here in 2005, the operate gate hasn't been used.

Q: What cause this problem in your opinion?
A: Design and construction operation, for sure.

Additional answer from another TAO officer: Because the local administration was not the inspector. We don't know how to inspect or control the construction.

A: I don't know whether it was a project function inspection for water distribution when the project construction work was finished.

Q: It's obvious now that water can't go to the distribution system?

A: Ahh..It can't reach the level. This is a pond level (hand expression) and the channel is here higher than the pond level (hand expression). It's impossible. If you wanted to use pump, why you made this. In fact, to make a drain system, this is a gate and this is a channel, (hand expression showing the gate is higher than the channel). When you open the gate, water flows. Farmers can have benefit, separate to individual farm. But this is channel, and this is the gate. Whatever you do, it won't come to this level. If you want water level to come up to this level, water will overflow through the spillway.

Q: It means that there is a mistake over leveling?

A: This is a reason why we didn't accept the transfer. It was from a design work and construction work, I am sure. But we don't know about the cooperation from locals or what….I think it's not about the local cooperation issue because they agreed to construct here. Some places have problem with this, for example, if you make it this high or this low, it will flood over my rice farm. They (locals/ farmers) agree/ allow the construction. I went to ask when it was dredging work, and they agree. I got a budget for 1.4 million baht for dredging work of this weir. I ask for permission regarding land acquisition, they allow doing the dredging. After I got the 1.4 million baht for dredging, Mr.Surapon got the budget for spillway work. This one was not informed to the local administration. We didn't know. It does only for inform that someone will come to improve this project. We have never seen drawing, never been a part of construction control team. But after you finish your construction and taking care of a project about a year, then you transfer to us. In fact, transfer project process is that you should let us participate since the beginning of the project, for example, part of the construction committee. When the project is transferred, budget also should be transferred.

Q: Is it the policy issue?

A: We don't accept the project because of this. You made 20 million baht weir and take care of it for a year or two year, then send official letter to transfer the project to the local administration office. When it's broken, where the local administration find 10 million baht to fix it. Then it has to go back to the department. Why does the department transfer the project to us?

Q: What if the project is in a good condition, the local administration would accept the transfer?

A: Ahhh, It has to trace back that if it's working well, but don't forget that it will be broken

someday for big scale project, because the local administration office has never done big project. Especially for technician like me, simply speaking, miscellaneous technician with no specialize. In maintenance work or design work, I can tell you that a design and cost estimation of 20 million baht weir. Ok, it was nicely calculated. Then after finish it, it works well and transfers to the local administration. First year, second year, third year, fourth year has no problem. But, if there is a problem in the fifth year, such as, it's natural disaster occurs and the project is broken. Then they (the department) claim that the project is already transferred to the local administration since 2007. Now it's 2012, it's up to the local administration to fix it, Where we can get the budget? And, how dare we can take it apart and fix it with no specialty. We have to make an official letter to the department anyway. This is a problem. The local administration office has only technician who graduated technical college, and my boss has bachelor. But no one has knowledge about foundation and structure. We can do a new construction project, but for repair work…ok, you give me a standard drawing, ok we understand because we have a technical skill. But in repair construction, it just let me go and take it apart, who can be responsible whether it may be collapsed. For example, the transferred 20 million baht project need 6 million baht to fix, we need to ask permission from the local admission board to fix it. My section has 7 million baht for one year budget. If I spend 6 million to fix this weir, then what about the others. You must not forget that you must transfer the repair work budget as well.

Q: This is probably the same as almost every local administration office.
A: Everywhere (very loud voice) in this district. When I met other technician, we have this discussion. Every civil works come to us, but we are not specialist. They have master in water resources, PhD in water resources, PhD in structure. We don't have license to do public work design, and if we want we have to hire and pay anyway. When we want that person to be an inspection committee member, he/she doesn't want to com.

Q: Besides the construction work, is there any problem related to a project management?
A: Frankly speaking, my office doesn't have project management on this weir. Everybody knows after construction completed that this is a weir, but there is no designation for responsible person. Making spillway is to prevent the weir broken. It's not like the central plain which they have a pumping station. A project like electrical pumping has concrete structure of their committee, and management system. Users request to committee, then the committee operates water pump, and the users pay for fee. That is good project management.

But we don't have it here. We have more than 10 wires, dams and reservoirs with spillway. When water overflow spillway, we just throw it away. What locals want to use water in dry season, it's no water. Ok, this project has distributed channel which is a good plan. It's reservoir, spillway and gate. If the management is good, when member want water, they can get a key and operate a gate and operate water to the channel, is it right? Member who wants water can take water to their farm. That is good water management. Ok, the project has good plan, but you make distributed channel higher than operate gate. Taking it is the same. When you come for project assessment, how I can report the result when water doesn't flow to the channel. My sub-district is the leader of the basin only, but for a good the weir project management, we don't have. Except, there is private usage by pumping water to their farm. But it's not in form of user group or water fee collecting. It's 100% personal use.

Q: Do you know a project background?

A: In my opinion, first it is a push from locals and a politician in this area. For example, if I want a water resources project, I will send a letter to the district administration office that locals need water, and they need a weir or channel. Then, after the letter was sent, it was a follow up by the politician, chief district, or other as sequences. Mostly it is the Royal Irrigation Department that sends officer to survey then design and allocate budget for construction. It's not related to the local administration office. We are just sending request from the beginning only. It's like villager request, the local administration send a request to the department. The department sees the letter, then send officer to preliminary survey then design. After that it was contractor award and construction. That's all.

Q: What is villager's opinion after they have a project?

A: when first having a project, everyone is happy. They think that "Oh I can use this water for sure". Everyone is happy. The village where this weir is located is also the same when they see the department come to make 10-20 million baht project. But who can make a highest advantage is what you need to think about. Mostly, it's private sector set up the pump and take water for vegetable or rice farm. But if we want a good management as the government policy (operate gate, distribution system) same as the central plain, but my area is not a flat area. My area is hilly.

Q: If the structure functions well, do you think it will have a project management system?

A: If it functions well, it will certainly have a project management because it will have gate

operation system or request to open-close the gate. Simply like a road to our house, if it's convenient well, somebody will use it. But if it's not convenient, no one use it. It water flows well, it will be water user group establishment. If someone wants to use water, he/she come to ask to open the gate and pay for fee. This is ok. If it's work, it will have management. But it's not working now.

Q: From the problems that you mentioned, what can be solution?

A: First, the local administration office should be involved in a process of a project survey, design, awarding contractor and construction control. You should inform the local administration office how you design, for example, intake structure elevation, how far water can go. The local administration office should be informed these subjects. Second is involvement in project quality control (construction monitoring). Ok, you can do it, but you have to have function testing. Third is budget. Even though you transfer a project to us, but you have to look after us. For example, if a project has problem, the local administration office can contact this person who is in charge. It's not like after transfer the project, the project is up to whatever my office wants to do. If you have an annual monitoring system, you can send your officer to monitor a project whether the project is well function or locals have benefit from the project or not. And if a project has to be fixed, it must have a budget for repairing. We can take care of the project. But after you transfer a project, you throw it to us and you have no responsibility at all. You are out of trouble. We will have a problem anyway. Those are solutions. It needs follow up. It is not just asking me that "Is it working only". The maintenance work needs to follow up. These are solutions. For this project, we don't accept it because you made problem, but you have never come to see it (loud voice). One day you want to transfer it, it's impossible.

Q: What could be obstacles to your proposed solutions?

A: Obstacles…It' all about budget that will support sufficient workers. My problem is lack of officer. Officer, budget..But for clearing the construction area, we can do it. The department has enough workers or not. But the knowledge and skill will not be a problem (for the department). The officer who is in charge of follow up a project and maintenance budget are problems that the department doesn't work on it. If the department appointed an officer in charge, for example, this person takes care of these five projects and come to monitor a project every year, once a year. This is good. Once a year is ok, but this is like throw it too us and never come to see. We also don't know what to do.

Q: You said that when first project comes, locals are happy with it. How long does it take for locals to drop or lose their happy feeling?
A: When it is not use/ no benefit, about a year it will get quiet. It's same everywhere like the one close to his house (pointed to another worker). When project came, locals expected that they will have water to use. After construction and locals can't use it, that feeling is disappeared with in a year.

Q: What do you mean by "locals can't use/ benefit from the project"?
A: I meant after construction finished, it was too far to use as a water storage for water supply (plumbing), no electricity. But I understand why it located in far area because the water resources project needs water from nature and flows into a project. If we make it close to the village, it will flood over the village. And no electricity line connects to the project. If you want to have a pumping station, it needs engine or electricity. Especially, the project which close to this guy house, people who live close to project can't benefit from the project, but another village because the water over flows spillway and goes through channel to the village downstream.

Q: Even the central government comes to provide or develop water resource, but if it's too far from village, is it left like what it is? You will not try to find the way to take a water to use?
A: In many places, the central government provides raw water and locals think about it. Like in our case, we did survey and design for the water plumbing system from mountain with total cost 6 million baht. We proposed it, but it was quiet. We send the project through channel, but it was quiet. Locals have idea, but the budget is constraint. The same issue whenever we said, it is a limited budget. We have water storage but not water distribution system. When you design and construct of course there is a operate gate, but after 5 years or 10 years you have never come to see it whether it can operate or not. The gate can't operate due to rust, and gate is broken. There is no follow up like I mentioned before. But if you come to see and check it every year like is it leaking, can it be operated. My office has only 2 technicians. You want me to check the project that you transfer to me, do I have time for doing this. Do I have sufficient knowledge and capability for doing this? Where can I get budget when the project becomes failure? Worker and budget are obstacles. After you finish construction, you should set a maintenance budget. The gate without operation for a year or two year will be malfunctioned (can't open), and when it can't open the locals will leave it. That's the local's thought.

Q: Why do they think like that? Why they think that if it can't open then just leave it like that? Why didn't' they try to fix or maintain it?

A: It's out of their capability for sure (loud voice). The basic knowledge like put lubricant on the gate, they certainly do it. But if it's more than at best they can do, they will try by using force. Sometime they try until it's broken. Or in some case they hit the gate with a hammer. For locals, you don't have to mention it for maintenance a project, it is not in their mind. It has to out of their hand, and then they leave it. If they want water, it's possibility that they will dig the weir. That is the local's stubbornness. When it becomes broken, then leave it. And the department doesn't come to see it and leave it also.

Interview with Mr.Pleam: WTK-LV01

Q: What is the current situation of this project?

A: This project was constructed on the hill. Water doesn't flow. Water doesn't get in the canal. The point is that it can't raise the water level up because it will affect some people land. If we block water to higher level, water can go to the canal. It may not have a survey for the construction. I am not sure because that time I was in abroad. I am not sure where the source of budget, but it certainly is no function. It's like making a canal through a hill.

Q: I went to talk with the technician in the local administration office, and he complained about the limited budget, project condition and limited capacity of the technician.

A: It's difficult to work with him. They are not serious in water problems. When the villagers are in trouble, the admin office doesn't prioritize project by the villager's problems but ranking by the easy project to difficult. It means that they choose to do the easy task first. Frankly speaking, they work just day by day without considering on sustainability of the community and advantages for the locals. The project should come from the local's need and must have public hearing. This is a process. If project comes without plan, it's difficult to succeed.

Many water resources projects were not so successful. There are many problems in water resources development. One problem is that the area for water resources development was not preserved. The local administration doesn't set the regulation to preserve water resources as a public area and this requires buffer area for at least 15 meters away from the resources. Since the area is limited, the project advantage is not as it was designed. For example, people invade a public canal because of their selfishness and no one complains. So, the canal is filled up for personal used and eventually it's gone. There are many details for water resources development. Locals know very well about their area. Sometimes in public hearing, leader sale his idea but villager doesn't think carefully and raise their hand to support the leader. There is no time and chance to present their idea. The leader presents the picture on paper in public hearing and it seems good. So. Ok.. Let's have a project.

Q: Why villagers perceive a project in positive way?

A: They didn't think logically. They think positively by the picture they saw and their imagination that it will be good. The villagers didn't have good time to think carefully by themselves, such as, can we move this project to this location instead of this location. No one wants to argue and mostly support by saying "Oh this is good".

Q: That is what the government agency does in order to follow the Office of Prime Minister Regulation on public participation?

A: Most of the time, it's like that. When they come to inform about a project, it may have some villagers who benefit from the project and try to convince others to support the project. It is fine if there is benefit for real. But it doesn't and becomes a problem which resulting on waste of budget. Sometimes, the local geography has been changed.

Q: How it was changed?

A: From invading public place to personal use. In the past, it was possible to make retardation pond to keep water for dry season. Some people around the pond may lose some land but there is water for dry season and rain season. But sometimes someone doesn't care about this.

Q: Regarding the Wang Ka Ta weir project, was it the problem from the project start?

A: I haven't been to the project. It was constructed by the office of accelerated rural development in that time, may be. Probably it was before the local administration office was established.

Q: Because the local administration office said that when the project was constructed, they were not informed anything. But when the decentralization law is used, the project is transferred to them

A: In fact, the project came long before the local administration office was established. It was constructed in that way on the hill. This technician doesn't know anything about the project. I think the budget came through provincial politician channel or the provincial administration office channel. The local administration office didn't know much about the budget channel. The transferring is a legal process. They found the project was already malfunctioning and it has to be transferred by law. But this project is in their responsibility area. If the project can benefit villagers, the office can develop it, but has to be based on the opinion among the administration board. If the project has potential to benefit locals, the local administration office has to initiate the project and continue working. I think the project must locate on the high hill, so they didn't want to pick it up to develop again.

Sometimes for the small pond project, it's supposed to make a pond at this location, but the budget hasn't arrived yet. So, they make a rice farm on this location, but when the budget

came there is no place to make a pond. They decided to make a pond on the high hill where no water to store. This occurs many times. For example, this district received budget for 100 ponds, the local has to find places to make 100 ponds. This is problem regarding to water resources development.

