METHODS

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Participatory Action Research (PAR) was used in this study to develop the participatory water quality database system for SAOs in Mae Taeng Watershed, Chiang Mai Province. The findings from the study came mainly from "action" of the SAOs target groups during the research process. Quantitative and qualitative research methods were used to ensure reliable results.

Research Design

Conceptual framework

Local administrations such as SAOs play important roles in environmental management of their own jurisdiction. The participation and learning processes are both means and ends in working with the community in all steps. The research design emphasized the participation and learning processes in database development for SAOs to ensure community empowerment and capacity building to help the community make correct development decisions. Therefore, PAR was selected as a research method here (Figure 8). The SAOs, relevant stakeholders or both took part in community analysis, database requirements design, database usage, and database evaluation. Observation and evaluation of steps in the participation and learning processes of this research ensured the validity of the research results. Figure 6 shows the research conceptual framework.

Participatory Action Research was used with an aim of applying the findings to the existing issues. The research was designed to integrate quantitative research, Sample survey research, and qualitative research methods to find answers to the problem statement. Most part of the research contributed to a better understanding of local participation in the development database.

In this context, the participants had a chance to learn and manage some changes involving them. Consequently, the participation model is not only an alternative to promote opportunities for the people to take part, but also empowers them to determine their own destinies, through improvement or increased capacity in managing and controlling resource use for the community. Moreover, the public participation is seen to transform the development approach, from top-down to bottom-up. In this way the people could play major roles in development concerns, with the full support of the government sector. This kind of relationship is not limited to the people and the government sector, but it includes the relationships of all stakeholders related to the issue.

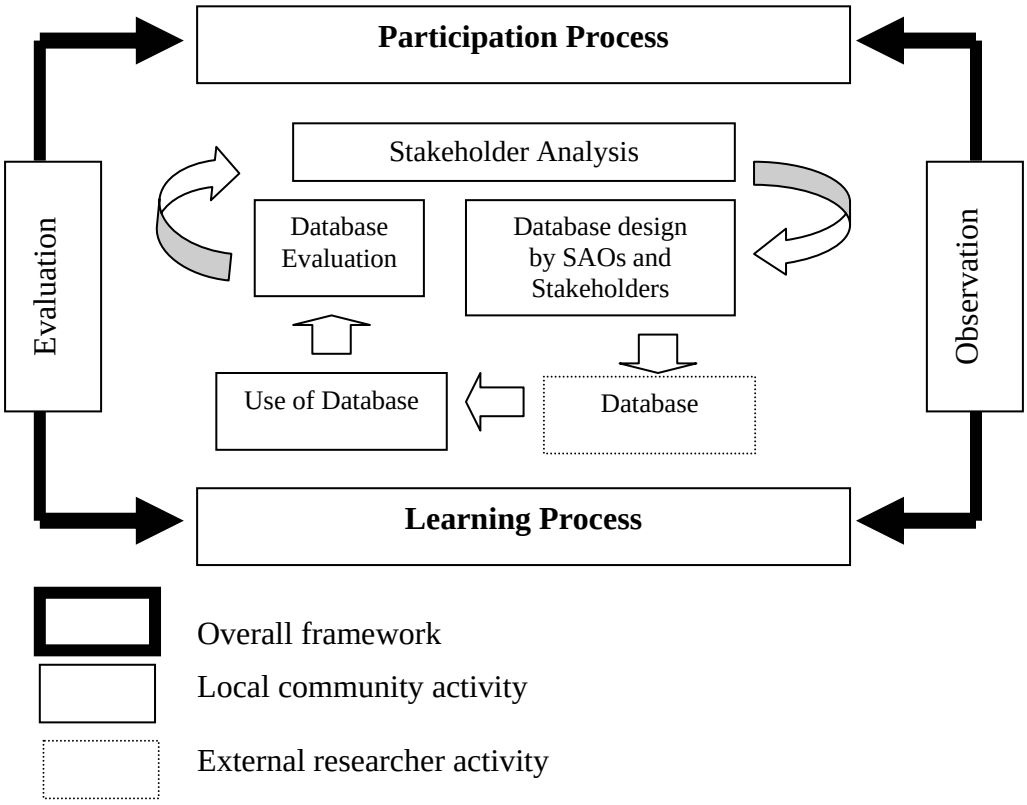

Figure 8 Conceptual framework of the research

Testing the Validity

The succeed of watershed management database was based on valid information. The researcher ensured that people in the local area understood the management procedure and provided us with accurate and useful data. This was ensured through observation and evaluation of the research process and its results. The process responded to local needs and watershed management concepts. It was a requirement that the research goals were reached through the participation of all parties. The researcher used the following evaluation techniques to ensure that the results were valid.

