



INTEGRATED STRATEGIES OF WATER RESOURCE MANAGEMENT IN MAE RIM SUB WATERSHED

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Abstract


The study of Integrated Strategies of Water Resource Management in Mae Rim Sub watershed, Chiang Mai Province aimed to develop integrated strategies of water resources management with the participation of stakeholders in the watershed, to strengthen the communities in the watershed and to achieve the sustainable use of water resources and other resources involved. The 80 samples from 6 groups included of community representatives, local government, related government organization, education institutions, religion institutions, and representatives from the business sectors in the watershed. The data were collected by using observation, questionnaire, interview, seminar and focus group methods. The collected data were analyzed according to qualitative techniques, and the presentation of the result was done in a form of descriptive report.

The study found that the problems of water resources management in Mae Rim Sub watershed originated from inefficient management process and lack of correct integration process. Regarding solutions to the problem, the stakeholders in the watershed are working together to develop the water resources management and integration process. The findings have proposed the main integrated organization, the participation of stakeholders, the efficiency of water management by community, efficient data base system, education system and understanding and knowledge building system, measure and incentives, law enforcement (several regulation that harmonized with the whole area of watershed, the agreement/commitment of the sub watershed, the morality and good governance and finally the local level have to promote participation of stakeholders in the area. In addition, the communities should realize the value of resources, the existing of water resources, problems, the respectation of themselves and pride in the wisdom of their ancestors. The communities have the opportunity to fully develop their potential to solve the problems by themselves.

Keywords: water resources management, integrated, sub watershed

Introduction

The Mae Rim Sub watersheds is a sub watershed of Ping watershed, covering 3 districts of Chiang Mai; Mae Rim, Mae Taeng and Samerng. Although in Mae Rim watershed, there are several development projects of water use solutions and development from involved authorities, both of local and national level, including the receiving of enormous budget constantly, it is still found that all budget in the project cannot solve the problem of water use in the area sustainably. Additionally, there are many problems found in the area, for example the lack of water in drought season, damaged/ shallow water resource, flooding in rainy season, insufficient and unclean drinking water and tube water, especially tube water from



mountain tube, and ineffective water management of community because of knowledge lacking, fighting for water in drought season, lacking of water arrangement and lacking of academics who can manage the water.

From current problems, it is likely that problem will increase to a more severe level in the future in many aspects; agriculture, and consuming. As there is the expansion of inhabitant areas, tourism and industrial areas that needs more water. It leads to the fight for water both in the upstream area, in the middle and the downstream. This is because of the lack of good water management in each area, deforestation by some groups of people which cause upstream destroying. Because of severe tendency of the problems, including the failure of water management, it is necessary to develop water management in Mae Rim Sub watershed through participation of every groups, water use analysis, analyze the factors leading to integrated water management to develop the water management strategies in Mae Rim area. The result of the study will lead to the findings of sustainable water management in the area, solve the problem on water management, serving policy and strategy of national development that aims to have well living society, with morals, update knowledge, warm family, strong community, peaceful society, efficient economic, good environment and sustainable natural resource under good moral administration of democracy government system with the King as the leader, living with global community with dignity.

The objectives of the study

1. To study the situation and problems of water management in Mae Rim Sub watershed, Chiang Mai province
2. To analyze the factors of integrated water resources management in Mae Rim Sub watershed
3. To develop the strategies of integrated water resources management in Mae Rim Sub watershed

Methodology

Sampling site

This research's population is people in the communities who used water in Mae Rim Sub watershed that covers 3 districts including 1) Mae Taeng including 5 sub districts, 2) Mae Rim including 5 sub districts, and 3) Sa Moeng including 3 sub districts all together are 13 sub districts and 72 villages. The researcher divides the samples, who are stakeholders of using water resources at Mae Rim Sub watershed area into 6 groups as follow;

1. 72 representatives from community (villages) in the area
2. 13 representatives from local authorities (Municipality, Sub district Administrative Organization (SAO))
3. 15 representatives from the Mission unit from government
4. 13 representatives from educational institutions
5. 13 representatives from religion institutions
6. 13 representatives from business sectors