Q: What are local villager opinions about the water resources project in this area?

A: In fact, everyone needs water. Living in the sloping area, no one doesn't need no water. Sometime in the past, there was conflict in this area. When a reservoir was made, there was flooding on someone land and they complained to the district administration office. When someone complained, it has negative image to the project. Number of people who complained was much less than who benefited from the project. The complainers asked for compensating money but they didn't have any paper to claim on their rights over those land. Instead of making high dam to preserve water in dry season, the dam high had to be decreased. But right after the project finished, those complainers were the one who benefited from project a lot because they were living just next to water. Land price was also increased. It is like this!! No one wants to sale their land where close to river. They can do many activities since they live close to water. People who live at the high hill area are jealous of those who close to water. Living close to water has many ways to survive. It can do everything all year round. But those who live on the hill and hill slope area have to rely on nature. This is what I sometimes don't understand. Water resources development needs a discussion among people. Sometimes people don't understand how important water is. Another issue is that even though water is available, but it may not be used. Nowadays, people way of thinking has changed into more careless. They used more pesticide and it goes to river. Normally we should have 15-20 m. buffer zone growing some plants on the bank. It's no need to do dredging. Let it grow naturally. Look, let me ask that when we do dredging, where you put the soil from dredging? Just right on the bank and after rain, it will be washed and fall back in the river again.

Now when there is a dredging project, the local administration is looking for contractor because they want to use money. They don't think in sustainable way, spend less money but preserve more water. This is important issue. This money goes through politic system. Politicians are controlling budget, so what the local people can do? When the project was approved, it is already assigned that who will survey or construct this project in order to have more profit.

Now there are many dredging works, because the politicians own backhoes. If there is no dredging work, those politicians will be bankrupted. But, how we can stop them!! The

construction plan came from the department. When locals see project, they said “Oh, this is good. I am happy for this”. But they don’t know impacts from this kind of project. They think the project is good, but a year or two year after, the canal become shallow or blocked by grasses or soil.

Q: What can we do with this problem?

A: Locals need to talk and use their local wisdom. Now they don’t talk such as conflicts in dam project. This is because they don’t talk since the beginning!! If it was a talk and locals understand, it will be ok. We need to understand!! There is no one to inspire to locals about impacts in future that affect them. We (locals) are sitting here not those who come for dredging. The contractor just comes to work and go, but we are here. We are the owner of this place. We have to eat..we have to use..we have to take care it. How we do to make it stay with us for long time..not to make it change. They should think like this. It has to be changed.

Q: If there is a talk since the beginning, everything can be understood?

A: Yes, it can. But most of the time, for example, there is 300 million bahts dredging project, politician ask there subordinate that where is available without asking local need or public hearing. Public hearing can do later. This is a problem. This is very certain. I asked every province, every district, and every sub-district. It’s all same. This is how project develops.

Regarding public hearing, when they come to ask about the project and someone reject the project, it seems like that person is pointed to his face and said that “money is coming but you block it”. But let ask whether the money (budget) comes, is it really benefit to locals? Is it sustainable? Is it worth of budget? Locals don’t realize these. Like road project, it has been doing again and again and again. Locals don’t know this is tax which comes from every one. They thought that “it’s ok.. it’s not my money..it’s government money” Death!!! This is death. This is way of thinking and nothing else.

Q: About water resources project, are locals happy when they get a project?

A: If a project is constructed in the right place, they are happy and it’s working today. And project that is constructed in the wrong place is project that was not refinement. It’s not screen…not consulting ….no public hearing…no real public participation. People in upstream, mid-stream and downstream need to talk. It’s not like you are upstream and you are doing well but the impact affect the downstream area. It has to be flexible and have mutual benefit. Stakeholder is important.

Q: How people realize about this issue?

A: They don't realize this. Nowadays, social value has been changed. Children now don't know how to think; even teacher doesn't know how to raise awareness on loving hometown and taking care of environment. It is changed. Even teacher doesn't understand, how they can teach their student. Everything is connected. Water relates to way of life.

Q: Do you think what will happen with the Wang Ta Ke project?

A: It will be gone…probably locals will cover the canal and make it as their private land. You can go see it. Except there is new survey and design again to make water flow into the canal.

Q: But the local administration office claimed that they don't have money?

A: In my opinion, this project is a dream project. It couldn't find the place to make a project so just put it here and local can't use it.

Interview with Mr.Prasit Youngnontad; WTK-LV02

Q: what is problem related to the Wang Ta Ke weir project?
A: At the beginning, the problem was that the weir couldn't drain water efficiently. Water couldn't drain out from one spillway and it overflowed to the road until the road was damaged.

Q: Drainage is the small gate?
A: Yes. The original was three small spillways. But after the road was damaged, the district constructed the box culvert and next year the box culvert was damaged by water erosion. Then the district made the new box culvert again. Later there was a budget for this spillway (constructed by the department of water resources). The previous block culvert didn't help to protect the road. The road was broken again because the water was too strong. But it didn't last long, probably dried up within 2 days. Water came so quick.

Wife: The village chief asked for the canal connected from this weir by pumping water into the canal. It was in Mr.Tum period.

A: In the Mr.Tum time, he thought that the area where far from weir didn't get water, so he went to ask for the canal. After we had the canal, villagers came to pump water for their rice farm. But it was not for long because it was far. I told them that we should go to ask Chaing Laung for installing a pump, so it will benefit many farmers. The canal is quit long distance.

Q: The canal is about 3 km, is it all concrete canal?
A: It's all made from concrete.

Wife: If we actually pump the water to canal, the storage in this weir may not sufficient again, isn't it? This weir storage is small, isn't it? It can't store a lot of water

A: It's like this. The canal is constructed in the high place, so it has to dig very deep in the ground. I saw it was about the backhoe height. At the beginning I told them to make a canal on this line, through the rice field. They could make it as underground pipe or concrete canal through the rice field. Because it wouldn't use lot of area. But the village chief didn't agree because he wanted to take water to his farm. Simply speaking he made a canal for his farm.

That's why water can't go.

Wife: Along the canal line is his family members.

A: If we dig it 0.50 meter lower, water can go to all rice fields. But taking water to that hill is not working. Water from this weir is few, and it can't push water to go far. If we keep water high, it will damage the road.

Q: When was the slope spillway constructed?
A: Last year (2011). There is three times construction on this weir to prevent road from being damaged. Water released from spillway goes directly to the small creak down there.

Q: Was it the local's need for the project?
A: The village chief came to ask signature when he told that he will get the canal. So everybody signed. But we didn't know anything about the plan or where the canal line going.

Wife: I understood when he said it. Distribution canal required pump to send water. If we did this canal without pump, water couldn't go. It had to have pump from a government agency permanently installing. The village chief just made the canal to his farm, and no one was against him.

A: That time I didn't know if it benefited or not. They just constructed it.

Q: So the village chief told everyone that it was for a canal construction but didn't mention the direction to his farm?
A: Generally, everyone wanted to get water. But we didn't know what distribution canal was. Locals didn't understand the definition of distribution canal, which had to pump water into the canal.

Q: That is what the contractor said?
A: They said that this is distribution canal, but local misunderstood that it could work by gravity. Locals didn't understand this. This canal really needs pump otherwise water can't get in. Even though the road is flooded, water doesn't even get in the canal. It's too high (laughing).

Q: Did they say clearly at the beginning that this canal needed a pump?
A: I don’t know. Even the village chief didn’t know about this project that what would happen after we had the project.

Q: Everyone expect benefit from this canal?
A: It would be big benefit from this canal if water was pumped into the canal and send to farms.

Q: How long that it functioned well?
A: Someone came to pump water for 2 years, and it stopped. Pumping from the weir into the canal for all day couldn’t take water to the rice farm. It’s small pump.

Q: Now it’s no use?
A: Not at all. We depend on rain only. When rain falls and rain water get into canal, then we can use that water.

Q: But now the canal becomes full of soil?
A: Oh!!! it’s all broken. It can’t be use.

Q: When was it start, those broken canals?
A: It’s gradually broken every year. No one takes care of this for many years, just left it.

Q: Was there instruction on the canal when the construction or after it was completed?
A: Not at all. I didn’t know anything. They came and just did the construction right away. Villagers didn’t know anything. It seemed that it was a secret.

Q: How long for the construction?
A: About 3 months.

Q: Was the weir and the canal constructed in the same time?
A: No. The weir was constructed long ago before the canal. The weir was constructed in the period of PM. Kugrid, hiring local as a labor. Other construction came to add later. It was also dredging work.

Q: Why nobody take care of the canal since the beginning?

A: I proposed the local administration office for some maintenance and asking to the department of water resources. The department came to see the project; also they came the early of this month. When the department came to see the spillway, I told them to increase storage level about a meter higher in order to store more water. If the storage level is increased, the out season rice field will be fine.

Q: If there is a pumping station and canal is in a good condition, do you think villagers can take care of it?

Wife: I think it won't be. It has to be discussion with the village chief. Let see what the village chief say, we will have agreement. It needs to have a water user group.

A: Water users themselves have to get together and make a group.

Q: if the project is in a good condition, you think locals will take care of this canal?

A: Yes. Water is what everyone needs. If water can go to my farm, I will do everything. Everyone will be very happy. No one cares about the project because there is nothing to be interested. It's no water.

Q: What to do next about this project?

A: We think that we want to keep water to use in dry season. When water comes a lot, it's difficult to drain (prevent from flooding), so they made this spillway. But this type of spillway can't keep a lot of water.

Q: Did you have discussion with the department before they constructed this spillway?

A: No one knows anything even the village chief. When the budget was approved, they came with backhoes and trucks full of rocks and sands. I went to ask the village chief that where did you get the budget to make the spillway and he said "Oh! I didn't know about this". This spillway is high standard. It's never been damaged. The main concern is to protect the road (close to the weir) from flooding because we have to fix it every year in rain season. If we dredge the reservoir and make a bank around the reservoir, it will cost about 35 million bahts and it can store a lot of water. I propose this idea to the local administration office many times. This project will benefit everyone in this area and it can benefit to the farm land until the

bridge. If we fix this current project, we need increase storage level about 1 meter, then water will flow in the canal.

Interview with Mr.Prasit Kannok: WTK-LV03

Q: Have you been living here since the project was constructed?

A: Woo..I was her when they come to survey at the first day. That time I thought to take the canal through this way (pointed to his farm land). But the farm on south side said that it couldn't go, he didn't cooperate. I was thinking to make it this way. He said he didn't want to lose his land.

Q: Do you know who constructed it?

A: Was it the Royal Irrigation Department? It was about 3.6 million baht project, I am not sure.

Q: Did you participate in the project when it started? Did you request for the project?

A: I was a committee which just watched the project only. That time was Mr.Thongrit who was the village chief. It's about 1997. I think the project sign is somewhere at the end of this canal.

Q: Did you use this project after the construction completed?

A: It was used in the first year that means water has to flow over that road, main road connected to the highway, and then we can use it. Water level has to reach one level.

Q: That operate gate?

A: First year only, the second year can't not be used because the road and the weir were damaged (tarred apart), and soils fell down blocking it.

Q: No repairing?

A: No. they said it's no benefit, so no one fixed it.

Q: Who are "they"?

A: It's water user, the villagers. No one take care of it…how is it?? If one wants to use water from this canal, it has to use 2 pumps for 3 hours. But still it's not enough for rice farm. I think if we want to pump like that, the canal should be higher than the farm (ground) level, isn't it? I saw somewhere else that the farm level is lower than the canal level. When someone wants water, they go to stop water and water can go to farm easily. But in here, farm is higher

than canal, so how can I take water to my farm. I have to use one pump there and one here. It's costly. It has to be two pumps, so that's why no one uses this canal. If the canal is higher than farm level, it will be very benefit. But it can't be like that because our ground level is not even. In other places, I saw they make a road and canal is parallel to the road. When anyone wants to use water, they just separate water to their land. If we want to fix this canal, are they going to do it for us? I want a canal on the same line by making a canal with small pond here (pointed to area closed to his farm).

Q: Is there agreement among water users?
A: They said that if we need a canal this one must be removed (dredging), make it lower and preserve water around this area. Probably push it down 1.5 -2 meters, water will come.

Q: If we construct a new canal, will someone take care of it?
A: Umm, we need to have a group (low voice). But the problem is there is no pond around here.

Q: I mean if we make a nice canal or let say it's pipe line.
A: Oh, pipeline is good. But the problem is that if water comes, it will go into there (another natural stream at the end of canal). There is no pond to preserve water, or a gate to control water.

Q: You mean you don't want to let water go with no use?
A: Yes. I plan that if we make a gate here, we can control water whether to keep or to let it go to stream. Then, water can be managed to use in farm land.

Q: If the government do as what you suggested, will it be large benefit?
A: It can be used for many rais. It can use this water up to that house closed to the school. It's probably more than 1,000 rai benefit. From here and down there, it can use water. If we have water, we can do farming all year long because there is water all time.

Q: Is water in reservoir all year round?
A: Yes, it is. Water comes from those mountains. They throw water away freely without any benefit instead of make use of water. I feel regret for water that was released with no use. I try to find the way to preserve water.

Q: Have you get together and discuss about this issue?
A: I have discussed that if we can change the canal level for 2.0 meters lower than this, water will come. But now I do what I can do like you see.

Q: Did you discuss with the local administration office?
A: Oh, they don't have enough budgets. I already talked to them. This project budget was 30 million bahts, the local administration office budget is less than a million. So I think it has to talk to larger agency. If we fix it in the same way we did, it will have the same result. It gives a little benefit. But if we make it big canal with road parallel to it, it can give more benefit.

