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Collaborative triangle for effective community water resource management in Thailand

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ABSTRACT

Water resource management through community collaboration is a crucial way to bring sustainability to water utilization. This study highlighted the key factors affecting community water resource management. The study was based on the Royal Initiated Project in Thailand's southern region. In this research, qualitative analysis was used and a case study was applied as the research strategy. The data were collected from relevant documents, observations, and in-depth interviews with 30 key informants consisting of 5 water resource management experts, 4 academics, 5 community leaders, 10 members of community water resource management committees, and 6 government organization officials. The data were analyzed using content analysis and accuracy checks were made with relevant people until a common conclusion was achieved. Then, synthesis was used to describe the context relationship linkages. The findings showed the importance of geography, lifestyle, sense of ownership, and modes of practices of people in the area as well as the involvement of a network of government agencies (Hydro and Agro Informatics Institute and local government agencies), Thammasat University, and the Ban Kuan community. The government agencies and Thammasat University played a partnership role in supporting the community in terms of transferring knowledge, helping with analysis of existing situations and problems, and giving guidance in problem-solving, supporting management-related issues, and coordinating with water resource management agencies and other government agencies. These interactions can transform the concept of community water resource management into actual practice and create sustainable development for the community. Moreover, the findings illustrated the key factors in community water resource management according to His Majesty the King's initiatives which include management-oriented, community-oriented, social network-oriented, and technology-oriented factors.

Introduction

Development in rural areas needs to rely on community involvement and a partnership with key stakeholders for technical knowhow and financial resources. The industrial development of these rural areas through outside

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investment when scrutinizing the impacts on social development (the so-called social divide) has emerged. This has been due to the negative impacts on the environment on all fronts—air, water, soil, plant, wildlife, human health, and livelihood. Because of the on-going problems facing social and economic development, in Thailand as with many countries in Asia, the concept of community water resource management has gained greater recognition and recently has been promoted.

Water is a natural resource that is essential for life and economic development. In general, the natural sources of water that every human being depends on can be categorized into air water (rain), surface water, and ground water. In some years, the lack of rain can cause a low level of water in streams and further causes drought (Punya, 2008). In some years, there can be a high volume of rain, which causes floods that ruin the assets of people in the catchment area. In addition, inundation can further cause havoc and polluted waters, all of which can be considered a water crisis. Such situations can be found in many areas, every year, throughout the country. His Majesty the late King was very concerned about water resource management solutions, which are a main concern of the people, especially those whose occupations are in agricultural sector, which means the majority of people in the country. It can be seen that water resource management is the focus of most of his Majesty's development projects, such as the cloud seeding project, the Chai Pattana water mill, and "kaemling" flood mitigation (retention basin) (Maiklud, 2007).

Simply put, the fundamental social and economic development of Thailand has to focus on all aspects of agricultural development because it is one of the fundamentals of the country's economic system. An important way to improve the efficiency of agricultural outputs is to emphasize research into new types of crops—both economic ones, such as casava and rubber, and soil nutrient ones, such as nitrogen-fixing hemps. However, the fundamental resource for achieving such purposes is 'water resource management', including its development, storage, irrigation, drainage, and waste water treatment.

Information from The Thai Meteorological Department (2015) and Hydro and Agro Informatics Institute (2015) shows that, in Thailand, there is a sufficient level of rain, but the water reservoirs are still limited. When rain water cannot be stored and managed properly, the lack of water management can cause both floods and droughts. This can be seen in the case of the southern part of the country, which faces severe floods practically every year. It can be seen that the problems of flooding can be caused by several factors including: heavy rains in the rainy season and a limited number of retention basins; the expansion of urban areas and infrastructure without proper planning; forest destruction, which reduces the retention capability of the forest; the construction of roads without sufficient water-draining channels; and excessive pumping of water from underground leading to land subsidence and enhancing flooding. As can be seen, the problematic issues mentioned drive the need for efficient and comprehensive water resource management, which requires collaboration at every level of the society, from the government agencies down to local communities. This approach can help deal with water changes and water management in order to reduce the level of damage that might occur to the economy of the country (Bunclark, Carter, Casey, Day, & Guthrie, 2011).