Data analysis

The study analyzes primary and secondary data to develop the strategies of integrated water management in Mae Rim Sub watershed. The analysis is taken by data interpreting, expanding and summarizing by data and present study results in analyzed description form in order to answer the objectives. Such as cooperation, community network, rules, regulations,

morality, awareness of using resources, suggestions about integrated water resources management, watershed level conference to develop integrated water resources management at the area of Mae Rim Sub watershed, and using questionnaire to collect the quantity information of physical characteristics of the watershed, water resources conditions, amount and types of the water sources at that area, conditions of other related resources (soil and forestry resources) and basis information of economics, and society of community at that watershed area including population characteristics, occupations, income and basis structures for accuracy, completeness, and reliability of the information. This information leads to the development of way and strategies of integrated water resources management at Mae Rim watershed area.

Results

1. General context

Mae Rim sub watershed is a sub watershed of Ping watershed that is a main river of Thailand. It covers 513.65 km². in total or 321, 031.25 rai, covering the area in 3 districts of Chiang Mai province ; Mae Taeng, Mae Rim and Samerng. For Mae Taeng district covers area of 5 Tambon; Pa Pae, Sob Perng, Mung Gai, SanPayang and Kee Lek. Mae Rim district covers the area of 5 Tambon, Saluang, Huay Sai, Rim Nue, Mae Ram and Rim Tai. Samerng district covers 3 Tambon, Sanmerng Nue, Mae Sarb, and Yang Mern. The area of Mae Rim watershed mostly is mountain and some parts are plain area and hill. The forest area is $\frac{3}{4}$ of the whole area and it is an important headwater of several rivers in the area which is divided to be 4 small watershed: the Upper Mae Rim watershed, the lower Mae Rim watershed, Mae Hao watershed, and Mae Ram watershed.



Figure 1 : General context of Mae Rim sub watershed

Because of its prosperity, Mae Rim sub watershed has been developed quickly in every aspect and the coming of various business, the improve of infrastructure makes the area becomes an industry source, manufacturing, service and tourism industries. The numbers of immigration and setting up in the area from both local Thai and hill tribe people (Karen, Hmong, Lue and Lisu) that cause diversity of hilltribe, language, religion, belief and culture. In Mae Rim sub watershed, there are 49,175 residents; 24,396 men and 24,779 women with 19,538 households. Most of the population is in working age, 20-60 years. The hill tribe people who are living in the area are mostly Buddhists, and some are Christian.




Figure 2 : Situation and problems on water use in Mae Rim sub watershed

The main occupation of the people in the area are agriculturist, ranch, general employee, industry workers and some are civil servants. The main fields are rice, fruits such as Lychee, mango, orange, northern vegetable- chilies, cauliflower, carrots, beetroot, winter flower – Lily. On the ranch, there are cow, dairy farm, buffalo, pig, chicken and duck. Part time job or supplementary job of the residents are products of women’s skill development group, housewife group, elephants camp management, cow farming to serve as cow cart for tourism, etc.

2. Situation and problems on water use in Mae Rim sub watershed.

- 1) Lacking of water in draught season, river that flow water to agriculture at areas has no water and the water from irrigation is not enough canal in each area is draught canal does not meet standard and cannot deliver water of agriculture area. In water canal, there is sediments so much that it cannot conserve enough water.

- 2) Problems of drinking water and tube water found is that when wellhead becomes draught and tube water is not clean, especially mountain water tube which is muddy and red in rainy season and cannot be used. Water is not enough to use in draught season.



3) Problems of water resources are damaged or shallow. Reservoir and dam are shallow so the water cannot flow smoothly. Also sediments blown during flooding season are piled up and leads to shallow water resource. The draining is blocked in dense communities. Some water resources are ruined and left over without any maintenance, also problems of polluted canals.

4) Problems of water management communities that is inefficient because of the lack of correct understanding and knowledge on water management in communities. There is fighting for water in draught season. Also there is the lack of water arrangement and experts on water management who can cooperate with local communities to solve the problems.