Q: Do you regret for 30 million bahts project?
A: I am still regret until today. It's waste of the budget when we can't use the project. It's not worth of it and it can be used only one year.

Q: Why was it used only one year?
A: That year was a lot of water and it get into the canal. It's only one year. But if they want to make water flow into this canal, the farm and road up there will be damaged. We went to see the water and it was really high to make water flow in the canal. They said that "it is distribution canal not drainage canal". Distribution canal is different from drainage canal, right? Distribution canal need to pump water in and send water to farm while drainage canal is just open gate and water will go on the canal. Using distribution canal and pump cost more money because we have to pump two times; pump from reservoir to the canal and pump from the canal to farm. Only way to fix this is to make this canal 2.0 meters lower than now and make a control gate here to control water to the natural stream behind the school.

If it functions well, we will help to take a good care of it. But it doesn't work, who wants to take care of it? I was thinking to make a dam by cooperating with farmers around here to get water in dry season. Hiring back hoe car won't take more than 3 hours to make this dam (laughing) and collect about 5000 baht from these couple people. This guy will be willing to pay because he is looking for water to use in his farm.

Interview with Mr.Thongkam Boontoon: WTK-LV04

Q: Are you benefiting from this weir project?

A: No, I don't use it. Normally, it can be used but the benefit is not throughout. It is like this. At the beginning there was a budget in the PM.Kukrit Pramoj time, it has original weir constructed there. I donated my land for the weir construction in that period. At first, the location was decided at around the village, but later it was relocated to the current location. I thought the benefit was distributed to everyone at the beginning, but it was not. Later, there was more budget coming and the weir was enlarged. Regarding this canal (water distribution system from the Wang Ta Ke weir project), it was in the period of Mr.Wanpet, the village chief. He came to consult with me about to have a canal for pumping station, the distribution not the drainage canal. Distribution canal is to distribute water from pumping water into the canal and send water, while drainage canal is just drain water into the canal and flow by gravity. You must talk about this correctly. But if he made a drainage canal, upstream will have negative impact. The problem is public property. When water flow to somewhere, it's considered a public property, and you can't touch it. It is like in Bangkok, you see it?

But there is some lost now because someone is benighted, changing of village chief, there is water stuck. I want someone to help on this not to have water stuck and not let anyone make something block the water way. Now you see it in dry season, but if you came on the flood season, last year the department of water resources in Khon Kaen office came to see and I ask them to make a road on both sides of the canal.

Q: But I saw street along the canal?

A: No, it's not. First construction was only the canal itself.

Q: the street I saw was not from original?

A: No. this is that when provincial politician heard that the department coming, he came to dig out the canal and drop those soils next to the canal. But it was not a road. I want this reservoir to be a tourist place.

Q: Who made this canal?

A: It was an office of accelerated rural development (before the 2002 government reorganization). There was no the department of water resources in that time.

Q: When the ARD came to do this, did they ask the locals?

A: don't mention that time; even now there is no public hearing on anything. They have never come to ask locals what we want and how we want. One day they came and say that I am contractor. I follow what they told me to do. Normally they need to come to ask us who know well about water level, what situation and how to do it. But, this one they came with the machines. I didn't know anything even the village chief wasn't informed. One day I found that there are many backhoe cars and machines, and then we knew what was going on. The department also asked me whether it was public hearing or not. I said no.

Q: Were you informed after the construction finish about how to use and maintain the project?

A: It may be informed to the village chief, not to locals or people. I don't know much about this issue. Frankly speaking, this project can give a lot of benefit if there is a good management, but now only one family get benefit, the one that live close to the project.

Q: In order to use water, you have to pump water?

A: Now it is personal pump. I once dig the soil to drain water out because it flooded my rice farm. Today my farm can't use about 12 rai, and this is big cost.

Q: Why villagers who have land close to the project or benefit from the project don't get together and do something?

A: Who else, it's only his family (loud voice/ angry). The land that the canal goes through is only his family, more than 1,000 rai. But now some of it was sold. The canal was digging in his sister land for their personal benefit. It's culture that no one wants to argue with village leader. It's no use of talking or arguing with one who has power. And still now this culture exists.

If you want locals to have benefit from this weir, you need to make a road along the canal. Then I will by a PVC pipe to connect with the canal underneath the road as a farm turnout. Now you can even increase storage level up to 1.5 meter, so water level is higher than farm level. When flood season, water will overflow on top of spillway.

Q: But the problem is water doesn't get into the canal?

A: Water doesn't get in the canal because there is no water. If you come on April or May, you can't walk cross the weir (wet crossing). It's big rain in that period and lots of water. But when there is no water, it was scramble for water even today. There is fighting every year.

When there is no water, one block the canal to take water to one's farm without care to others. That's why I lost my benefit, probably more than 10 rai. I want to say that you should listen to the people. Owner of the place knows this place very well and how to do to make everyone happy, no one losing their benefit. For this, the people up there are losing benefit while the people down there are taking advantages. If you follow what I said, it will be ok. I want a road, and it's about 1,200 meters.

Interview Mr.Sawang and Mrs.Buddee Petkaew: WTK-LV05

Q: Do you use water from this weir?

A: I am using water for rice farm, in-season and off-season rice field. In dry season, I pump water up from the weir directly when there is some storage.

Q: Did you use the canal for water distribution?

A: The one that was made by government? No, I don't use it. I use the one that I made it by myself. I dig it from the old box culvert and bring water to my farm. The one that government made, I can't use it.

Q: Why can't it be used?

A: How you can use it. The water can't flow to the canal. The water can't get into the canal many years ago. The canal is higher than the reservoir storage level. Someone wants to pump water from weir to their farm, but they quit because it's too far. It was working in the first year, but the second and third year it getting stuck. Couple families around here can take water from the weir directly, so it's not so many problems. But people who live close to the canal don't have water at all.

Q: Were you here when the project was constructed?

A: Yes, I was here.

Q: Did they inform you what they did?

A: They said they came to dig the canal and they asked me to sign on something. They said that the canal would go through my land, so please sign for agree on the construction on my land.

Q: How do feel when the project is constructed but you can't use it?

A: It's ok for unable to use it because my rice field is there (pointed to the weir direction). I can take some water. For the land that I donated, it's ok as long as other people can also get benefit. It's not big land. If water can go, I wouldn't say anything. It's neighbor convenient. We are neighborhood. I wouldn't obstruct for others improvement. It doesn't matter the project can be used or not, as long as the neighbor may have benefit, please do it.

Q: When you donate your land to make a canal, do you feel that this canal is your property?
A: It belongs to the government. It's government property after I gave it to them.

Q: Why?
A: I already signed to donate this to the government. It's not mine. When I want to take my sugar cane truck cross the canal, I told the village chief that I fill up the canal to make trespass. I told him that I will use a tractor to make a pass on the canal for a truck to move my sugar cane product.
Q: This canal?
A: Yes, this canal (laughing). I can't use a weir as a pass because it's too steep and too small for a truck. I fill up the canal that I donated to the government. The village chief said that it's ok but if somebody complained, I must remove the pass and make it like before. I informed the village chief.

Q: After the project finished, it can be used only one year?
A: yes, only the first year.

Q: Why only the first year? Is it because of a lot of water?
A: When it's lot of water, water can get into the canal. But it was flooding, and this area was in trouble. Then they came to make a box culvert, but the water was drained into my farm. Lot of my farmland was damaged. After that, they come to make spillway. First two times were broken from flooding and this one is the third time. Nowadays, my farmland is less damaged but others are still damaged from flood.

Q: Does it mean that if there is no weir and canal, you will not be in trouble?
A: Yes. Before they make this reservoir, I had difficult time because there was no water. But after this reservoir was made, I am ok. It's no problem in both dry season and rain season. I can pump it. Before this weir, the road was damaged by flood every year. Now it's convenient.

Q: What do you thind If there is improvement or reconstruction of the canal?
A: Oh..up to them. Whatever they want to do because I already gave the land to the government.

---------- Mr.Sawang

Arrival----------

Q: What cause this project malfunction?

A: The intake structure of the canal is higher than the spillway level. And in rainy season, rain washed the soil from the canal side into the canal which makes the canal become shallow. That causes water not to flow. Another reason is that the entrance of distribution canal is higher than water level, so water can't flow. These are important reasons. Even there is overflow on the weir spillway, water still can't get into the canal. If there is water flowing in the canal, it means that it's flooding everywhere. Also the road will be gone. Those are causes.

Q: When the contractor or the department came to construct it, they didn't know about the level differences?

A: Probably they didn't know. They were contractor.

Q: Were you informed when the contractor came to work?

A: No. No one told me. I didn't know about this. I saw when the machines and workers already came to the site.

(mentioned by Mrs.Buddee) ?They asked us to sign on the paper, didn't they?----

Mr.Sawang: No…after they started construction then they asked us to sign the paper. It's like this when the machines and workers arrived, they started surveying and signing the paper. It's not that they came to inform in advance.

Q: No public hearing?

A: No, it was no public hearing. In that time, there is no public hearing.

Mrs.Buddee: Didn't they do public hearing through the village chief?

Mr.Sawang: No. If they did it, we must have known about it.

Q: Did you request any need of the project thorough any agency?

A: No, I have never asked. In previous time, it was emergency project supported by the provincial politician, Mr.Songchai. That one is also no one knows about it. It suddenly came. Someone came to me and said that "they told me to make a canal, and which way that it should go?". I was …Oh! What is this!! When it (a project) came, I don't want to lose it. I want it. That year, the canal was dug over there. But it didn't work because there was no

water level measurement. There was no survey, no nothing. Suddenly they just made it. It was very urgent. When it came, I don't want it to go somewhere else. I pointed the canal line to go through my family farmland.

Q: What is people opinion when the politician said that this is a project for you? Did you reject?

A: That time, I didn't reject because it is difficult to have a project. When it comes, I don't want the project to go to other places. The provincial politician brought it for us, I would take it first. But the village chief didn't know anything about this. The village chief asked me that what they did. Now it has to inform every one, the local administration office, the village chief. In that time, it didn't. I didn't know when the project comes, so when it comes I take it (laughing). Here, this canal is what I said. If water flows by the canal, everything is damaged. Road will be cut. It cost a lot to fix it. Every year, it's two to three times a year. That canal, some part is totally block because soils fall into the canal and close it. In high spot when they dig in very deep to make the canal and those soils from digging fall in and fill up the canal. It becomes stuck. That cause malfunction of the canal. If possible, we have to remake a canal and make it lower to the spill way level.

Q: Is anyone or group taking care of the project?

A: No, there is not.

Q: How is the project being managed?

A: Let it be as it best. There is grass, fish in there, it's is what it is.

Q: If someday it's broken, what will you do?

A: It's gradually broken. They will come to fix it.

Q: Who are they?

A: A contractor. Asking to the local administration office. If they don't have money, then asking to the provincial administration office. And the contractor will come to fix it. The department of water resources came to construct this and the contractor is responsible for this because it's in1 year guarantee period. The department gave the project to locals to take care and suggested to have a group to take care of a project.

Q: What will you do if you want another project?

A: I don't know how to think. There are many projects overlay each other. The canal is here as well as the weir and spillway. Before the spillway was made, this house was flooded and my stuffs were gone with the water. I had to go and pick them from over there (pointed to far away spot). I have experiences many times. When it's heavy rain, I start to worry.

Talking about this weir, I want to have a road around the reservoir. It will look much better. Making like a bank covers the all area. Then we can use clean water. If possible, I want a plumbing system because the old one can't carry the capacity. This weir has larger capacity than that one, it can be used in dry season.

Q: Can you conclude the causes of this problem?

A: Eh…what can I say? When they came to make it, I went to see it and I said water can't go because it's too high. The contractor said that "I follow the drawing"… "the drawing said this, so I do as it said". How can they take water to the high place?

I don't understand the term "water distribution" and they said this is for you to use pump. If you want to use water, you need to install a pump and pump water for use. Wow….who will come to pump!!

Q: After the construction finish, did anyone tell you how to use or maintain the project?

A: I am not sure about this. It may be someone come but in the village. I am here and I may not know it. They may talk to the village chief. I am not sure when the project was constructed; maybe we have to look at the project sign. I have a project sign, here! I keep it here, it's our property. They said the land owner around here needs to take care of it. They just said that simple. It's not my land, whose land that means the land owner must take care of.

Q: Who said that?

A: People who are not benefit from the project.

Q: How beneficiary take care of the project?

A: This project doesn't benefit that much. I pump water for my farm. It's only few families.

Q: How many families are using this weir?

A: Oh, this one…many. After the weir finish, I dug a canal for my farm, and then others came

to connect from my canal.

Q: You didn't say anything when others come to connect from yours?
A: No, I want others to have like what I have. We are farmers, we must love each other. When it's broken, we need to help to work together. "If I want to do this for myself, it's very easy" I told them and they understood.

Q: But the main structure has no one take care of it? Lot of trees are growing.
A: Right.

