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Research Article

Assessment monitoring of watershed management to reduce risk disaster and community adaptation to climate change in Pasak River basin area, Thailand

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Abstract

This qualitative study was conducted to assessment monitoring of watershed management to reduce disaster risks and community adaption to climate changes in Pasak river basin. This study also employed participatory action research methods. The locale of the study was Pong sub-district, Loei province. Research instruments were observation form, data recording form, and an in-depth interview conducted with a target group of 105 peoples obtained by purposive sampling. Results of the study were the following: Almost all of the informants were engaged in agriculture with ginger and maize growing. Most of the informants migrated from neighboring provinces, aged between 41-50 years and had problems in water management as a high investment expense on bringing water up to the agricultural areas; unable to use groundwater; and surfaced soil erosion. However, some natural water sources can be utilized during the rainy season. Therefore, the community tried to solve these problems by keeping water in big containers, building cluck-dams, and digging a big pond for public use. Regarding the past Pasak river basin management, there was a basin management policy mostly focused on check-dam construction and emphasized utilization rather than natural resource conservation. It was observed that community participation in the conservation was rather little and not consistent with the development plan of concerned agencies. The following were management guideline gained from the study: 1) coordination of all parties in preparing a strategy on the improvement of the eco-agricultural area which was consistent with the area condition of each farmer; 2) support on in-depth eco-agriculture guidelines for the adaptation to global warming condition and natural calamity; and 3) using the public policy to solve the problem in natural resources/environment and disaster Pasak river watershed area based on community and concerned party participation for sustainable utilization.

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Introduction

Phetchabun mountain range originates in Laos P.D.R. and spreads to northeastern and central Thailand or it covers Loei up to Lopburi and Saraburi provinces. Its important mountain peaks and crests are Phu Soidao, Phu Miang, Phu Khad, Phu Hinrongkla, and Phu Khieo. In central Thailand, Phetchabun mountain range is of Phetchabun mountain ranges 1 and 2. The former is to the east of Pasak river called Dong Phayayen mountain range whereas the latter is to

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west of Pasak river and it covers Phitsanuloke-Phetchabun-Loei highway (350 km). Streams from Phechabun mountain range 2 flow to the west and meet Pasak river whereas those flow to the east meet Nan river. The flat plain between the two mountain ranges is abundant in ground water making high agricultural yields. The highest peak is Phu Luang (1,571 M.), followed by Phu Kradueng (1,316 M.) in Loei province and it is like a table due to erosion by water (Pong sub-district administrative organization, 2015).

Actually, Phetchabun mountain range is important in terms of ecological dimension in many aspects such as there are big conserved forests or national parks i.e. Nakaew national park, Phu Hinrongkla national park, Phu Luang wildlife sanctuary park, Phu Reua national park, Phu Kradueng national park, Nam Nao national park, Phu Phamn national park, Phu Khor wildlife sanctuary park, Phu Kheo wildlife sanctuary park, Phu Phadaeng wildlife sanctuary park, Phaphueng wildlife sanctuary park, and Khao Khor national park. Since all of these forests connect one another so there is high bio-diversity. In addition, Phetchabun mountain range is the origin of many streams or rivers for water use of people in northeastern and central Thailand. Important watersheds there are Pask, Nan, Loei, Pong, Chi watersheds, etc.

Pasak river watershed is very important to people in central Thailand. However, it has specific complicated problems due to its appearance i.e. high slope, narrow shape (a little water catchment area, rapid and severe water flowing rate which results in flash flood, etc. All of these have an effect on difficult watershed management. At present, the problem condition of Pasak river watershed is closely related to climate change. For example, flood and drought (El Nino-La nina phenomenon) cause damages to social and economic aspects. Besides, Pasak River involves a lot of water use activities such as agriculture, consumption, and industry. All of these have a lot of stakeholders making unbalance in water management and water competing. Therefore, monitoring and assessment are essential to the reduction of risks on disaster and community adaptation towards climate change in Pasak river watershed area.

Objectives of the Study

Specifically, this study, aimed to:

- Explore water management, problems encountered, and monitoring/ assessment of water management in Pasak river watershed area and
- Propose a guideline for water management to reduce risks on disaster and community adaption towards climate change in Pasak river watershed area.