Many areas of the country have applied the concept of the Royal Initiatives in water resources management, such as building reservoirs and retention basins ("kaemlings"), exploring and expanding of the routes of flood waters into the sea, and retaining water that goes to the Khong, Chao Praya, Mool, and Chee Rivers. However, the water management strategies mentioned must be integrated by the planning sectors and the operation processes which can be done by the communities within each area. In this way, water resource management can be sustained. Nevertheless, the active collaboration of the community in water resource management needs support from experts in such issues as building dams and reservoirs, and the application of technology in community water resource management. Moreover, Thailand still needs knowledge and research that are applicable to real-time floods and drought management and water resource management (Hydro and Agro Informatics Institute, 2015).

According to the rationale mentioned, this research aimed to analyze the key factors affecting the success of community water planning resource development and management according to the Royal Initiatives in the southern areas of the country. This is actually a collaboration between government sectors, such as universities, the Royal Irrigation Department, and the local communities. This will lead to the preparedness of the communities in adapting to the changes in weather conditions and increase the capability of the communities in water resource management.

Table 1
Directions of water resource management under Royal Initiatives

Understanding water cycle	Assessing water quality and quantity	Developing water resource management
Information • Water plan • Water source situation	Analyzing and solving • Water balance • Solutions • Collaboration • New model: forest agriculture, new agricultural theory, water balance at the end of water cycle	Water management • Implement the plan • Develop and renovate existing man-made and natural water reservoirs • Build a new water retention structure • Evaluate, follow up, and expand the effectiveness of community water resource management

Source: Hydro and Agro Informatics Institute (Haii) (2015)

Literature Review

Community Water Resource Management Toward Sustainable Development Organizational and Functional Level Maturity Models

Water management under the Royal Initiatives focuses on all aspects concerning water, including water problems solutions, geographical issues, people's modes of living, and cultures, with the main aim of providing enough water for all inhabitants in the area all year round (Hydro and Agro Informatics Institute, 2015; Maiklud, 2007). Therefore, the main approach to water management in Thailand is to adopt the directives of the Royal Initiatives by focusing on water resource management at the community level, which is considered the proactive way to convince the community to pay more attention to sustainable water management. This approach consists of three main elements, namely understanding the water cycle, assessing water quality and quantity, and developing water resource management (Hydro and Agro Informatics Institute, 2015) (Table 1).

Understanding the Water Cycle

This can be done by scrutinizing the information and facts in the local areas, such as looking at water plans/maps, dates and information about the situation of water supply in the area, so that problems can be understood.

Assessing Water Quality and Quantity

This is the analysis and appraisal of the solution to water problems by focusing on the collaboration of people in the community and between the government and local community. The work must be processed in accordance with the royal initiatives in a way that is appropriate for society, geography, living conditions, and cultures. In this stage, the insight gained from the study of the water resource situation in the area must be experimentally applied until the solution obtained is appropriate. In addition, it might require support in sustaining the water resource management and career development for people in the community in two areas: 1) Forest Agriculture Group—the group of people who help preventing natural resource deterioration and advantage being taken of the forest land, and protecting the rights of local people. Such an approach increases the balance between natural food and ecology, improves the lives of humans and the quality of the forest, and supports the income of the community; 2) the new theory of his Majesty the late King which supports the management of water and land, water conservation, and water distribution. This is done in collaboration with the

