

RESEARCH ARTICLE

THE PATTERNS AND ROLES OF PEOPLE'S NETWORK IN WATER RESOURCE CONSERVATION IN URBAN AREA, THAILAND

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ABSTRACT

The government agencies and private sectors have been putting efforts to properly monitor and alleviate the water quality problems. However, the complaints about wastewater in the urban areas in Thailand is increasing each year. This research aims to study the patterns and roles of people's network for sharing knowledge and plans for water resource conservation in Krathum Baen district, Samut Sakhon province. The qualitative approach through participatory action research (PAR) was used for conducting this research in order to discover the causes of the water quality problems which were caused by management. A focus group discussion, and in-depth interview methods were used for collecting data. The obtained results were analysed by SWOT analysis. TOWS Matrix analysis was applied to evaluate the developed strategies for the implementation of the water conservation management. The results showed that firstly, water resources conservation network played an important role in water conservation management in the river estuary. Secondly, the structure of the people's network was another key factor in the management due to their intention to improve the environment. Finally, the comprehensive SWOT-TOWS Matrix analysis indicated possible strategies for the water conservative implementation which consisted of the participation of developing leaders in water resource conservative management with the government and private sectors, and developing of village learning centre. This finding showed that the participation of the community is necessary for management to preserve water resources and achieve sustainable development goals. In order to obtain the participation, guidelines for the development of people's networks for water conservation is suggested. Furthermore the structure and roles of group as well as patterns and roles of people's network participation are also recommended for successful management to improve the water quality problems.

KEYWORDS

Development, Group Process, Pattern, People's network, Role, Water Resource Conservation

1. INTRODUCTION

The Thai government has developed a 20-year national strategic plan with the goal of improving the quality of life for its citizens along with conserving the environment. With important development goals in mind, cooperation between the inside and outside of the country is necessary in order to achieve the sustainable development goals in all dimensions. The operation based on mutual growth of its economy, environment, and quality of life is crucial for creating sustainability to the next generation. (Samut Sakhon Provincial Treasury Office, 2020). The environmental aspects which consist of the growth, balance and sustainability are prioritized by the Thai government to reach its goal by 2037 when Thailand hopes to be the best of ASEAN countries in terms of citizen's quality of life and environment. Therefore, Thailand has to improve the way to manage its natural resources to be sustainable balanced. To do this, the foundation of the improvement which is the people's sector has to be strengthened. Then, studying how to create these groups or the networks can be an important aspect for development people's network as an important sector for developing the future of the nation.

Samut Sakhon Province is located in the lower Thachin river in the central region of Thailand. Overall, the water quality of the lower Thachin river

was in the deteriorated range. The water quality problem of the river is dissolved oxygen value, including the level of impurities in the Biological Oxygen Demand (BOD) form, and the presence of Coliform bacteria that exceeds the standard level. The problem areas are mostly near the delta of the Thachin river and around the Ban Plong Leam school. Despite both public and private sector efforts to seriously mitigate environmental problems in Samut Sakhon province, during the fiscal year 2012-2017, it appeared that the number of complaints tends to increase each year. In 2013, there were 50 complaints about wastewater problems, while in 2017, there were 79 complaints about wastewater (Ministry of Resources and Environment, 2021).

Therefore, it is necessary to empower the people's sector to conserve natural resources and environment by themselves. To begin with, studying how to link people's network partners and promoting the creation of a network of people's sectors to conserve water resources will enhance participation in the conservation of natural resources and environment. This cooperation will enhance the conservation activity to be more effective because people in the area are directly affected by the change of natural resources in the district of Krathum Baen, Samut Sakhon province. There is a leadership network in the people's sector in the district of Krathum Baen, Samut Sakhon province and it needs to expand its reach in

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order to conserve water resources. There were two main original groups in the areas: one older group was called "Environmental conservation network group" and the other youth group called "Green Ants youth network".

With regards to the field trips of the researcher team, the team has learned that in order to conserve water resources more effectively, the network group needs to be expanded to reach other groups of the people besides the youth. Moreover, the operations of those groups lack a coordinative strategy and effective working systems. To remedy these problems, ongoing promotion activities and a network mapping are necessary to support the groups' collaboration. Therefore, this research aims to connect people's networks for sharing knowledge and plans for expanding a people's network in water resource conservation in Krathum Baen district, Samut Sakhon province through SWOT analysis. This development will support the role of government agencies and the private sector for the work of the people's sector council network. This research project integrates information from the needs of the area to study the structures and roles of people's networks, needs of government and private agencies, and various community organizations to help manage network relationships and build strong communities. Moreover, it will lead to the growth of the community that can be a strong foundation of the development of the society and nation.