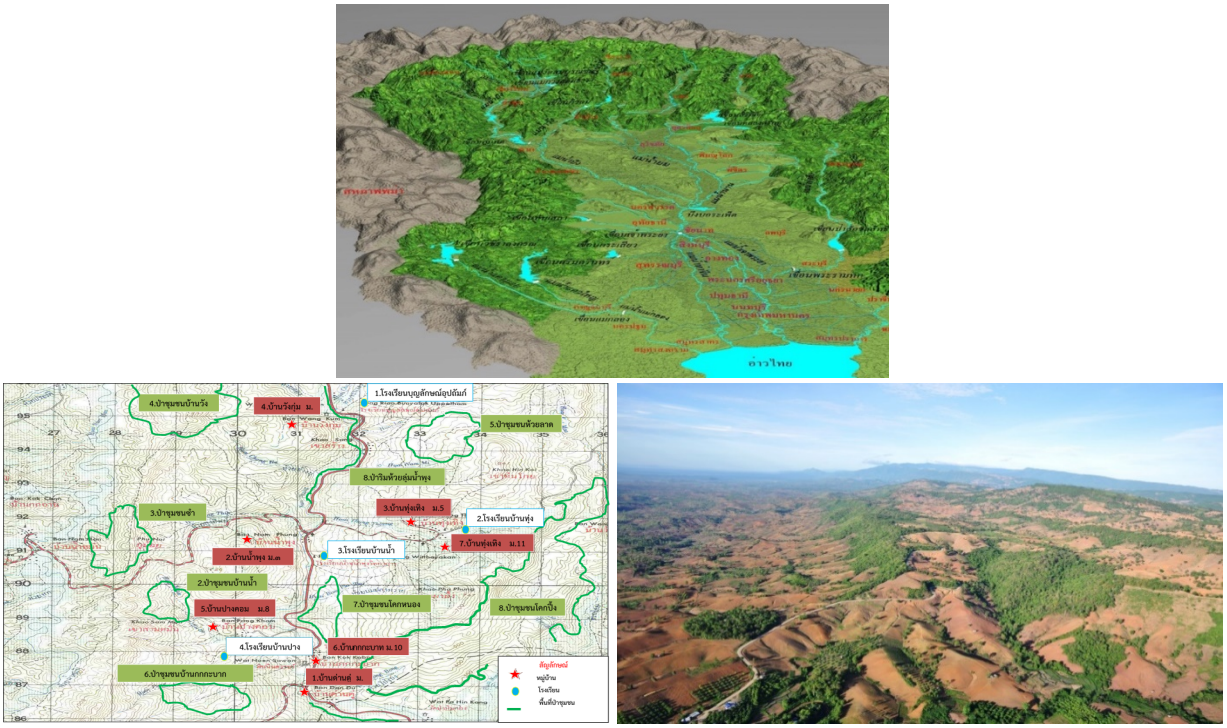
Research Questions

- How is the water management and what problems are encountered?
- What is the guideline for the water management to reduce risks on disaster and community adaptation towards the climate change?

Scope and Limitation of the Study

This study explored condition of water management, problems encountered, and monitoring/assessment of water management in Pasak river watershed area. It aimed to propose a guideline for water management to reduce risks on disaster and community adaptation towards climate change in Pasak river watershed area. The scope and limitation of this study were as follows:

- Locale of the study was in Pong sub-district, Dan Sai district, Loei province which was part of Pasak river watershed area.
- Population in this study were people living in Pong sub-district and they must possess the following requirements: 1) village member and had been living there for not less than one year; 2) earning a living in the area and; 3) willing to be in the target group of the study.
- Time span of the study was one year (May, 2016-April, 2017).



Figures 1.

Local of Study

Method

This study employed qualitative research. In other words, it was a participatory action research (learning exchange venue, survey, interview, and focus group discussion (Chooto, 2005). The target group consisted of 83 people, and 22 community leaders/local scholars living in long sub-district, Dan Sai district, Loei province. They were obtained by purposive sampling and willing to join the project. Research instruments in this study were observation form, data recording form, and in-depth interview form (Semi-structured or guided interview). Content correctness was checked by 3 scholars. Obtained data were analyzed and synthesized by using content analysis, methodological triangulation, and interpretation.

Figure 2.

The Activities During Survey, Interview, And Focus Group Discussion

Table 1.