5) Problems of flood in flooding season because there is not enough water storage reservoir. The existing water resources are in problems from piling up of sediments. Villager's dam and canals are too damaged and shallow to keep rainwater. Water barrier is scoured until they are damaged and left without maintenance.

6) Problem of deforesting, especially in the headwater area, in most of the area, forests are destroyed to make agricultural land and motivating plantation, including the invading of capitalist and tyrants to plant several economic plants and implant tourism business, especially in the headwater.

3. Problems on water resources management in Mae Rim sub watershed


1) Problems on communities. There is the change of attitude, belief and original way of life in the communities on water use, the significance of natural resource and water resource has been changed. The communities lacks of preparation to encounter problems of water resource that may occur and integrated self-dependence process and water management and solution.

2) Problems on water organizations management (Community organization/ watershed). Organization or group that established are not supported constantly. There is no clear objectives and direction, which leads to the lacking of work's direction and activity development to achieve objectives. So, there is no motive for the work and the lack of budget for activities and co-ordination with organizations and network, also the lack of following and monitoring leading to the weak in organizations.

3) Problems of administration model. The problem emerged from lacking of participation from people in community on water management, lacking of discussion stage opening involving people in the area to exchange and propose their opinions. The water management solution of involved authorities do not serve the real requirement of the community. There is no integrated management together among stakeholders in the area and no basic data involving water resource. That is systematical and update.

4) Problem on morality and the mind of water management. Local people lack of themes on natural resource using. They do not take care of water resource in their own area and that causes damaged canal, greed and selfishness, especially on exploiting natural resource in the area. The involving authorities also ignore problems and do not pay attention on solving problems.

5) Problems on providing education, training for the correct understanding. In the present, most education institutes in the area and some groups of academics focus only on score of examination, not morality and the mind of natural resource conservation.



6) Problems on state's policy and involved laws. Previously, Thailand has not had an efficient water manage enough, the solutions on water problems are just extempore treatment and the works are separating works, there is no integration, the country's governing is from top-down or setting up the policy from the top to leads the country and neglect the significance of local communities.

4. Factors leading to integrated water management in Mae Rim sub watershed; 10 main factors as followings

1) Main integrated organization. Main organizations have main responsibility to coordinate for building up the cooperation among community, educational institution, religious institution, non-governmental organization, and government sectors. They have to build up network among all stakeholders as well as play a role of a center of all kinds of integration to raise the concordance with principle of integrated water resources management. Furthermore, explicitly, permanently, and consistently, set up working structure and resources management based on the cooperation of all stake groups.

2) The participation of stakeholders. The strategies of integrated water resources management at Mae Rim watershed needs the awareness of all stakeholders especially community that is the group that was directly affected by the problems happening in the area. It decreases problem, obstacle, and conflict of integrated water resources management those might happen in the future and enhances the management to run effectively.


3) The efficiency of water management by community. To run the integrated water resources management at Mae Rim watershed effectively and sustainably solve problems are essential to bring the community at that area to participate in problem solving and management by themselves. This enhances the community to become self reliance of using water resources. Even more, it leads them to have the working network with thinking, considering and decision making process and cooperate together under the management by community.

4) Efficient data base system. Effective data base is a very important tool for the water resources management of all related sectors. Those sectors can use the same data base to solve water resources and other relating resources effectively as well as build up the integration at the province, district, sub-district, main watershed and sub watershed level.

5) Education system and understanding and knowledge building system. To provide accurate educational system and knowledge and understanding building process about using natural resources to people at watershed is very important for sustainably using natural resources of people at the watershed area.

6) Integrated water resources management plan. Integrated water resources management plan of both community and watershed level is essential since the plan is the determinant of way of operations and activities to solve problems and manage the water resources systematically. The plan has to come from the cooperation process of all sectors of stakeholders in order to practically response the need of people at that watershed area and solve the problems from using water resources at Mae Rim sub watershed.

7) Measure and incentive of water management. Measure, incentive and motivation of water management at Mae Rim watershed is the factor that has to operate together to promote and support the working cooperation according to the set plan and activities and achieve the successful planning of integrated water resources at Mae Rim sub watershed.