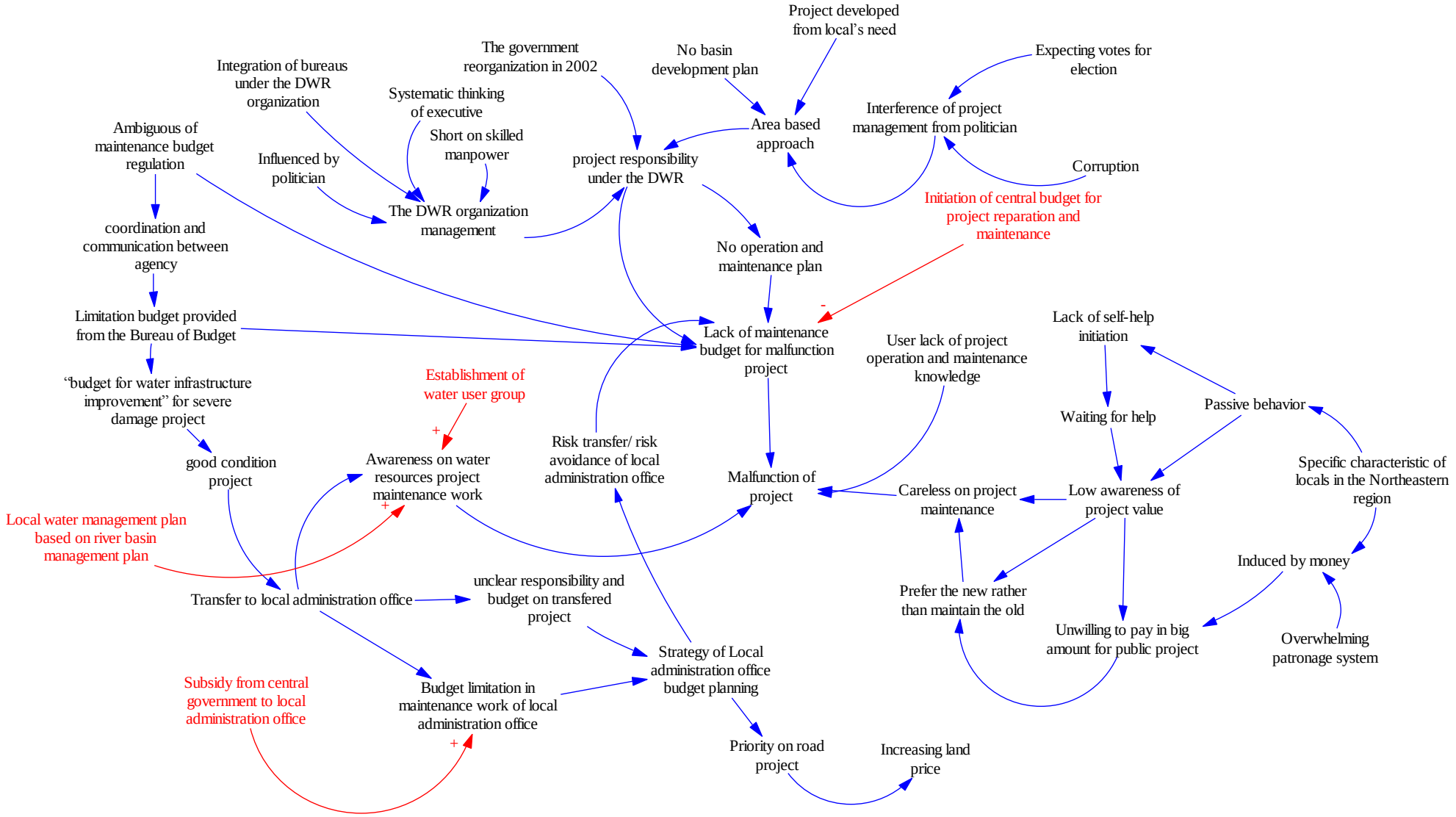
Q: Why? It's water storage.
A: I..I…I think so. I want to cut those trees to make it clean.

Q: Is it possible to get together and clean it up?
A: They don't want to come to do it. They said that "it's not my land" like I said (laughing). I said "Right, it's not your land, but we use this water together". "If there is no water, we will have trouble". Then they said "umm"… "I am leaving"… (Laughing) They keep saying that it's not their property, no benefit. We have different idea. If they think like me, I think it will be good.

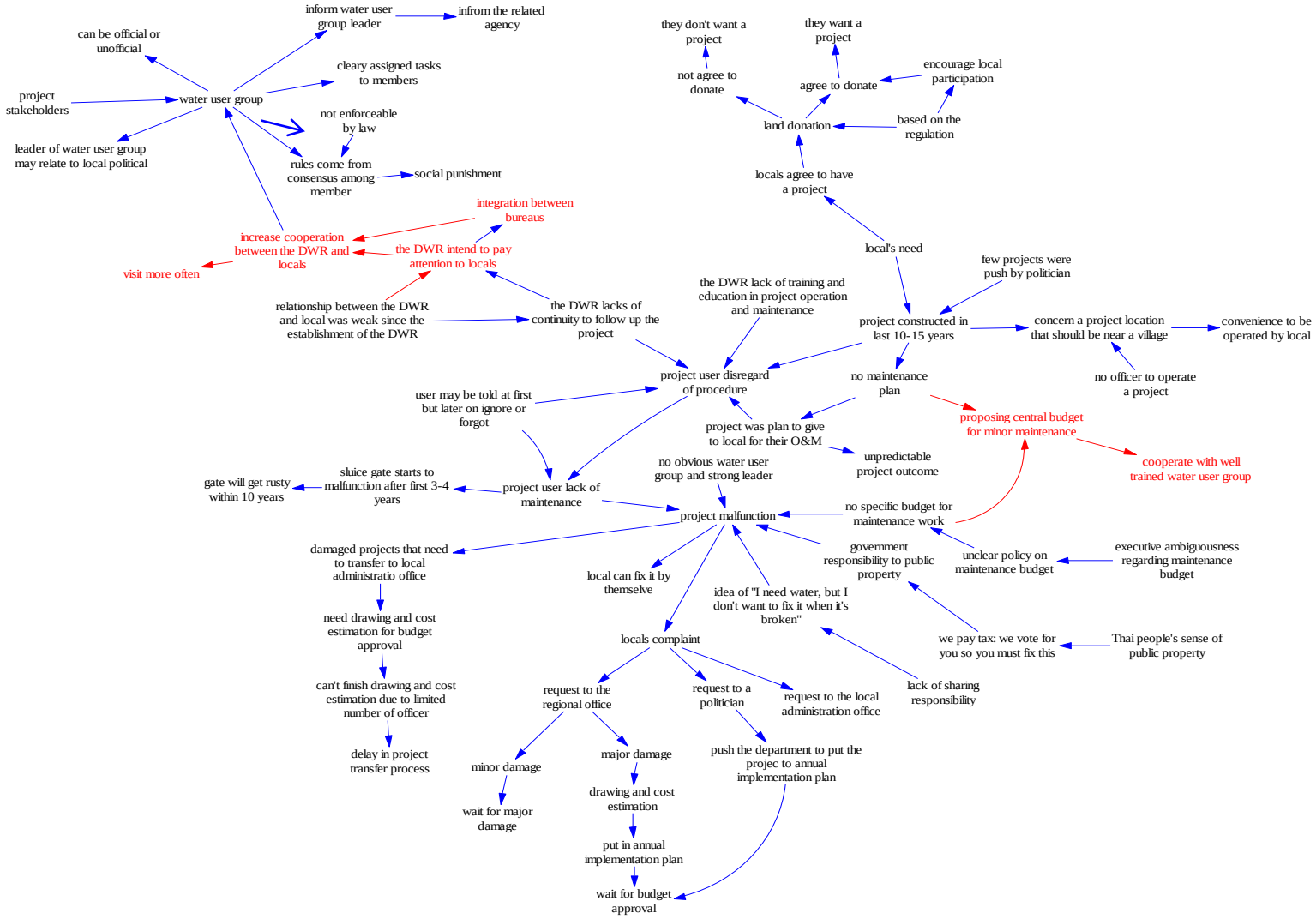
Q: Can we establish water user group?
A: This one needs to talk in public, meeting and need officer to come and introduce. Anyone wants to come and take advantage, they just come. I want them to think as I am thinking, but they don't. If I encourage them too much, they would say this is my personal benefit. It becomes that way. So, I let it go.