1) Prior knowledge of watershed management was tested through the detail and in-depth questioning. Participants were asked to evaluate how much they learned at the end of the teaching process.

2) The database was tested by representatives of the target groups to test its usefulness in managing water quality throughout the watershed.

3) The degree of participation of all parties was evaluated by attendance at meetings and level of attentiveness etc.

4) The comments and feedback were recorded by check list sheet at all stages of the research process.

Research Process

The research process involved 3 main related tasks: 1) to assess the types of water quality information required at the sub-district level in the northern region. This step relied on the quantitative exploratory research method; 2) to design a water quality database system using qualitative research methods and a participatory action research design; and 3) to assess the results of the participatory development database system process using both quantitative and qualitative research methods (Figure 9).

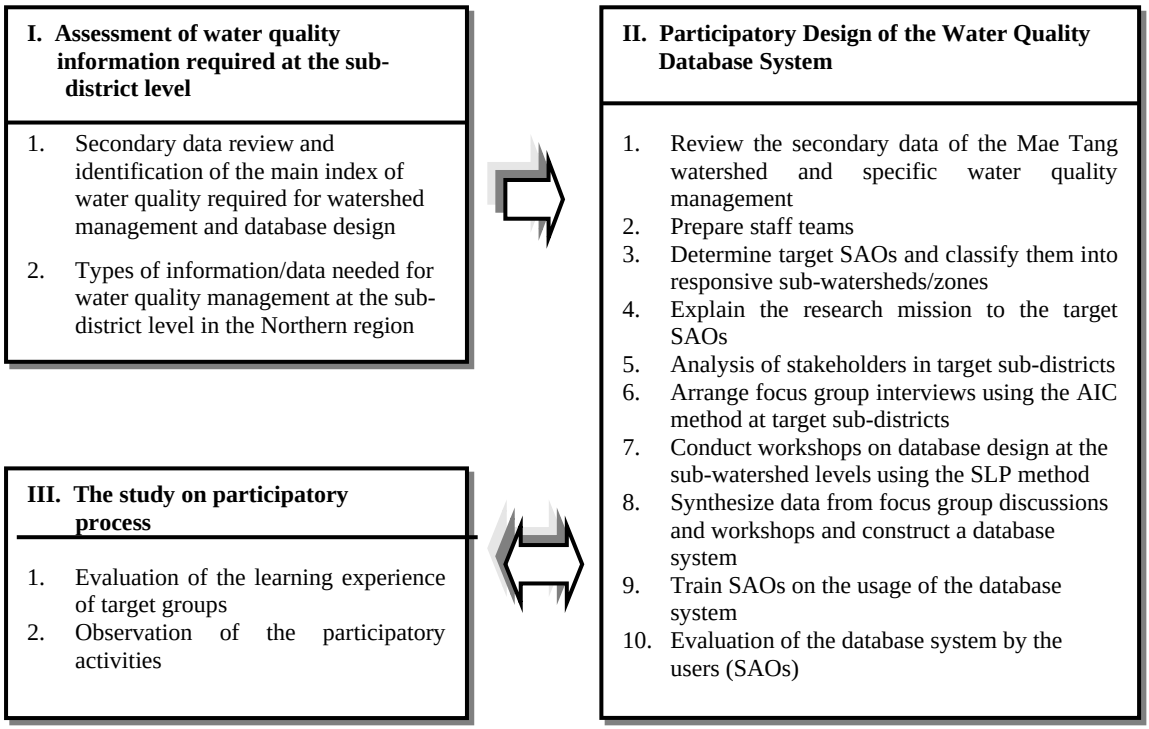

Figure 9 Research process

1. Assessment of the Water Quality Information Required at the Sub-district Level

The exploration of information required for water quality management at the sub-district level within Northern region of Thailand was required to understand the existing situation and issues related to water quality management at the local level. The procedures of such explorations employed mailed questionnaire method with details as to flows.

1.1 Sampling Techniques and Sample Size

The targeted population of 768 SAOs located in the northern part of Thailand. They were included with Chiang Rai, Chiang Mai, Nan, Phrae, Phayao,

Mae Hong Son, Lampang, Lampoon and Uttradit (Department of Local Administration, 2000).

The stratified sampling technique was employed and the Yamane statistical sampling method was used. The number of samples was 287 SAOs at a confidence level of 90%. The samples' sizes per province was shown in Table 1.