2. LITERATURE REVIEW

2.1 Individual with the Water Conservation

From studying the problem of water shortages in Iran, it was found that farmers' willingness to conserve water was largely based on projections of outcomes and self-efficacy. The more a person feels that his water conservation behaviour is satisfying and rewarding for himself, the greater the willingness of individuals to make significant efforts to conserve water will be. Besides conserving water, there is also a religious component to consider, especially in Islamic countries, it is the belief that water is sacred and a gift from God to humanity. Therefore, it is most likely that conserving is helpful (Yazdanpanah, et al., 2015). Based on the analysis of the incentives to take action to protect biodiversity and the environment, it can be seen that there are several important factors to consider. The research question is why people are engaged in actions that support the environment and why people are so committed to protecting the environment. The results of the study showed that most participants had positive experiences with the environment. On the one hand, some people who have had negative experiences can play an important role in taking action to protect biodiversity and the natural environment as well (Molinario et al., 2020). In addition, the youth would participate voluntarily in the environmental field project. It must provide participants with a unique and valuable experience. The sense of satisfaction and accomplishment that came from helping to preserve nature could be powerful motivators. It was also recognized that these benefits were to individuals rather than to the community. It could lead to more environmental protection attitude and wider sustainable environments behaviour in the community (Leyshon et al., 2021).

2.2 Group with the Water Conservation

From the study conducted in water scarce regions in England, social norms, social identity are the most effective when linked to group membership to encourage water conservation in a residential area (Russell et al., 2020). It can create effective communication according to social norms (Lede et al., 2019). It was also found that cognitive resource pooling is also a variable related to environmental attitudes and the relationship of environmentally friendly behaviours (Langenbach et al., 2020). Finally, it was found that raising awareness among group members through capacity-building activities by relevant agencies could help to improve communication and cooperation within the group. It would increase the willingness of participants to participate in sustainable water management (Ahmed et al., 2020).

2.3 Network with the Water Conservation

The form of a strong community organization network must consist of 2 factors: 1) Factors inside and outside the community. 2) Guidelines and models for strengthening community organizations that are participative and self-reliant (Treedej et al., 2021). In addition, to create a relationship between people and nature that is consistent with the ecosystem, there must be an organization to manage, ranging from community-level to network integration. Working together as a network will be able to negotiate the power to manage the environment of the community as well as to solve the environmental crises. In addition, to improve water conservation, it is necessary to develop a participatory protection and

community management program for rivers involving local communities, environmental specialists, and the central government (Borreroa et al., 2020). Therefore, to solve problems that challenge water security require participation from multiple stakeholders. However, the stakeholders who often have conflicting visions can make it difficult to achieve complex and effective water goals. The frequency of discussions and meetings can help to improve adaptive and resilient governance of water systems (Lutz-Ley et al., 2021). Based on the literature review, there were many factors from the dynamic of individuals to the network level for increasing the water conservation behaviour. These factors have never been applied to the Thai context before. It is still the gaps that need to investigate the group of water conservation success and failure cases.

2.4 The Sustainability of Water Conservation

It is crucial to recognize the political nature of water-related decisions when considering creative institutional arrangements for supplying a reliable supply of high-quality water. Water managers must face a difficult challenge for example, reducing water use without taking actions that the public or politicians might find objectionable (Poyner, 1998). In fact, a decision maker may find it easier to adopt a policy that is socially and politically acceptable (Letey 1999). Effective water policy must be supported by sound science, sound economics, and sound social norms (Letey 1999). Undoubtedly, there are political and institutional obstacles to sustainable water management (Kreutzwiser 1995).

To set the stage for this study, it should discuss how innovative institutional arrangements that have wider policy ramifications. Natural resource and environmental management strategies ought to be based on sustainability. An integrated approach to water planning and management is preferred within the context of sustainability. The integrated approach takes a comprehensive approach to solving water supply issues, considering both behavioural and technical aspects of water conservation. As a result, it's critical to comprehend the rationale behind why water conservation is necessary. Once this need is acknowledged, it is critical to investigate issues related to the management of water utilities by the public and private sectors.

Although it seems like sustainability as a goal is widely acknowledged, there hasn't been much progress made in realizing it. A legacy of water management organizations created to promote the development of water supply projects within a framework of economic efficiency has contributed to the lack of progress (Kreutzwiser 1995). The key goal within this framework was to offer clients an abundance of water at a reasonable price. After it was determined that this system was intrinsically unsustainable, interest shifted to alternate water management organizations. A new phase of conversation on attaining sustainable water usage was sparked by increased acknowledgment of ecological integrity and demand management within the current water management institutions (Kreutzwiser 1995).