Appendix III: Stakeholder mental models influence map

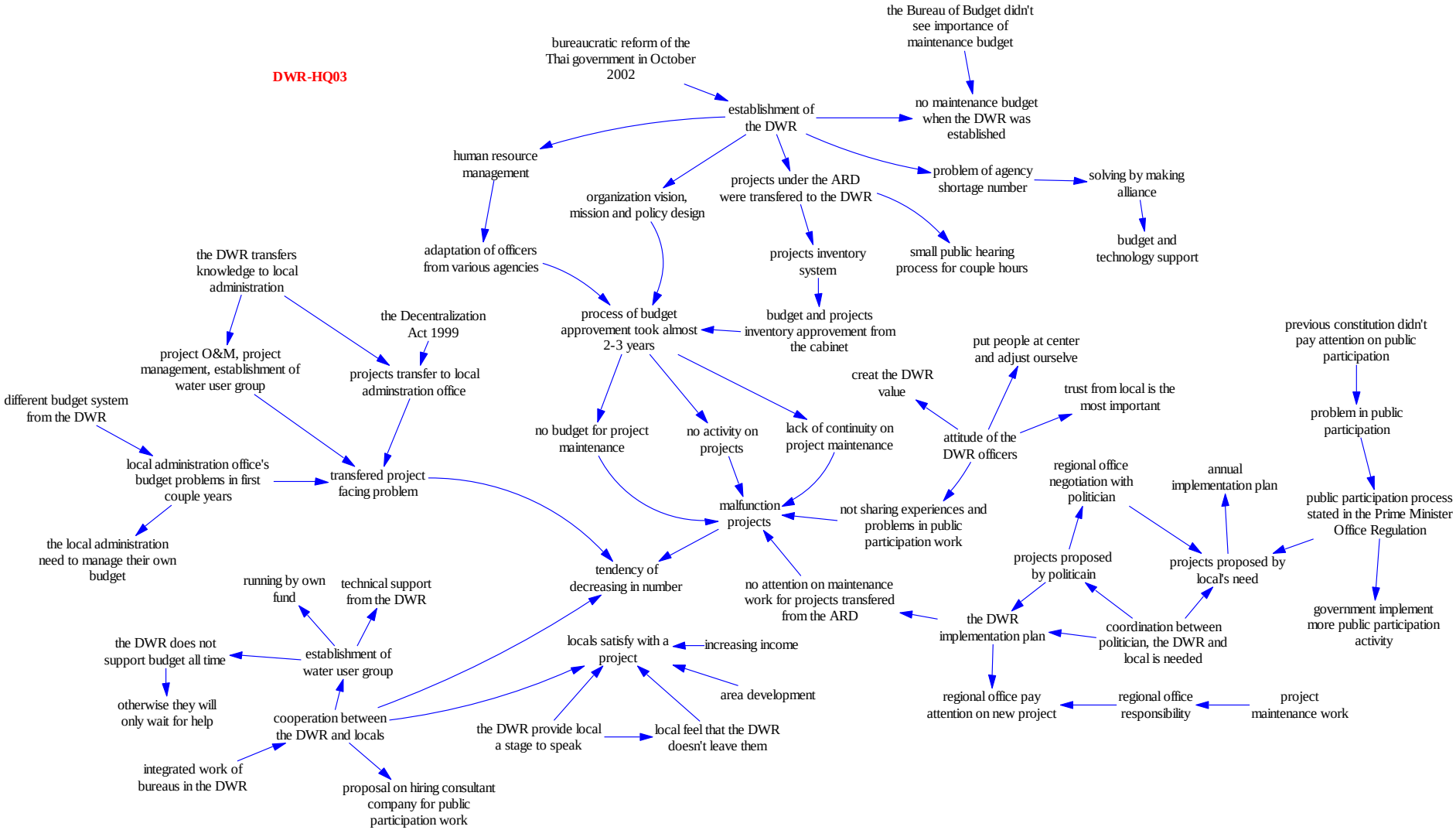
DWR-HQ01 mental models influence map



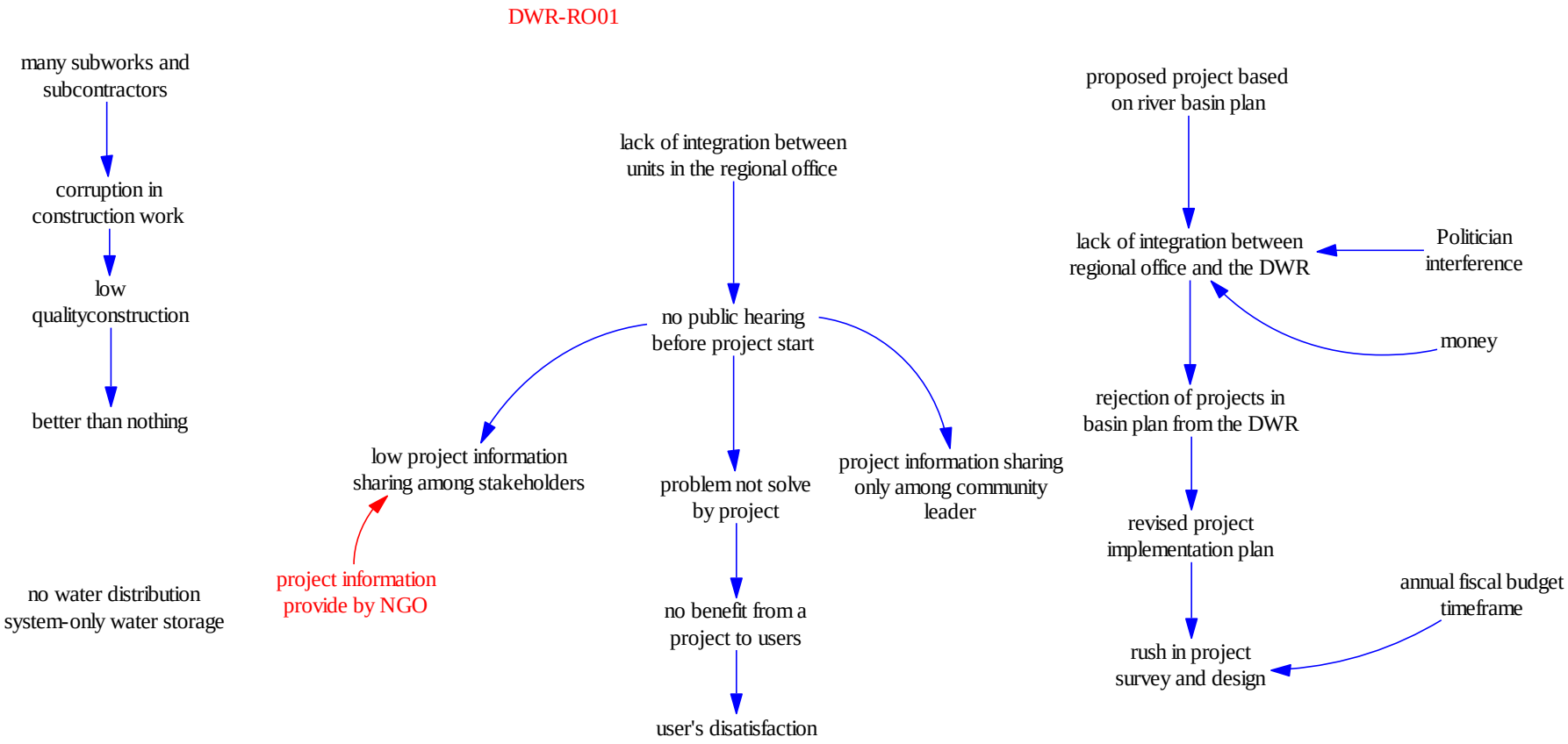
DWR-HQ02 mental model influence map



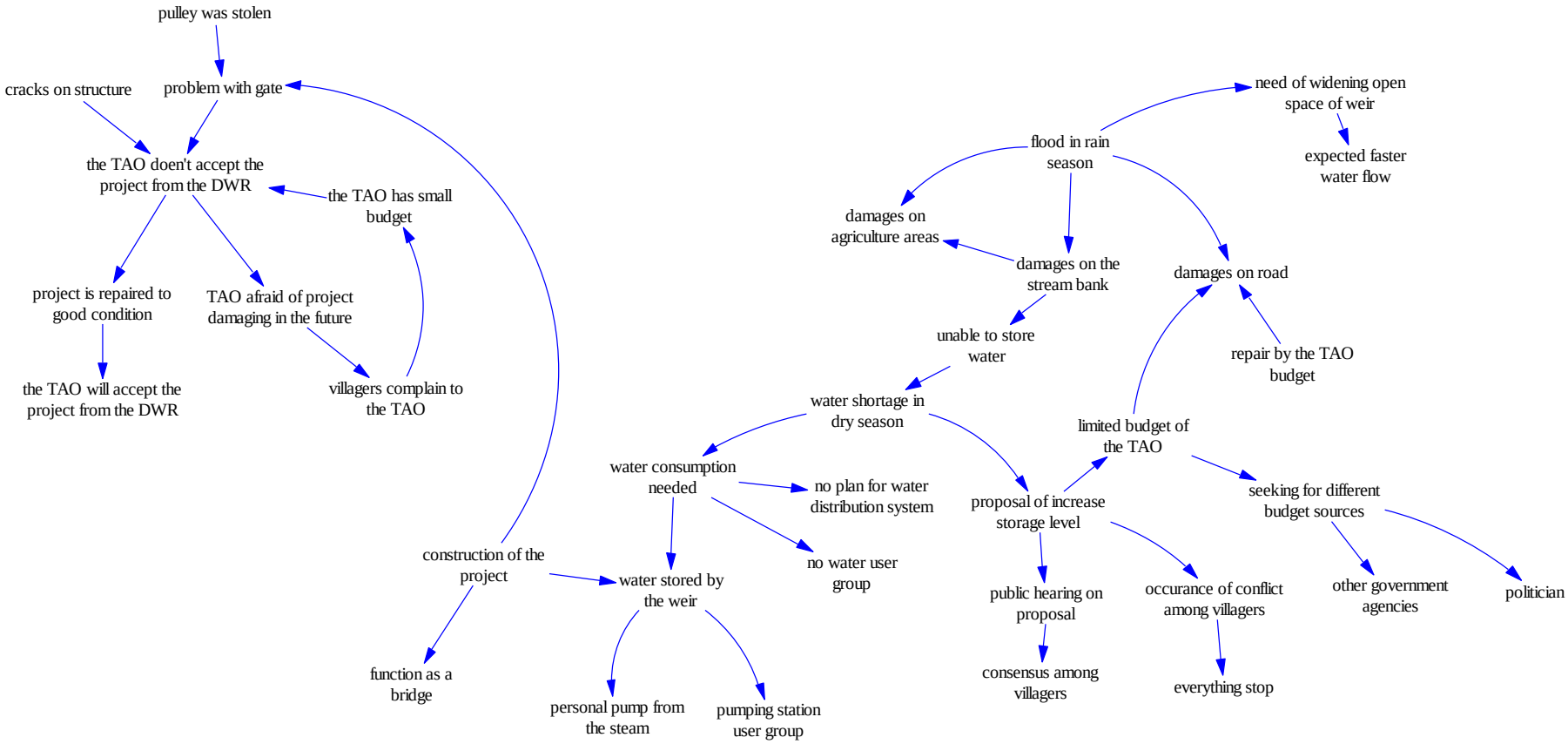
DWR-HQ03 mental models influence map



DWR-RO01 mental models influence map



KY-LAO01 mental models influence map



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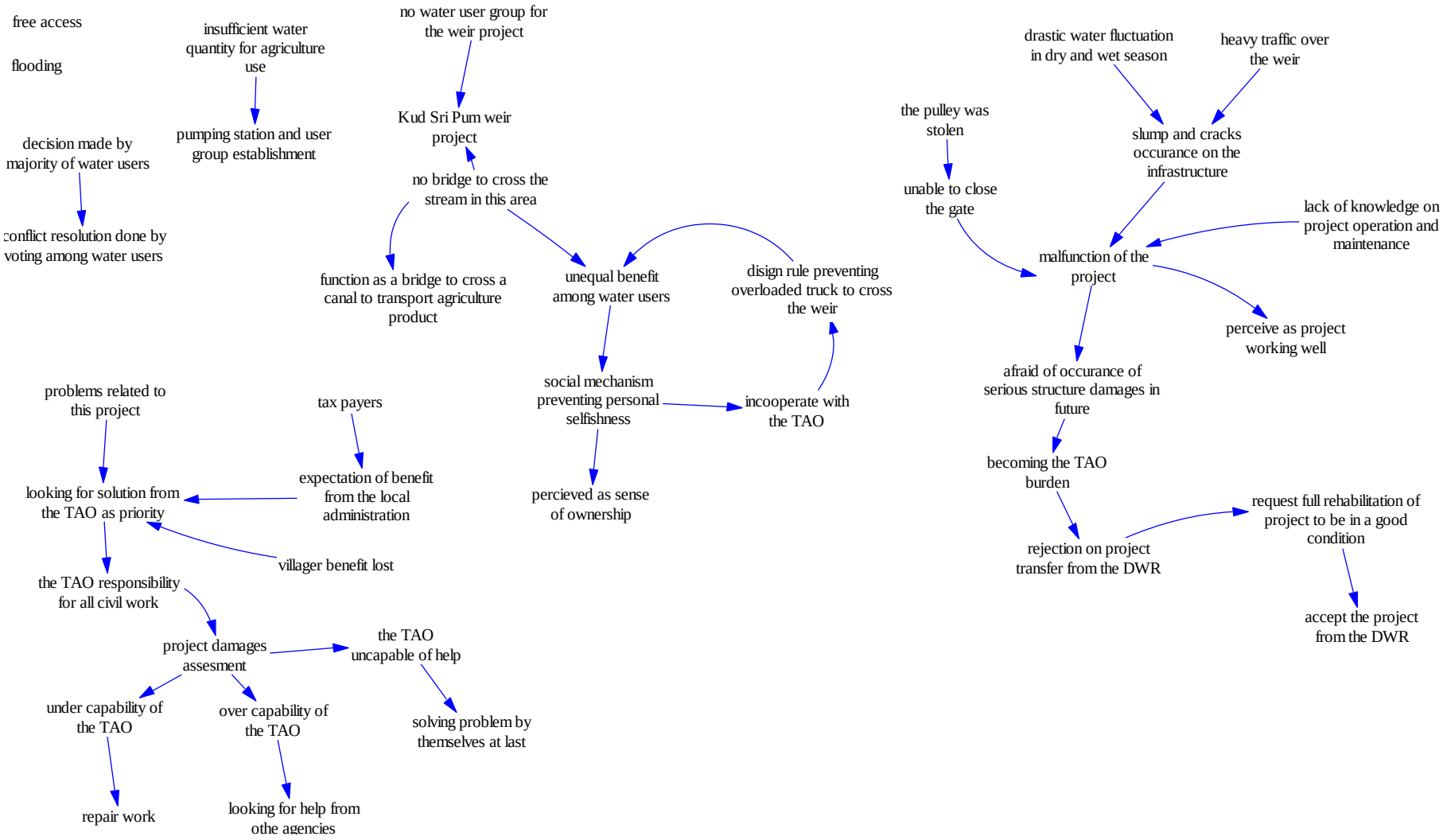

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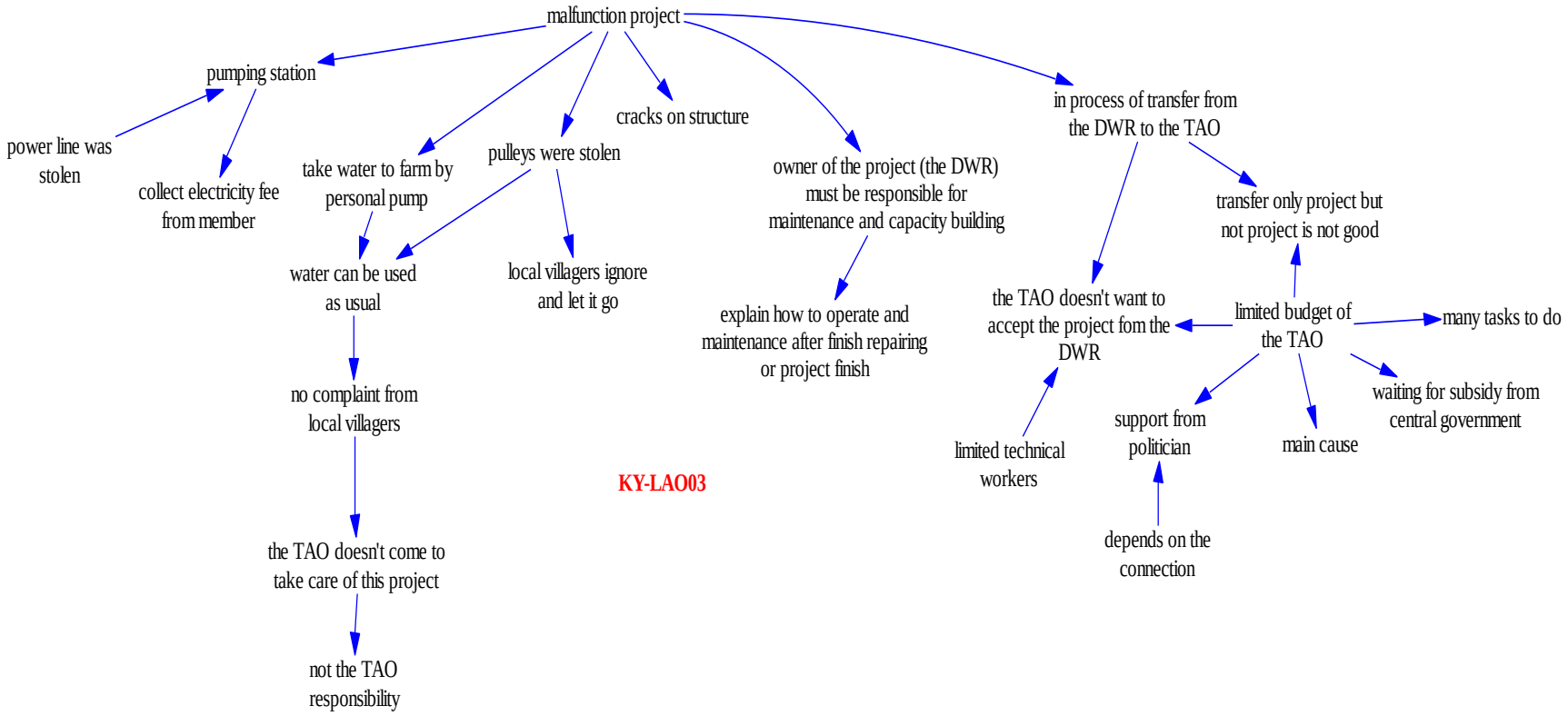
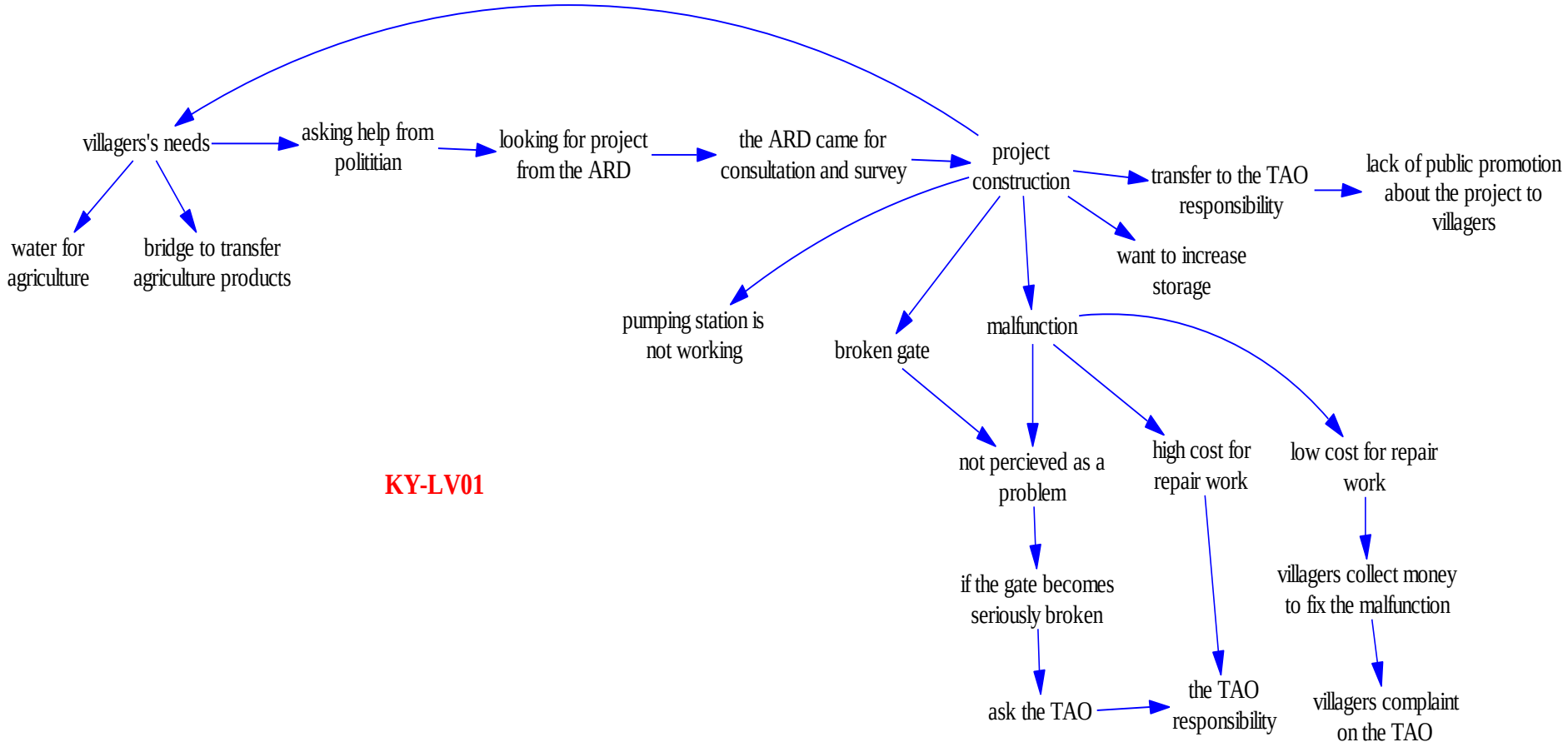