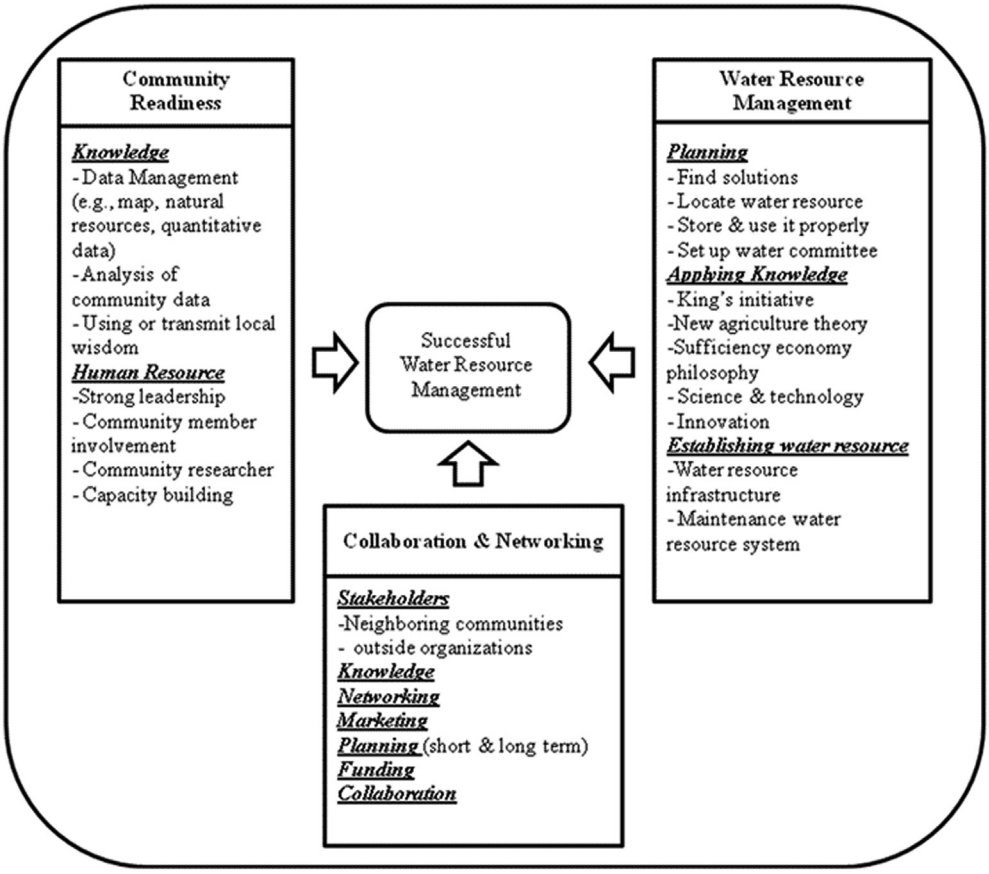

Figure 1 Model of social learning for sustainable community water resource management.
Source: Rassameethes (2009)

local administrative offices which leads to cooperation between government and local communities.

Developing Water Resource Management

This is the application of the plan to the real operators and the expansion of efficient network results to other areas in order to build network communities. This process includes providing a water management plan, supporting implementation, and following up and evaluating the end results.

The Success of Water Resource Management

Managing water resources is not an easy task. No single model is appropriate for all situations, but rather there is a range of means with different contexts. The community's water resource management in each area varies depending on its geographical and social characteristics. Each community has its own unique way of managing its water resources in line with its geographical environment and their ways of lives. In addition, many factors influence the success of water resource management. However, in many cases, some important factors are ignored, such as social factors, functions of government officials, culture, and the participation of stakeholders at all levels (Poolman & van de Giesen, 2006; Sultana, 2009).

Rassameethes (2009) studied factors affecting the success of building a sustainable community water resource management system and found that the success of water resource management consisted of three factors, namely 1) community readiness, 2) water resource management capability, and 3) collaboration and networking of all stakeholders. The model of social learning for sustainable community water resource management is presented in Figure 1.

Research Methodology

In this research, a qualitative approach was used. The aim of qualitative research is to understand the phenomena being studied. A case study was used as the research strategy. The case study strategy realizes the true environment and aims to study the phenomena in depth (Yin, 2009). This research utilized a single case study in order to understand community water resource management in a specific area—collaborative water resource management which based on the Royal Initiated Project in Thailand' southern region. A single case study is appropriate when the case studied is special to understand and exhibits clarity (Voss, Tsikriktsis, & Frohlich, 2002). The case study was selected based on the following criteria: 1) community has experience in managing water resources, 2) community has a group to look after and has regenerated the water resource, and 3) people in the community are involved in water resource management.

The research process consisted of three phases as shown in Figure 2.

1) The first phase was the review of the literature concerning water resource management and reviewing the information on the community being studied.

2) The empirical study examined the case study by observing how the community managing the water resource in the case study functioned, and by performing in-depth interviews. In this research, the data were collected from in-depth interviews with 30 key informants consisting of 5 water resource management experts, 4 academic persons, 5 community leaders, 10 members of community water resource management committee, and 6 government organization officials.

3) The analysis and interpretation took place after the first two stages were completed: the findings from the first two stages were used to analyze and interpret the collaboration pattern in managing community water resource and the key success factors of community water resource management in the studied community. The data collected in this research were systematically coded and analyzed using a qualitative data analysis software package which helped the researchers to classify, sort, and arrange data. In this research, software-based analysis was useful to extract meanings and insights based on the data collected from the interviews.