Finding the essential components of sustainable water management was the first step in reorienting water management institutions toward a new policy focus on sustainability. The use of water that supports the ability of human society to endure and flourish into the indefinite future without undermining the integrity of the hydrological cycle or the ecological systems that depend on it is the definition of sustainable use of water resources (Gleick et al., 1995).

There have been more calls for institutional reform to advance the transition to sustainability even though water management institutions are still in a state of flux. A group researchers argued that more innovative institutional mechanisms that can address a variety of interests in a new environmental context are required by the sustainability agenda, new forms of governance, and calls for greater community involvement in the decision-making process (Wood et al., 1999). The transfer of authority from governmental institutions to the non-profit and private sectors is a crucial component of these new forms of governance (Wood et al., 1999). It could be argued that the process of managing water resources has grown to be so complex that neither the public nor the private sector can handle it alone (Grigg, 1999). Finding an institutional setting that enables the public, private, and non-profit sectors to each achieve their unique goals is the challenge. (Wood et al., 1999). This circumstance has shown the importance of attention to what types of institutional structures are the best to accommodate diverse and locally focused aspirations while paying attention to the demands of the larger picture (Wood et al., 1999). An innovative water conservation partnership that brings together the governmental, corporate, and non-profit sectors and offers a method for successfully balancing social, environmental, and economic sustainability issues is presented in figure 1.

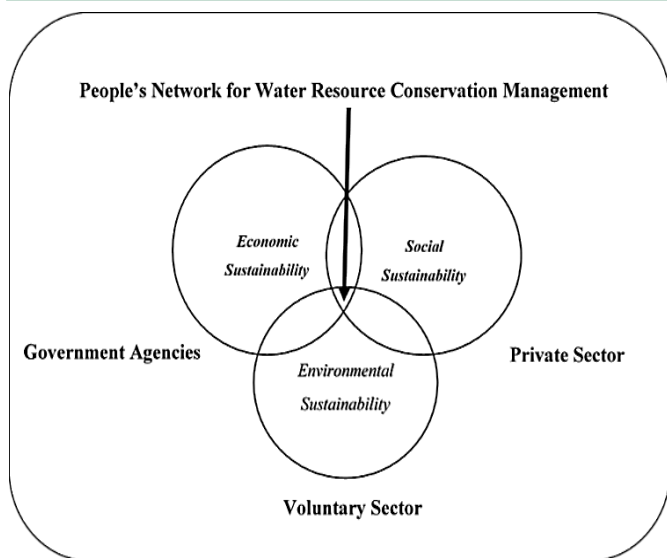


Figure 1: Sustainability and People's Network for Water Resource Conservation Management

3. MATERIALS AND METHODS

3.1 Group Discussion Methodology

This research is qualitative research. The design of this research was combining the concept of social science, community development and participatory action research (PAR) in Krathum Baen District, Samut Sakhon Province. The composition of the group for creating a focus-group discussion can be summarized as follows: 1) Regardless of race, religion, gender, and number, everyone should work together to meet their own needs. Combining different tools and strategies can help solve common problems. 2) The common interest that brings people together is what they have in common. For example, the members of this group all have the same needs. A common problem shared by many people is a reason why they joined the group. Until the group has determined what its goals are, it should consult together to find a solution. This will help the group achieve its objectives. 3) Interaction is essential for group cohesion. If the group members are related to each other, then they can work together to continue the group. There are mutual interactions. In particular, creating a sense of unity within the group will enable the group to work effectively.

There were five steps of this overall method as follows:

- Step 1 Understanding the resource and information: The research team has studied the process of building a conservation network, which was carried out by the green ant youth network and the environmental conservation network group in Krathum Baen district. The activity calendar was helpful in understanding the process. Mapping network clusters using satellite image analysis and GPS coordinates facilitated understanding of the expanding directions of the network.
- Step 2 Participatory action research (PAR): This project is participatory action research. Everyone who participated in the research had a voice and a say in what happened. There were many ways to collect data. The green ant network group and the environmental conservation network group were both based in Krathum Baen district, Samut Sakhon province.
- Step 3 Preparation stage: The third step was to coordinate the area and build relationships with the community. The researcher contacted the conservation network coordinator to study the status of the group and then planned the research together. The community networks in research areas have had a plan for monitoring changes in water resources in the area before this research project started.
- Step 4 Doing research: This step involved firstly, studying factors that were related to group formation, group processes, roles, and participation of the network in the conservation of water resources; secondly, conducting the model, methods, and procedures for solving problems and obstacles in the implementation of natural resource and environment conservation; thirdly, conducting group's working process; and then conducting a plan to develop people's network in

water resource conservation in Krathum Baen district, Samut Sakhon province.