8) Law enforcement, several regulation that harmonized with the whole area of watershed. Laws enforcement and regulations of water resources management is another factor that needs to be set as much explicitly and extensively as possible to avoid the gaps of laws and regulations that anyone or any group of people can use to take advantage on or cause damage to the natural resources by committing against the laws. Strictly and extensively apply the laws at Mae Rim sub watershed and impose the same punishment standard along the watershed area to manage the water resources effectively and sustainably are included.

9) The agreement/ commitment of the sub watershed. The agreement and commitment of water resources management at Mae Rim sub watershed is the regulation and operation way that operated together for preventing anyone or any group of people to violate the laws by making the joint agreement that linking the factors together. This is for creating a good collaboration of all sectors of the stakeholders. All sectors have to cooperate regularly and consistently and strictly operate under the agreement that creating together.

10) The morality and good governance. To follow the morality and good governance is the factor leading to integrated water resources management at Mae Rim sub watershed. People in the area have to aware of the value of water resources, most useful using water resources, strictly follow the morality, but not taking advantage for self benefit. Furthermore, to follow the morality continually can sustainably solve the problem of water resources at Mae Rim sub watershed.

5. Integrated strategies of water management in Mae Rim sub watershed by stakeholders

1) Community aspect

- Promote and support communities in Mae Rim sub watershed to recover culture and indigenous strategy on water management

- Promote and support communities in the area to have mindfulness on using and taking advantage from environment and natural resource.

- Promote and support communities in Mae Rim sub watershed to have water management following Royal idea of the King. For example sufficient economic method and the new agriculture method.

2) Water management organization aspect

- Appoint a main host on water management in Mae Rim sub watershed area


- Promote to group of all stakeholders in the area to set up network of each group to administrate water resource in the area and create integrate work on water management for straighten every network group

- Develop work process of existing water management organization such as committee in every levels involving the area of Mae Rim sub watershed, both in main river basin level (Ping watershed) and sub watershed level (Mae Rim watershed) by appointing the role and position of the work committee and step of work to be clearer and more strictly.

3)Administration aspect

- Give opportunity to communities in Mae Rim sub watershed to participate in consideration and making decision of administration and problem solving on using water resource in the communities.

- Every involving authority, both local unit and the mission unit in the area of Mae Rim sub watershed should coordinate on planning water management together so that water management of several units are in the same direction as intergradations form.

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- Morality and mindfulness on natural resource use
 - Add content of natural resource and environmental conservation harmonize with religion activities, merit festival, tradition ceremonies of communities in the watershed.

4)Education management aspect and understanding making


- Cooperate to establish the process or several activities to pass on correct knowledge on natural resources, ecology and the use of natural resource to create sustainability to people in the area so they know, understand and realize of natural resource 's value.
- Develop curriculum and teaching process of educational institutes in the area to promote natural resource conservation and environment more.

5) State policy and involving laws aspect

- Use the solution that starting from community base in every process of watershed management, both in the main watershed and sub watershed and have opportunity to express their opinion and make decision on direction of solution to meet the problem and the real requirement of communities in the area.
- Consider of necessary additional law and follow the law strictly to fix the criteria and standard to control problems occurred and catch up current situation.

Discussion and Conclusion

The factors that found at Mae Rim watershed area are accordance with the successful ways of watershed management by local in many countries such as Europe, America, Japan, and Korea. One of those is the St. Marys River management that is Local Management and Control- local is fully authorized to manage and control as far as the allowance of Laws. There are Implementation planning of the watershed management committee, and thinking and implementing cooperation among leaders of Local Government, the committee and public. (St.Marys River Management Plan, 2003). Motivation and voluntary methods are used to achieve the goals while focusing on knowledge cultivation and sub conscious mind stimulation to public regularly, applying laws, rules and regulations through the watershed area accordingly and cooperation of every government sectors. (Gesellschaft für Technische Zusammenarbeit (GTZ), 2004). Capital and funding of each city will be allocated equally in every year and combined to the management of watershed. Moreover, the committee and the city administrators will find funding from donation and external to support and run the plans and projects accordingly to the goals, and set up the written agreement for taking care of the St. Marys watershed. The Big Creek management is also one successful. There is a plan focusing on the cooperation of stakeholders to do planning, enhance the strength of cooperative networks between communities (landlords) and government sectors responsible for resources management as well as finding funding for project development, research, monitoring, and evaluation. Running the project by volunteer groups and fully supported by government, local and private sectors. The Big Creek management conforms to the Carson River Coalition, which indicated that the effectiveness of the management depends on one another respect of the stakeholders, building up the cooperation to promote the water resources conservation among people using water at the watershed area, and raising awareness to every sector on understanding the watershed area by educational process thoroughly (Carson River Plan, 2007). The study of the management of Ackerman Creek Watershed, and Farm Creek Watershed found that government sectors and stakeholders at the watershed area support funding to the management. The local has to plan every step of the project beginning from indicating problems, setting up objectives and implementation strategies to resolve the problem of water resources. It has a very important concept that