The reliability and validity of the findings of this research were enhanced by various means. Reliability was improved by recording, transcribing, and storing the data in

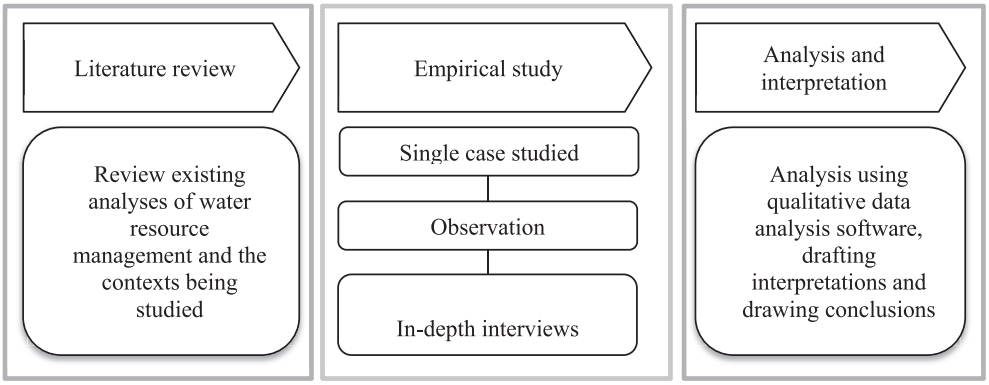

Figure 2 Research process

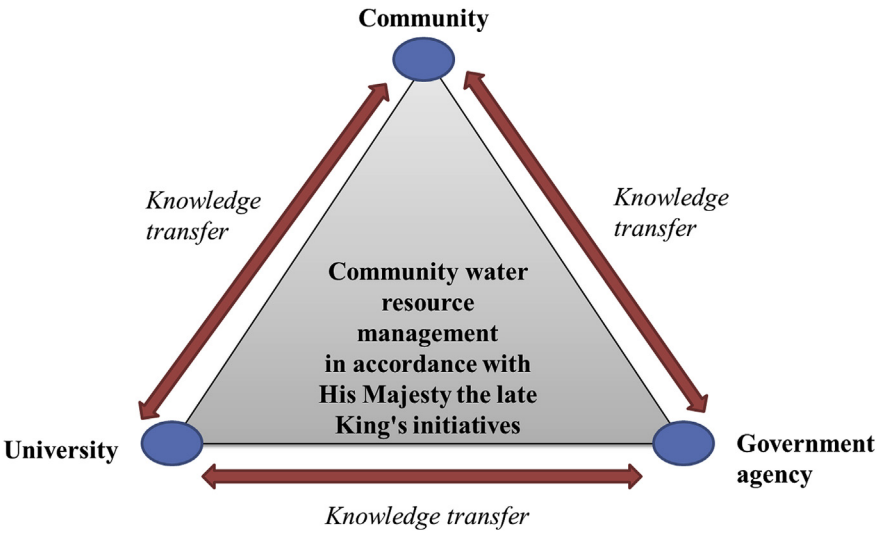

Figure 3 Knowledge triangle of community-based water resource management

a systematic way and using an analysis program to assist in coding and analyzing these data and in organizing the resulting patterns. Validity was increased by collecting data from informants who had different roles and positions (data triangulation), and giving informants the opportunity to review and comment on the empirical material and working drafts of the empirical analysis.

Results and Discussion

Context of the Case Study

The Ban Kuan community, Yala province, with a current population of 831 people (270 households), is an agricultural community where people mostly work in rice cultivation, rubber tree planting, and fruit gardening. Ban Kuan's geography is mountainous in the west and gradually slopes down eastwards into a low lying plain until it reaches the coast. Therefore, this low-lying plain area is flooded every year. Moreover, this community is always faced with drinking water shortages. The water is always tainted, has a rusty color, and is not potable. Therefore, the community is faced with both limited quantities of water for agriculture and limited quality of water for life sustainability.