KY-LV01 mental models influence map



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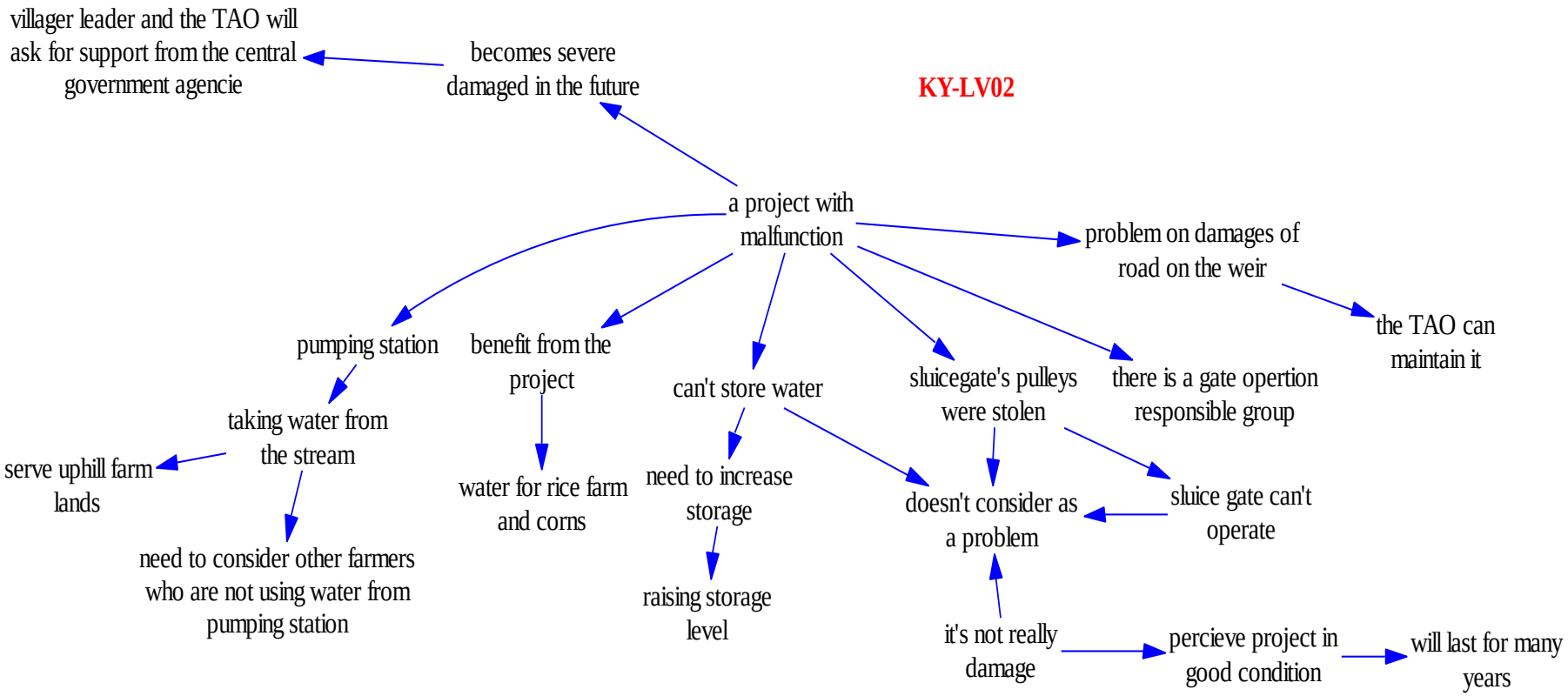

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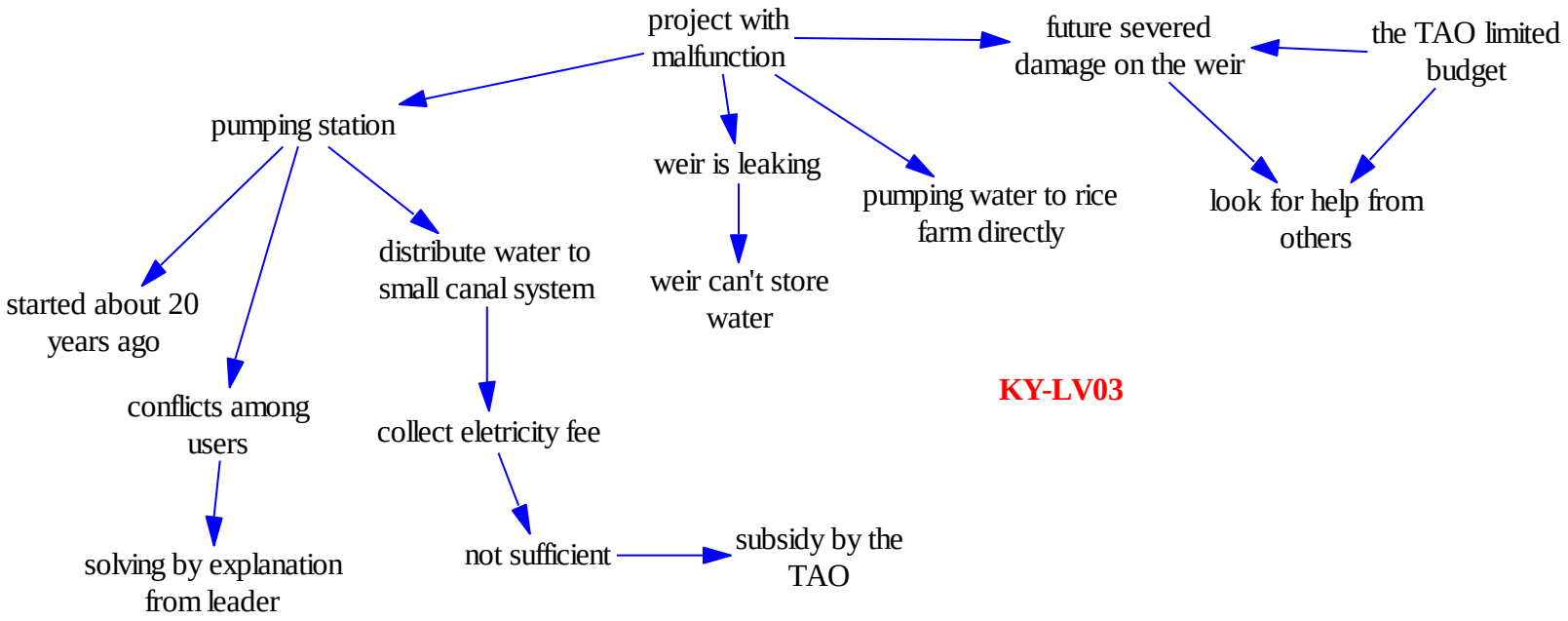
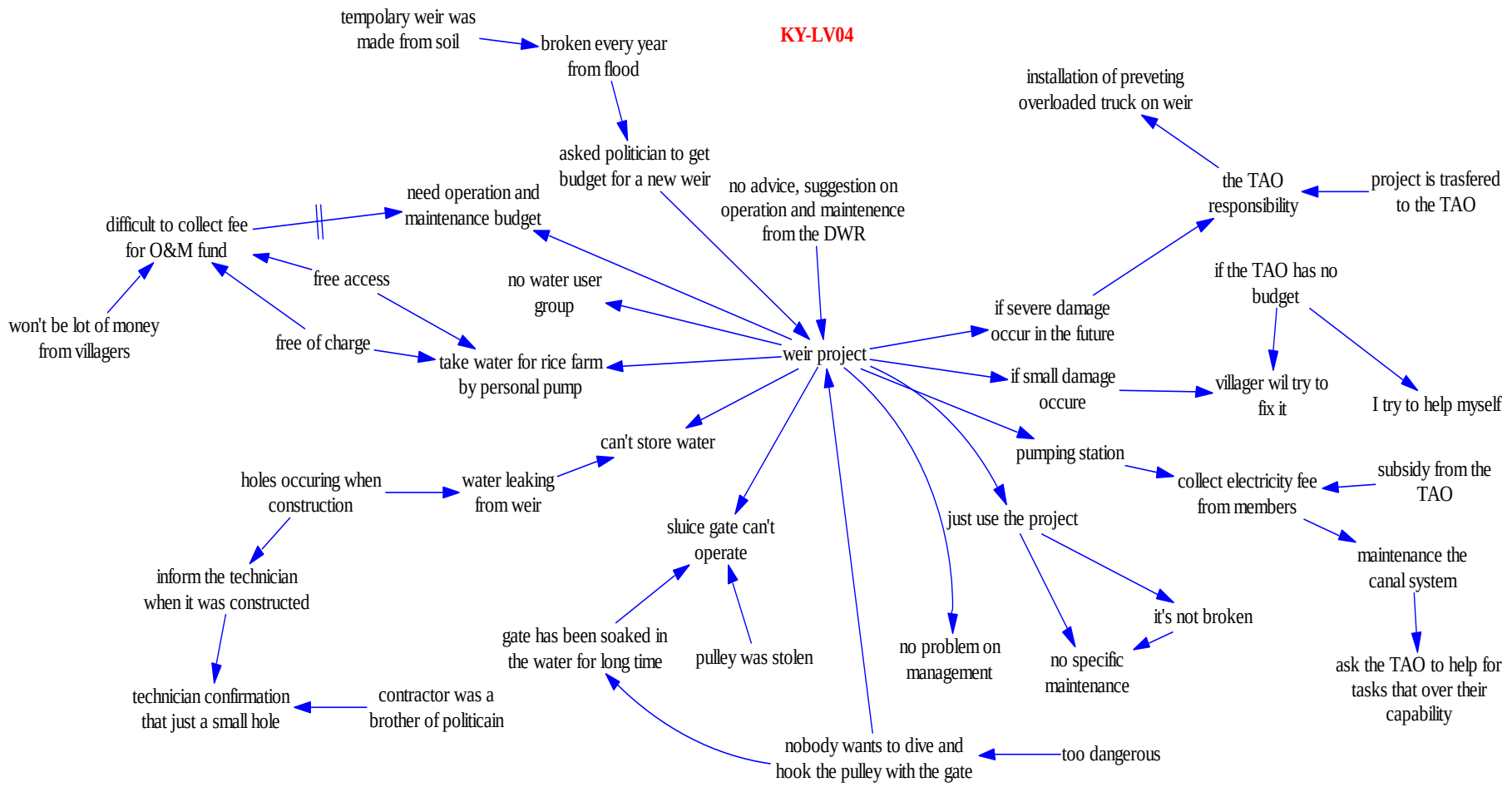
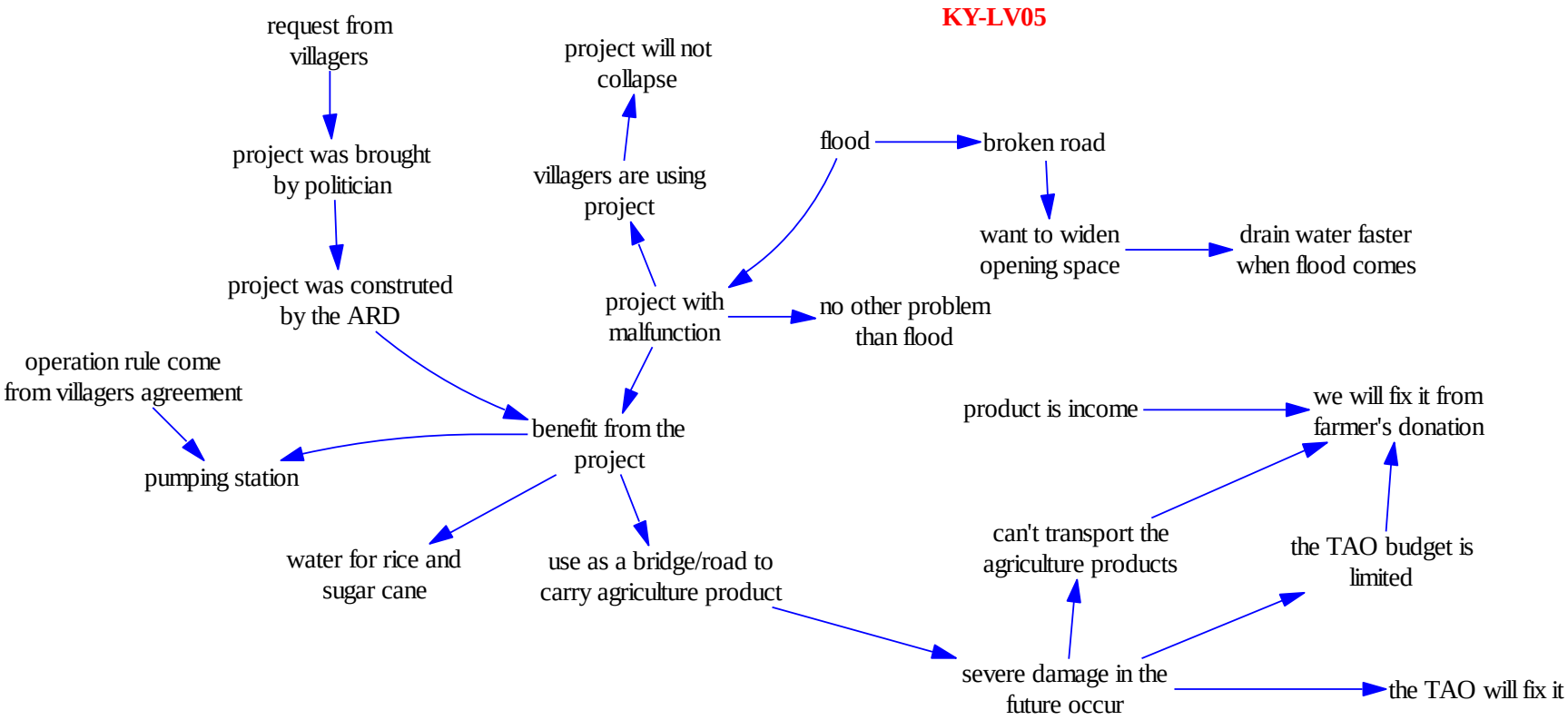