Table 1 Number of SAOs samples classified by provinces

Provinces	No. of SAO.	No. of Samples
Chiang Rai	120	45
Chiang Mai	184	69
Nan	92	34
Phrae	73	27
Phayao	59	22
Mae Hong Son	42	16
Lampang	89	33
Lampoon	45	17
Uttradit	64	24
Total	**768**	**287**

Source: Department of Local Administration, 2000

1.2 Questionnaire Construction and Pretest

The structure of the questionnaire was in line with the research objectives and main conceptual framework. The questionnaire was tested for validity and accuracy before actual data collection took place. The questionnaire topics were included: the general information of the SAOs, the perception and knowledge of water quality management and the utilization of water quality data, sources of water quality data, required or significant water quality data, and management guidelines and the maintenance practices of water quality at the sub-district level.

1.3 Data Collection and Analysis

The questionnaires were sent to the selected SAOs and returned back by mail. Descriptive statistics such as frequency, percentage, arithmetic means, and standard deviation were used to analyze collected data. Results are presented in a descriptive form, as well as tables and figures. Information gathered at this stage was used in the design stage of the participatory database system.

2. Participatory Design of a Water Quality Database System

The objectives of designing a participatory water quality database system was to gain active involvement from SAO representatives, establish learning experiences, and conduct observation and evaluation of the learning process. The research output was not only an acceptable and workable database for water quality management at the local level but also the learning experiences of all participating SAOs and stakeholders gained throughout the process.

In the participatory design process of the database, all SAOs in the Mae Taeng watershed were invited to participate in Appreciation-Influence-Control (AIC) process into uncover the main problems and issues they faced in water quality and its management using the water quality database. Mind map was the main technique in the AIC. The process provided an opportunity for them to exchange ideas and explore their strengths and weaknesses in resource management especially related to water quality.

The SAOs and stakeholders also underwent a learning experience in the process in the Social Learning Process (SLP). They were able to gain a better understanding of the significance of water quality information and knowledge on how to manage it throughout the watershed to ensure good quality of life of community members in the watershed which was an essential task in database design and function.

Observation and evaluation was an important task throughout the design and use period of the participatory research. Questions were kept in mind, such as the acceptability and usefulness of the outcome of the action research to the SAOs and the rest of the watershed, and how the participatory process facilitates linkages between the SAOs and other stakeholders in order to incorporate the benefits of water quality management for their own benefit and the benefits of the rest of the watershed. The answers to these questions would enable the researcher to determine if the database designed by the SAOs stakeholders at local level would be a workable choice in the new era of participatory watershed management.

Another key issue in the participatory development of the database system was determined in the process in order to represent the community and the concerned groups. The Snow-ball Technique was used to obtain a list of stakeholders in each sub-district. This may include the local authority responsible for water quality management, representatives from the SAOs, local people, etc. The researcher then collected information on stakeholder roles by use of an unstructured interview. This interview consisted of only broad guidelines or questions to be asked. Finally, the selection of stakeholders was done in such a way that it was possible to ensure that all key stakeholders were represented in the process.

The participatory action research process of the database system development is shown in Figure 10 consisted of the following steps:

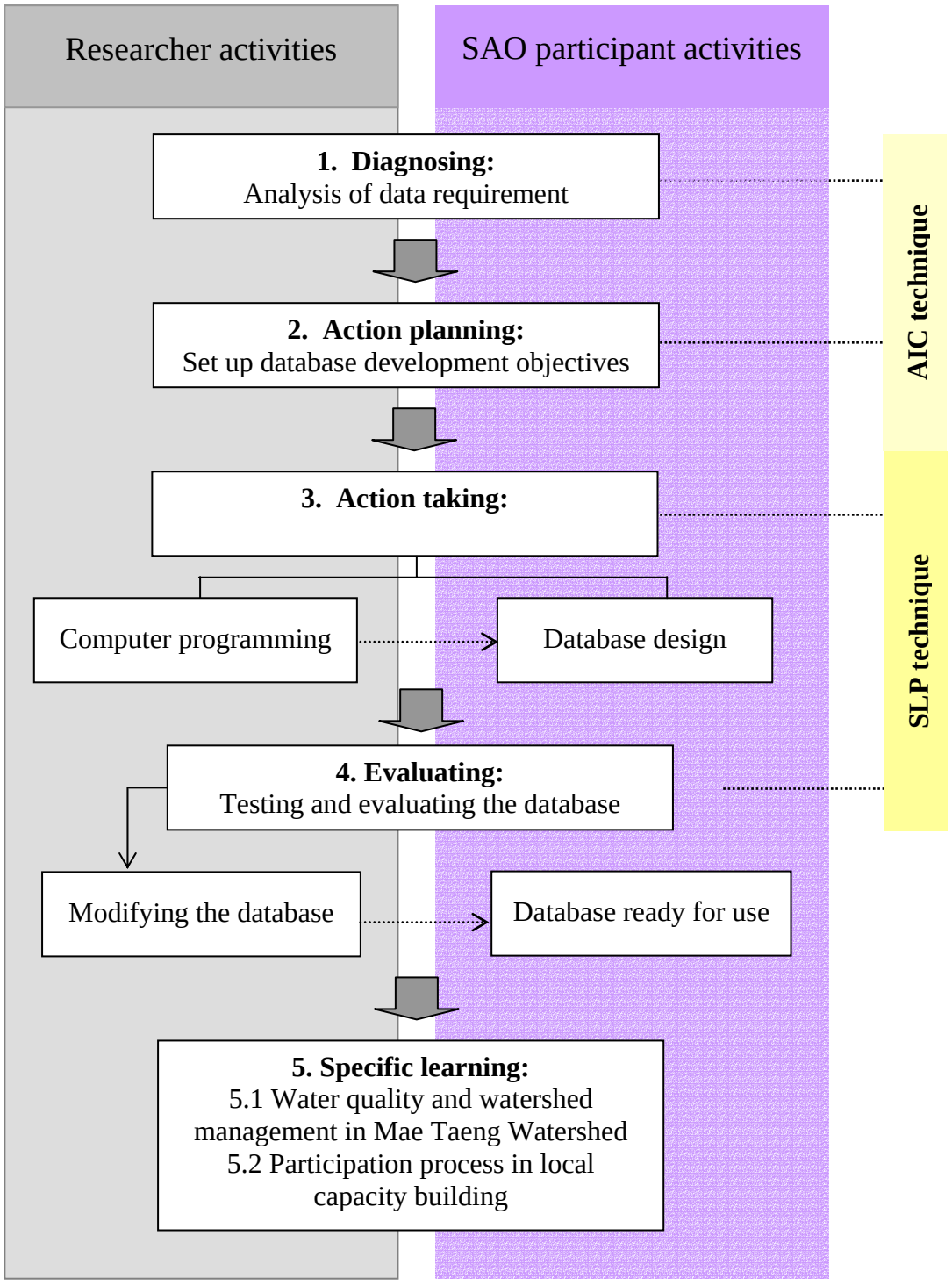

Figure 10 Steps of Participatory Action Research (PAR) employed in the study of water quality database development for SAOs in Mae Taeng watershed

3. The study on the participatory process

To obtain a high degree of validity, observation and evaluation were essential during the participatory process. While it is common to think of these 2 activities as similar, in reality they are different.

Observation was done to follow up on the progress of the implementation to ensure it was carried out as planned in order to overcome problems and to support implementation. Observation focuses on the efficiency and effectiveness of implementation.

Evaluation was aimed at analyzing the overall working process and systematically assessing the work accomplished. It could be said that evaluation is a learning process among the target groups, researcher, and the others involved and affected. Moreover, data evaluation was reviewed and analyzed as well as strengths, weaknesses, opportunities and threats. Any opinions gained from the evaluation were useful for society.

3.1 Knowledge evaluation

Since this study focused on participatory action research that emphasized learning experiences of the target groups gained from the research process, the knowledge gained at the end of the process was evaluated. Knowledge on natural resources and environmental management, watershed management, water quality and management, and the database system were the main knowledge components for evaluation. Target groups were evaluated from SLP performances.

The evaluation consisted of ten questions in multiple choice forms. That was, each question has four choices and had only one correct answer. Each correct answer was given one score while each wrong answer was given zero. All scores were analyzed using arithmetic means and standard deviation and then divided into three knowledge levels: high, moderate and low.

After constructing a draft questionnaire, three committees who supervised the thesis examined it for correction and improvement. Then about 20 individuals were asked to take the test to ensure content validity. Following the test, the draft questionnaire was analyzed in terms of its difficulty, effectiveness and reliability.

Following the testing of the questionnaire, necessary adjustments made and the researcher used this form to evaluate the target groups' knowledge before and after the learning process during SLP.

3.2 Observation of the participatory process and the related activities

The objectives of the participatory process were:

(1) to follow-up the implementation of the plan at every stage of the participatory process as planned

(2) to adjust the work plan and correct each activity according to the situation

(3) to evaluate and report the progress and performance of all the parties concerned

The instruments used for monitoring were not complicated and contained measures of all the indicators mentioned above. The target groups and the researcher collected data through observation, questionnaires, and feedback records. The researcher analyzed the results in both descriptive and quantitative forms in terms of the weaknesses and strengths of the participation process. Suggestions for the improvement of the model based on the experience gained while conducted this research are proposed as well as the participatory model for water quality database development.

Research Duration

From May 1st, 2001 to February 28th, 2004.