To eradicate the problems that the community faced, the community started to apply the principles of community water resource management in the area beginning with the compilation of a water map and locating the existing water retaining structures in the area. In this endeavor, they employed satellite imagery and a global positioning system (GPS) to analyze the directions of water flow, to draw a water map, and to collect information about the ground elevation using topographic maps and an altimeter. After that, they planned the improvement of water flow directions. By this method, they could reduce the flood problem that used to last from 20 to 25 days down to 3 days. In addition, throughout their remedial work, the government did not have to spend any budget to fix the problems from floods as they had done in the previous years.

The Ban Kuan community also started a clean-water-processing project. This project is a collaboration between the government offices in the area and the community. They set up a purifying water committee, which consisted of volunteers from the community who collected fees from the people who use the treated water supply. As a result of this project, people have a better quality of life and can buy clean water at a cheaper price. In addition, this community started applying new agricultural practices in the area which helped to reduce the expenses of farm owners and to increase their income by as much as three times. It has also become a model for other communities nearby. This project has been transformed into a larger project under the name 'One Tambon (sub-district), One New Agriculture Farm'.

Collaboration Pattern in Managing Community Water Resources

According to the findings, the Ban Kuan community has applied the water management methodology of the Royal Initiatives to the community, starting by using technology to explore water sources and to draw a water map to understand more about the water availability in the area. After that, they enlarged the existing water retaining structures until they reached a level sufficient for community needs, both under a normal situation and during drought years.

After that, they produced work guidelines concerning the sustainability of water management and local careers by establishing the model group for water management and applying the new theory for reducing expenses. A committee manages every issue concerning water by working with the local government sectors. They explored and collected information about water in the area and set up a water management plan which is appropriate for the

community to increase agricultural products and income as well as to reduce the problems of flood and drought. Then, they expanded the work to other communities and further improved their water management plan with local government sectors to encourage more serious collaboration between the community and government. From start up to the evaluation phase, three main parties (community, government agency, and university) collaborated in the form of a knowledge triangle. Knowledge, technical know-how, information, experiences, ideas, skills, and advice were transferred among the three parties in order to drive sustainability through community-based management.

In conclusion, this case study showed the successful collaboration among the government agencies (Hydro and Agro Informatics Institute and local government agencies), Thammasat University, and the community in transforming the concept of community water resource management into real practice and creating sustainable development for the community (Figure 3). The government agency (Hydro and Agro Informatics Institute) is responsible for supporting the water management of communities according to the Royal Guidelines, supporting and collecting information related to water, publishing and distributing useful information widely, and coordinating with water management agencies and other government agencies. Thammasat University gives advice and technical support on management-related issues to the community, monitors and evaluates the community performance, and coordinates with the government agencies and the community. Community involvement in the project is of critical importance in water management. The government agency and university consider the views, opinions, and perspectives of the community and provide advice as appropriate. Furthermore, the community was actively involved from the beginning of the project through to the evaluation and improvement phases.

Key Success Factors of Community Water Resource Management

As can be seen, community water resource management in the southern part of Thailand aims to manage the water in a way that the problems can be solved permanently and people can rely on themselves. According to the water resource management in the community studied, key success factors can be classified into four groups: management-oriented, community-oriented, social networking-oriented and technology-oriented (Figure 4).

1) **Management-oriented factors**

- Every aspect of the problem has to be managed. This includes the development of a water storage structure according to the conditions of the society and geographical suitability until people in the community have sufficient control both in normal and crisis situations. In addition, the management plan has to be able to support the availability of water and security of the careers of people in the area by supporting and providing knowledge of forest agriculture in order to reduce expenses, increase incomes, and sustain consumption.
- Collaborative work must be developed in a practical way for the community water resource management to be successful.
- Learning and working with the community by creating community ownership. To create the environment of community ownership, every member of the community must acknowledge and participate in every issue at meetings as well there being agreement on the decisions by a majority in the meeting.
- Private and public sectors must support the community by focusing on the benefits to society, economy, and the environment.