KY-LV04 mental models influence map



KY-LV05 mental models influence map



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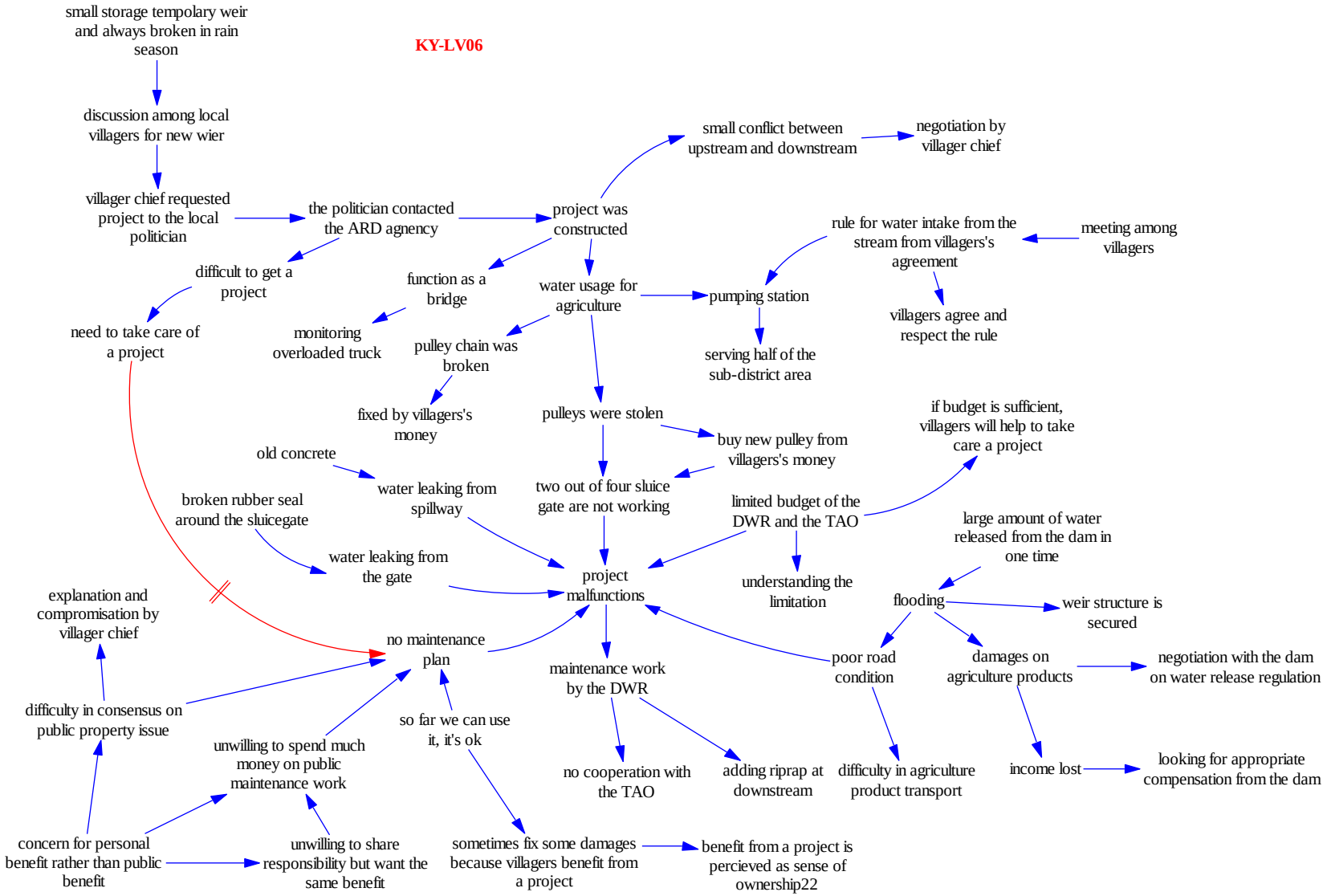
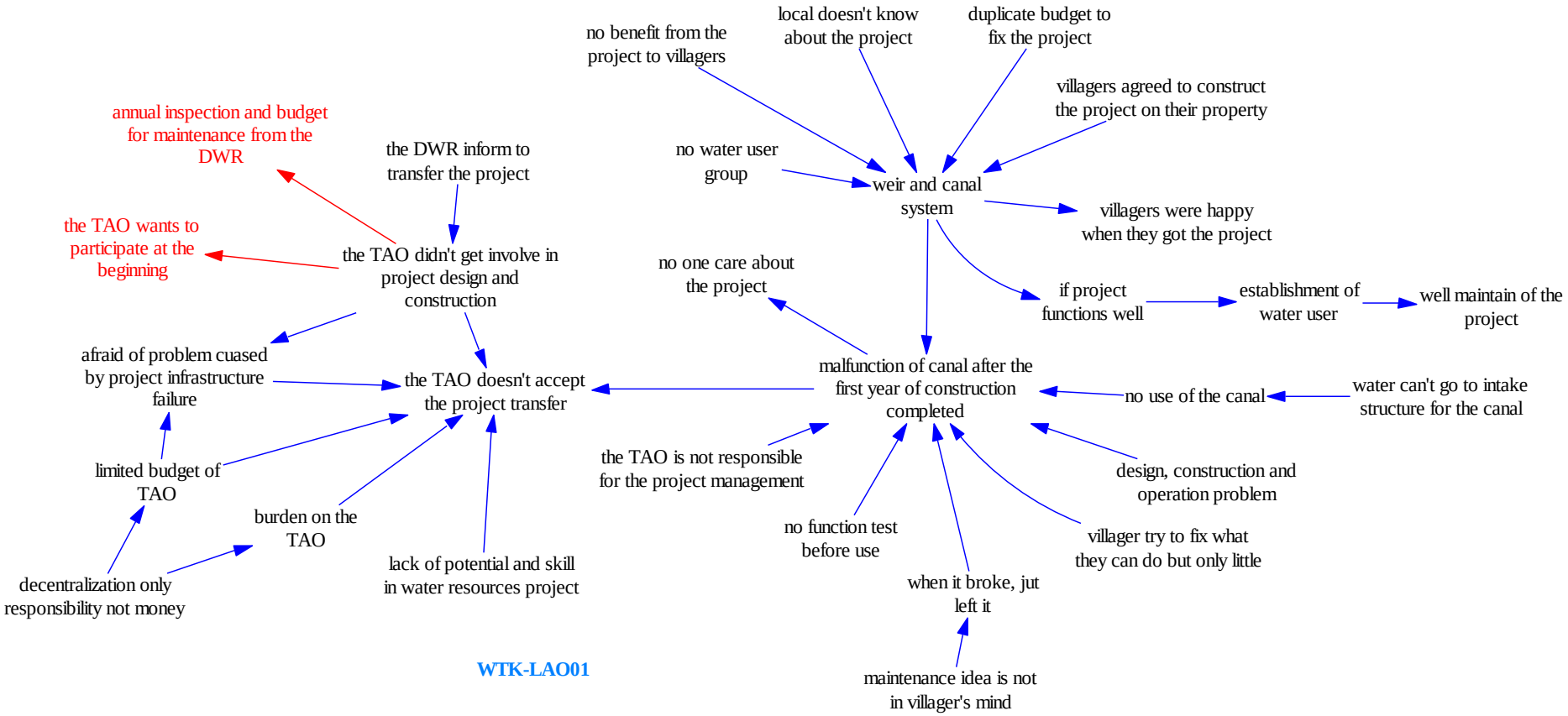


WTK-LAO01 mental models influence map



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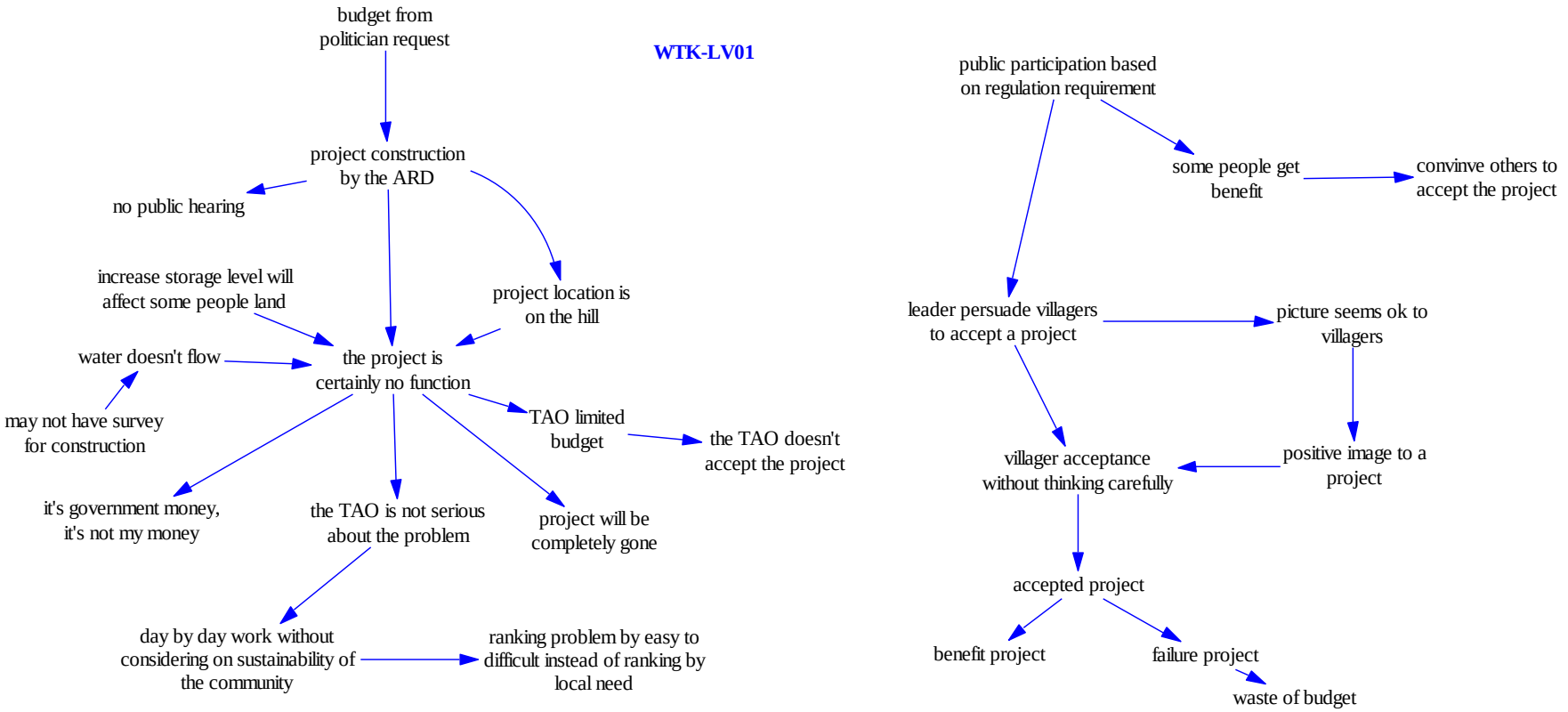