The Project Planning

Research procedures	Objectives	Research instruments	Target group/host
1. Explore the area and prepare data related to Pasak river watershed management	To find an appropriate area based on physical context of the community and community coordination	Focus group discussion, survey, observation, and data recording form	Community leaders Local people
2. Community/concerned agency venue to find problems encountered in Pasak river watershed management	To create understanding about the research project to data providers 2.To listen to opinions and suggestions of stakeholders in the community	Learning exchange venue, observation, and data recording form	Local people Community leaders, and local scholars
3. Data collection	To find basic data of Pasak river watershed management and problems encountered	Survey and prepare a social map by in-depth interview and focus group discussion	The team of researchers
4. A meeting between the team of researchers and community representatives (Once a month)	To monitor the project implementation and perceive disaster/ problems in Pasak river watershed management	Learning exchange venue, observation, and data recording form	The team of researchers
5. Analyses of problems encountered, impacts, and community adaptation	To make conclusions of problems encountered, impacts, changes, problem solving, and community adaptation	Learning exchange venue	The team of researchers
6. Venue on monitoring and assessment of Pasak river watershed management by the community	To perceive results of the analyses and changes as well as a guideline for problem solving and community adaptation	Learning exchange venue	The team of researchers
7. Preparing a research report for dissemination	To disseminate the research report	A report	The team of researchers

Results

Almost all of the participants were engaged in agriculture as the main occupation (maize and ginger growing), followed by hired workers for supplementary incomes. Their age range was 41-50 years and most of them migrated from neighboring provinces for farming on the highland surrounded by mountains (Pong sub-district administrative organization, 2015). Most of the participants living in the watershed had problems in water use management which included the following: 1) the water source for agricultural purposes was lower than the agricultural area making high expenses to bring water to the area; 2) the investment to bring ground water to use in the agricultural area was impossible since there was a limitation in topographic condition (mountainous area); and 3) soil surface was eroded during the rainy season and due to forest encroachment for cultivation and habitation of capitalists while natural water sources were inadequate for consumption during the dry season. However, the participants indicated that the community had a water management process by keeping water in big containers in the rainy season, building check dams, and digging a public pond.

Finding showed that there were disasters for 5 times during 2000-2015. This conformed to data of concerned agencies in the area which could be concluded as follow: 1) there was the occurrence of land slide in the area; 2) there were flash flood and severe land slide in the area; 3) there was flash flood in low land areas; and 4) there was immediate disaster which caused great damages due to flash flood in low land area. Disaster academics pointed out risks on disaster making flash flood for 4 aspects: 1) a slope area of more than 30 percent causes rapid water flowing; 2) the structure of stone and soil which is risky to occur land slide; 3) conditions of the forest, plants, and land use for example flash flood absorption and Soila Consistence; and 4) an amount of rain-more than 90-100 cubic mm/day will make flash flood in Pasak river watershed.

Regarding the past management of Pasak river watershed, it was found that the policy on the management mostly focused on check dam building and utilization of water rather than the conservation of natural resources. It could be seen that there was little community participation in the conservation which was not consistent with the development plan of concerned agencies. Besides, there was no study on impacts on the watershed area. No only this, there were legal limitations which hindered problem solving and policy of the government which had a negative effect on people in the up-stream area. There was no true and continual coordination between the public and the private sectors.

The following were part of a guideline for the management of Pasak river watershed:

- Coordination among all concerned parties in the preparation of strategies to improve the agro-ecology area of the farmers. It must be designed to be appropriate with each area condition of the farmers.
- Support an in-depth agro-ecology guideline to tackle global warming and enhance community potential in order to cope with disaster which may occur. This can be supported by using local wisdoms, local scholar brain storming, creating new innovation, resource rehabilitation and creating a social process for mutual development.
- Pushing public policy forward problems in natural resources, environment, and disaster in Pasak river watershed. This must be based on community participation as well as community network and concerned agencies for sustainable problem solving and watershed area utilization of stakeholders.

Discussion

According to results of the study, it revealed a guideline for the management a gained from the venue of an analysis of problems, impacts, and the community adaptation by the stakeholders. For an analysis of a guideline for Pasak basin management administration, as a whole, it could be for concluded that the collaboration among all concerned parties for formulating strategies of agro-ecology of farmers. It must be designed to be consistent with each farmer's topographic area. In fact, local wisdoms could be employed to support in-depth agro-ecology guideline which local

scholars were leaders for the development. This included existing natural resources, new innovation creation for resource rehabilitation, and the creation of social process for mutual development. This conformed to a study of Boonyakuakoon (2015) which revealed that local wisdoms are on the basis of 3 existing things: natural resources, knowledge, and social network. Local wisdoms should be a basis for community development based on participation of all concerned parties. Importantly, everyone must realize the value of existing resources and conserve or add it to be enough for their livelihoods. Also, they must be aware of accumulated wisdoms of their ancestors. Especially, the wisdoms to living of rural people that consistent with the preservation and conservation of natural resources, (Poungsuk, (2003), Heejung, et.al. (2016), and Poungsuk and Pourpan, (2010).