development by community is very important for water resources management. Using community as the base of the management can reduce problems happening in the watershed area. Building up the strength for community at the watershed area is the most sustainable management way. (Adil Al Radif., 1999)It conforms to Illinois watershed management indicating that success of the management comes from the cooperation of every stakeholder, organizations with strong management, acceptance of conditions, cooperation of private sectors and entrepreneurs to donate funding, including watershed knowledge and water quality into the curriculum of educational institutions, planning the watershed management by community based. The plan has to begin from indicating visions, policy, goals, objectives, way of using the plan, and procedures. The most important to the success is community process at the watershed area and willingness to manage the project of every sector (Falkenmark, M., and G. Lindh.,1976).


Form the successful ways of management of the countries above, we found that there are principle and concept similarities. Those similarities are enhancing local people and local management organizations to manage the projects, supporting the strength of local people and local management organizations by investment regularly and consistently, and creating the agreements and applying laws, rules and regulations those are the most important tools to build up the cooperation of watershed management.

However, even those factors comply with the integrated water resources management at Mae Rim watershed area, the difference of physical, biological, social, economical, and political and administrative of the country are the factors those differ the management of this study from many sample countries. When consider the components and capacity of Mae Rim watershed area, we found that there are 2 factors leading to integrated water resources management; controllable and uncontrollable factors;

1) Controllable factor is the factor that stakeholders at the area can set up the way to manage and run the project with their capacity and elements such as cooperation of the stakeholders, efficiency of water management by community, effective data base, integrated water resources management plan, educational system and providing knowledge and understanding of using natural resources.

2) Uncontrollable factor is the factor and stakeholders can't manage themselves due to the external elements such as political and administrative system, government's policy, laws including organizations/ main institution of integration, measure and motivation of water management, morality and good governance, watershed agreement/contract, and applying laws and regulations.

This Mae Rim integrated water resource management strategies convinced people to aware of their problem, understand, join in community self-resolution, gain spirit in tackle their own problems, community harmony and strength which lead to effectiveness in water resource management and sustain natural resources, social and economic in Mae Rim sub watershed. This corresponding to the idea from water resources management in many countries that is "The best water resources management approach is the management by people or community in the watershed" Consistent with the concept of Chiang Mai self-management that is the concept for strengthen the local community to revive an important tool which is the basis of the community rules, the process of social self-understanding. Apply knowledge of self-management and adaptation. The power of the local community is not only provide



information but it is the fulfillment of knowledge, understanding and self confidence that can make better changes and lead to self-solving problem of communities.


Suggestion

This research could possibly get integrated water resources management in Mae Rim sub watershed through participatory process from all stakeholders. The researcher would suggest another approaches for more effective management are include:

- 1) Create network group which could enhance community strength through modern social network such as facebook, Instagram etc.
- 2) Encourage community voluntary and active involvement of partners to preserve natural resources such as reforestation, making dike, dredging the canal and water drainage channel etc.
- 3) Enable factors to promote efficiency in cooperation from every partner.
- 4) All stakeholders should follow the strategies, support this reconstruction to actual application and consider this research finding as a demonstrable improvement in water uses efficiency to trial in the engaging area.
- 5) To gain efficient process of water resource management, needs to have cooperation from every involved both of government and the stakeholders in the watershed.

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