- Step 5 Analysis and evaluation; the strengths, weaknesses, opportunities, and limitations were analysed by SWOT and TOWS Matrix analysis.

3.2 Data Collection

The duration of this research was 12 months, starting from February 2020 to February 2021. The data was collected from the green ant network group and the environmental conservation network group in Krathum Baen district. Samut Sakhon province by using data collection methods that emphasize community engagement practices. The familiarization method in-depth interviews and focus groups were used for data collection in the study area 3 times with participants from 3 sub-districts to join in each time. Eight participants who were leaders of the people's network in each sub-district joined the interview and focus group discussion, so everyone had the opportunity to express their opinions as much as possible. The meetings were arranged for group discussion by making appointments with the people's network in each sub-district in Krathum Baen district, Samut Sakhon province as follows:

- The 1st time, July 12, 2020, 9 a.m. – 4 p.m. at Suan Sukkaphap 72 Phansa Rama IX in Muang Krathum Baen municipality, the target group consisted of the people's network from 3 areas: Muang Krathum Baen municipality, Donkaidee subdistrict municipality and Thasao subdistrict administrative organization.
- The 2nd time, July 19, 2020, 9 a.m. – 12 p.m. at Suwan Rattanaram temple in Khaerai sub-district, the target group consisted of the people's network from 3 areas: Suanluang sub-district municipality, Khaerai sub-district administrative organization and Khlong Maduea sub-district administrative organization.
- The 3rd time, July 26, 2020, 9 a.m. – 12 p.m. at Thakrabue school in Bangyang district, the target group consisted of the people's network from 3 administrative organization areas: Thamai district, Bangyang subdistrict and Nongnokkhai subdistrict.

3.3 Data Analysis

The data of this research was obtained by leaning from the community which using familiarization method, conducting in-depth interviews, and participatory process. The data was verified during the process of data collection and performing activities with the community every time. The participants were given a summary of the information in order to assess and examine the process of carrying out the activities, learning outcomes, and mutual understanding of the content. Therefore, the information obtained from the participants was reviewed and verified by all stakeholders.

4. RESULTS

4.1 Group Formation Factors

People's network for water resource conservation in Krathum Baen district, Samut Sakhon province derived from a gathering of many groups. Muang Krathum Baen municipality is the major people's network that has consisted of the members of Krathum Baen market community organization council, Khlongphasi Charoen group and the Rak Khlongphasi Charoen group since 2013. The aim of this network was to monitor, protect and restore the Klongphasi Charoen Canal and canal tributaries in the area. There are the community organization development institute as the institution together with local agencies in provinces that support the network by providing academic knowledge, the concept and workflow. In terms of the public sector, the district and the government agencies in the area support the purpose of integration, joint monitoring, conservation and restoration of the Klongphasi Charoen canal and branch canals in their own community areas. The main reason for the grouping was the presence of water quality and environmental problems in the area. Within the community, small group discussions were used to form groups at the sub-district level. These groups then had the opportunity to share their backgrounds and formation from these smaller discussions.

Figure 2 shows six factors of group formation of people's network:

- 1) Leaders: are essential for groups to function effectively. They must

identify the goals of the group and provide a driving force for problem solving. Leaders can be village wise men, knowledgeable people, and local leaders such as the village chief, village chief's assistant, and village committees. They can play an important role in facilitating community engagement. Leaders must be the ones driving water conservation efforts. There are unique characteristics of the leaders such as enthusiasm for working for citizens, dedicated to environmental protection, selfless, positive attitude towards innovation, and ready to learn. These traits are usually represented by one's spontaneity. This could be a community leader or a recognized member of society. The leaders of these networks are members of the community organization council, which oversees the network's operations such as local village head, assistant village head, village primary health volunteer (VHV), and the volunteer to protect natural resources and environment in the village.

2) Environmental problems: are the causes that bring people together as a group. Krathum Baen district has the Tha Chin River and sub-trenches scattering throughout the community. Sewage and flooding because of clogged garbage are examples of the problem in the area. When the group formed, it can strengthen the cooperation. They work together to find solutions to environmental problems in the area by coordinating with the responsible government sectors. When people become aware of the water crisis, they come together to organize a movement in order to conserve water resources in a way that allows the community to have a say in how the resources are used.