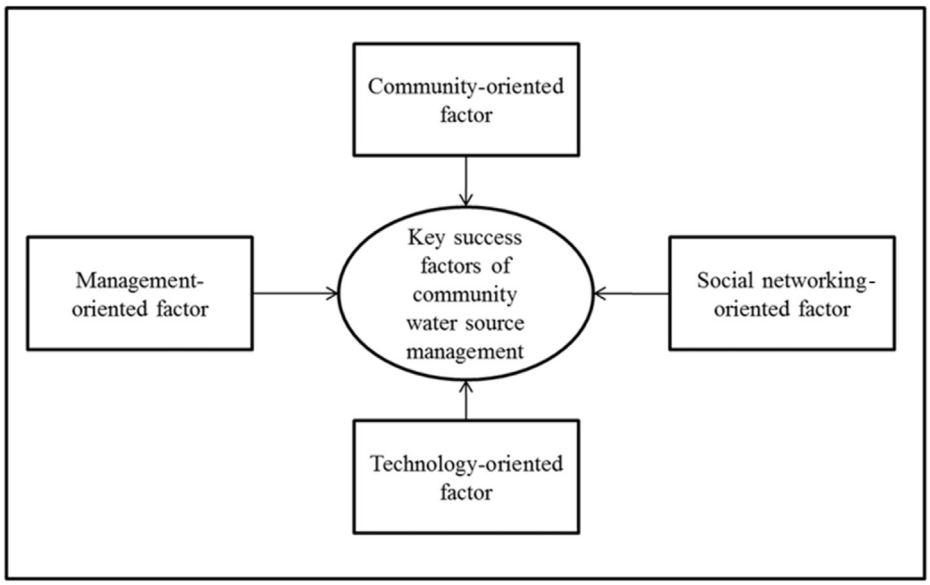

Figure 4 Key success factors of community water resource management from the case study

- The success must be transparent so that it can be a model and an inspiration to everyone in the community. This uses a learning-by-doing process, where every member of the community has witnessed the problems, the input, the process, the output, and the outcome and can transfer them to other communities. This is the best learning method.
- The knowledge developed must be systematically handled so that it can be easily accessed for analyzing, planning, and solving problems.
- Water problems must be solved by developing all available water resources in the area and the existing water structures should be rehabilitated rather than focusing on investment in building new water resources structures.

2) **Community-oriented factors**

- Every community member must be involved from the beginning to the end of the project. Participation of members in learning-by-doing will enhance their involvement throughout the process and inspire the success of the community development.
- The learning process is automatically developed, with the information and facts employed and the problems analyzed in a holistic approach as parts of the learning process.
- The sense of ownership is increased by establishing the water resource management committee. It consists of people in that community, and there are clear obligations and rules for maintaining and adjusting the system.

3) **Technology-oriented factors**

- Science and information technology, such as maps, IT, and information, must be fully employed so that insight can be gained concerning the water situation. In addition, social conditions must be delineated so that people will be able to 'find water', 'wisely used water', 'conserve water', and 'manage water effectively'. This can lead to effective water management and planning and everybody in the community will be wiser.

4) **Social networking-oriented factors**

- Community networking must be expanded. Results expanding beyond the successful community must occur.
- Collaboration must be established between the government sector, private sector and community and the work will benefit society, economy, and the environment.
- Knowledge, skills and technology in community water management must be exchanged among individuals, households, and communities.

Conclusions

Water resource management through the collaboration of the communities is a crucial way to bring sustainability to water management. This study explored the key factors affecting community water resource management in the southern part of Thailand. More specifically, water resource management focuses on all aspects of the geography, life styles, and cultures of people in the area with the main aim of providing sufficient water for people all year round. In addition, the ability of the people will be enhanced through self-reliance, sustainable careers, with financial security.

The results of the study show that collaboration among government agencies, universities, and communities is an important element to drive community water resource management toward sustainable development. However, the endeavor should be driven from the community level by creating community ownership. The government agencies and universities play a partnership role in supporting the community in terms of transferring knowledge, giving advice, supporting management-related issues, and coordinating with water management officials and other government agencies. This interaction can transform the concept of community water resource management into real practice and create sustainable development for the community.

In addition, the key success factors to community water resource management are: 1) management-oriented factors which emphasize the management of water in accordance with the society's cultural norms and livelihoods of people in order to enhance management capabilities and develop the process of learning, using information and facts available and eradicating problems as a whole before starting on a small scale; 2) community-oriented factors, which create community readiness for self-management, must be put in place; 3) social network-oriented factors which build a community network for expanding the results of the work from the successful community as well as systematically managing and transferring the knowledge gained; and 4) technology-oriented factors which apply science engineering, and technology to help the community to manage the water appropriately and efficiently.

Conflict of Interest

There is no conflict of interest.

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