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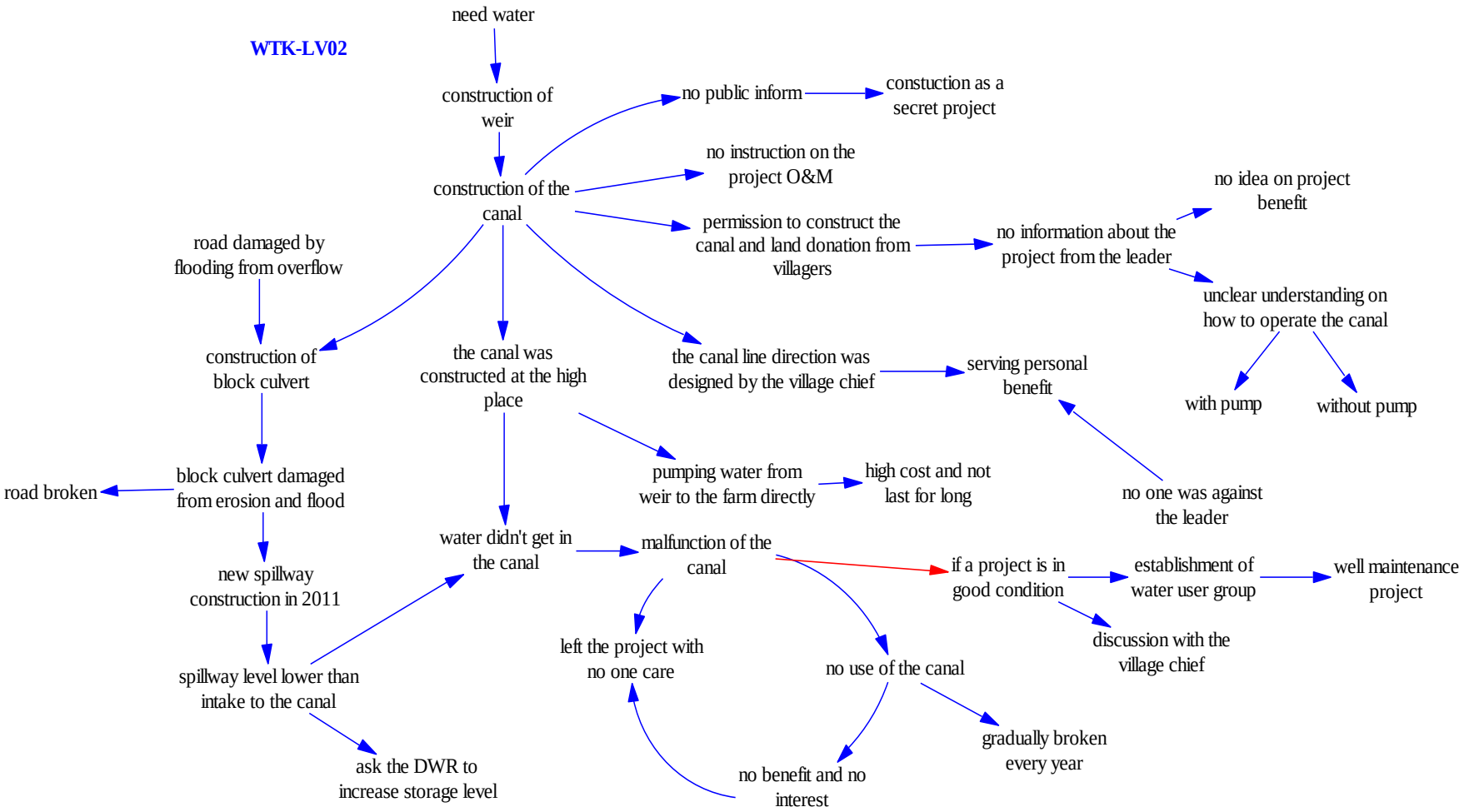

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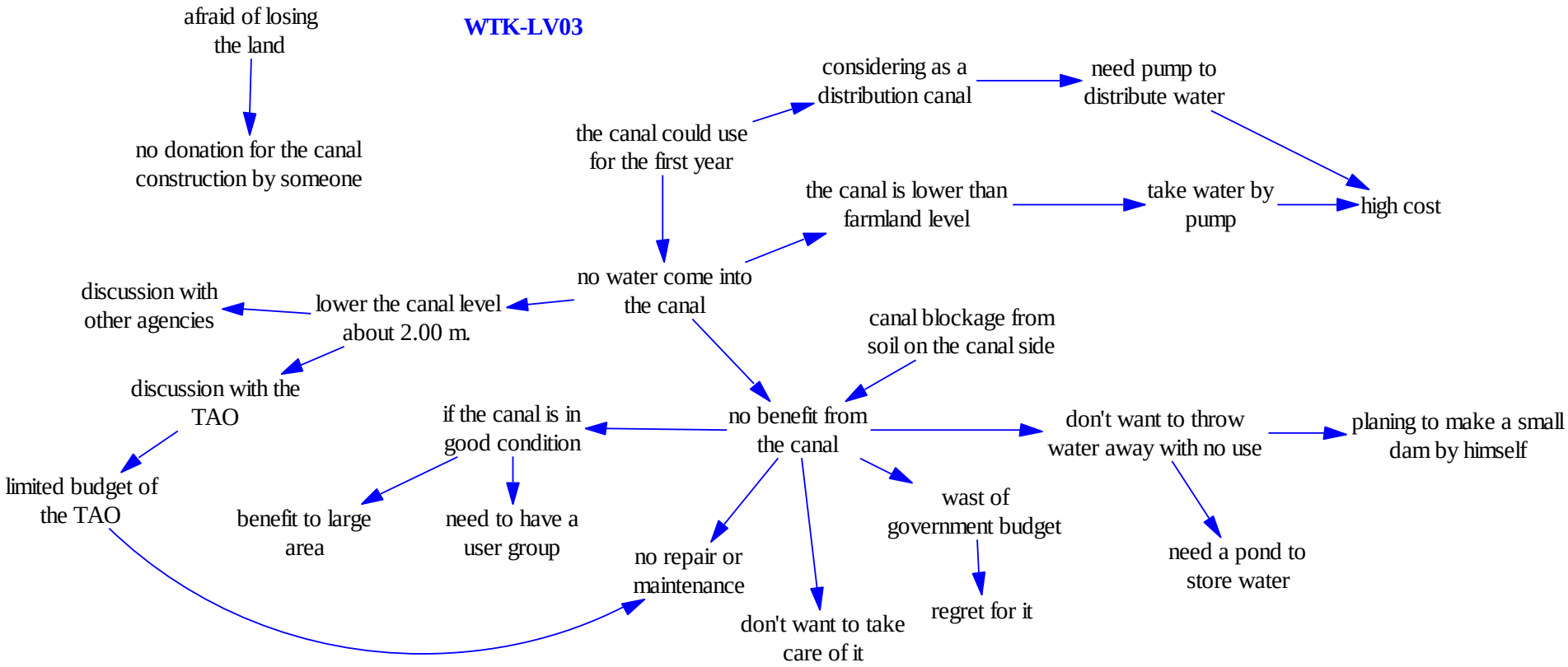
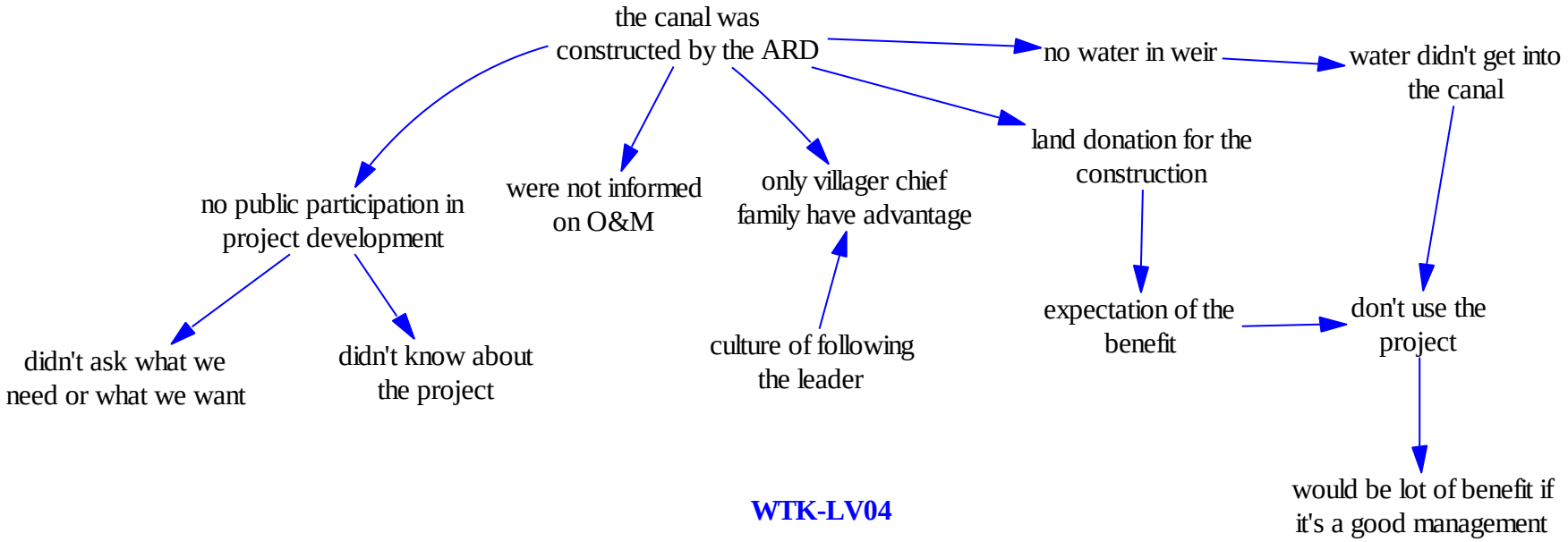


WTK-LV04 mental models influence map



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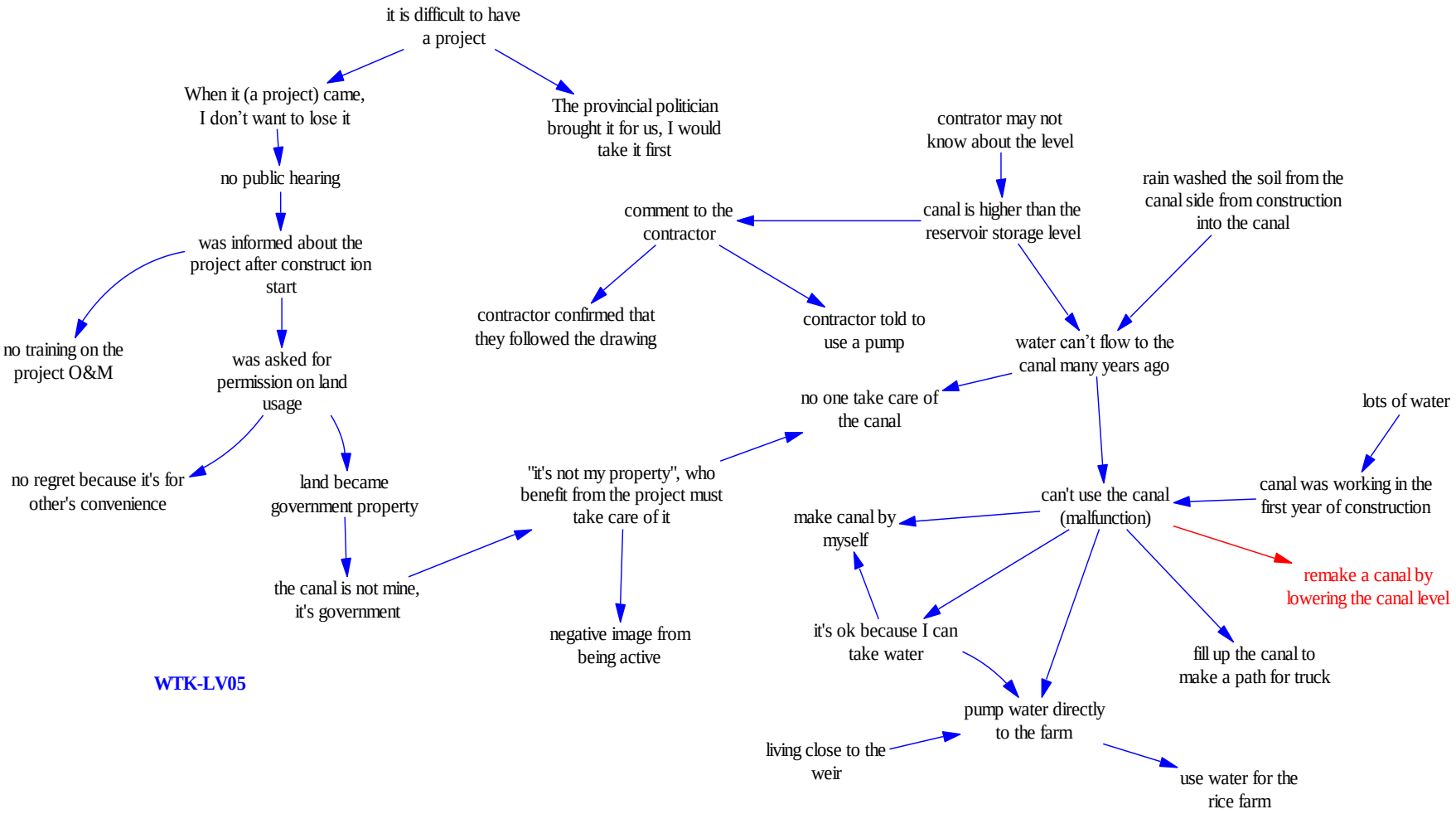

WTK-LV06 mental models influence map