According to results of the study, pushing public policy forward problems in natural resources, environment, and disaster in Pasak river watershed. This must be based on community participation as well as community network and concerned agencies for sustainable problem solving and watershed area utilization of stakeholders. This Consistenet with Tavida Kamolvej (2006: 2-5), Department of Diaster Prevention and Mitigation (2006: 43) that the coordination creating for services of a public agency needs to construct coordination and networks at 3 levels: the construction of coordination at the community level, network level, and agency level called social networks having integration of local people in the form of an organization. This aims to work with public agencies to reduce risks and to manage emergency cases or disaster. Main factors on disaster management include volunteer network, risk management plan, process of competency enhancement, surveillance rules/regulations, and community agreement which conforms to a policy of the country as well as the process of monitoring and assessment. All of these made up a clean and correct guideline for developing Pasak river watershed in order that the community there could adapt itself to cope with various changes. This conforms to an organic farming guidline perting the importance on farmers and local community. In fact, organic farming focuses on stability in farming as well as the conservation and rehabilitation of way of life of farming community. Also, farmers must learn production adaptation to match natural ways which conforms to way of life of Thai farming community (http://www.greennet.or.th/article/86).

In fact, lower northern and central Thailand are important in economy and industry and a lot of people settle down there. Thus, monitoring and assessment of Pasak river watershed management is essential to country development and flash flood prevention.

In addition, results of the study revealed that the participants proposed an alternative for the adaptation to the climate change problem or global warming to the farmers on the high land where there was drought problem. Hence, it must have a strategy to improve the agroecology in the farmer's cultivation area. This must be designed to be appropriate with the topographic condition of each farmer's cultivation area. In other words, it is called "an in-depth way of agro-ecology for the adaption to the global warming problem". It puts the importance on supporting people to be a planner and designer based on logic and reasons in accordance with the principles of sufficiency economy philosophy (Puangsuk, 2014: 188). This conforms to a concept of the adaptation of eco-community. It is the concept which connects ecosystem-based approach and community-based approach. Both concepts are on the basis of ecological system-bio-diversity and an ecological service which helps people adapt themselves to effect of climate change. Meanwhile, the concept of community adaptation is the one focusing a process leaded by the community. This involves needs, knowledge, competency, power, and adjustment to cope with climate change (Reid et al., 2013: 28-29). Pimpongsan et.al. (2013) suggested that an analysis of the community's system of managerial administration uder the concept of green government focuses on sustainability of natural resoures. That is, the community can manage natural resources (soil/water/forest) sustainably.

It also focuses on the application of Dharma to the process of farmer development leading to ideology creation of "self-reliance" and "sustainable development". Besides, the farmer must be supported to be skillful in knowledge management by using data as a basis for farming such as analyses of soil condition, water condition, climatic area, marketing, and changes of the farmer himself, the community, and globalization. Data learning will make the farmer

be ingenious in agricultural production, processing and group forming in accordance with steps of sufficiency economy. Besides, this concept can be employed of in other activities such as farmland layout, exploring potential of cultivation land, preparing farm/household account, developing land potential, improving soil fertility, supporting appropriate technology/innovation, increasing yields, using renewable energy, etc.

Conclusion

According to results of the study, there are two main problems needed to be solved immediately: 1) water for agricultural purposes, soil surface erosion, forest encroachment, ground water, etc. and 2) concerned agencies should solve the problems in an increase in the capability of community adaptation towards various changes by using social participation and a clear policy for sustainable problem-solving which guidelines from studies as follows of the coordination of all parties in preparing a strategy on the improvement of the eco-agricultural area which was consistent with the area condition of each farmer, support on in-depth eco-agriculture guidelines for the adaptation to global warming condition and natural calamity, and using the public policy to solve the problem in natural resources/environment and disaster Pasak river watershed area based on community and concerned party participation for sustainable utilization.

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