3) Interaction: The network consists of many groups. The leader of each group has many roles including monthly community leader meetings as well as ad-hoc meetings when necessary. They also attend the annual meeting of network's members. Groups of volunteers and women's groups also play an important role in the village committee board by providing allies and supports for operations. There are several groups that are responsible for addressing this issue. This is the social cost that has already been incurred as a result of the obligations that are in the area. All of these people are close to the community, and they have contributed to it in different ways.

4) Meeting the needs: The Tha Chin River, Khlong Phasi Charoen and branch canals in Krathum Baen district are important waterways that have been an important source of sustenance for the people of Krathum Baen for long time. When the water quality in the Tha Chin River and its tributaries cannot be consumed safely, it affects the people both directly and indirectly.

5) Participation: This network is dedicated to solving problems and preventing common issues. There are two types of participation:

5.1) Official participation: It is a group formed by government agencies to encourage participation between institutions and communities such as the natural resources and environmental protection volunteer group, irrigated canal water user groups, community organization councils, village primary health volunteers (VHV), village peacekeeping unit, and the new group under the water resources 2018 act called water users group.

5.2) Informal participation: People become members of the group in the manner of relatives, neighbours, or membership in a community. Then they participate in various activities that community members can use to conserve water resources, such as Loi Krathong festival, making merit by offering of food to Buddhist monks, etc.

6) Activities: The network has carried out activities related to the preservation and rehabilitation of Klong Phasi Charoen canal since 2014, such as Samut Sakhon environmental rehabilitation day activity, big cleaning day activity on July 4th every year, Klong Phasi Charoen Canal conservation activities, etc. The group also organizes activities to celebrate important days, such as religious days and environmental conservation days, in order to promote the growth of the people who come to work in the area to be aware of environmental protection. In addition, the network has carried out environmental conservation activities such as canal dredging, embankment protection, constructing of a dam prevents wastewater, cleaning of canals (e.g. trimming branches, picking hyacinths, inserting EM into canals) in various communities. In the future, this network has plans for the next phase, namely canal dredging and cleaning such as pruning the branches, picking up trash, picking water hyacinths, etc.

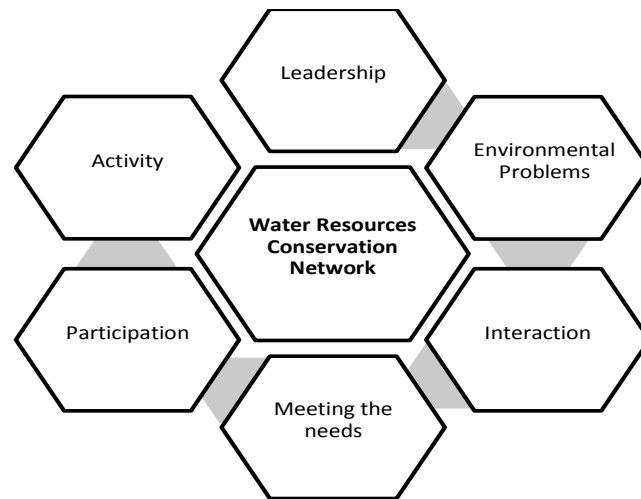


Figure 2: Relationship of the factors of group formation of the people's sector network to conserve water resources in Krathum Baen District, Samut Sakhon province

4.2 Group Structure

The structure of the people's network is based on the background of group formation. It can be classified into 2 groups, namely, the existing people's network with potential and new groups that have the intention to improve the environment.

1) Existing potential group: It is a group that has a good relationship with the network in Talad sub-district and expands to the concept of conservation through a network of leaders such as the green ant youth group, volunteer groups, village natural resources and environmental protection volunteers, village public health volunteers, village security kits, etc. It has been extending to Don Kai Di, Suan Luang, Tha Sao, Bang Yang, Tha Mai, and Khlong Maduea sub-district. This network already has activities that must be carried out together in accordance with the original mission. People in Talad sub-district are the coordinators when organizing activities or solving problems in the community. The prominent people's networks in water conservation in the research area are as follows:

1.1) The Green ant group was established in 2015. At the present, they do the activity once a month due to COVID-19. When there is an activity that involves children coming together to learn about environmental conservation, this group will often participate because they have been being cultivated an awareness of the importance of environmental stewardship through their activities. In the early days of the formation of this group, there was a lot of cooperation among the green ant youths. Governor of Samut Sakhon at that time paid close attention to the quality Klong Phasi Charoen Canal. Therefore, ongoing activities existed. In later time, however, the green ant group youth had less time to participate in activities because they had to go to special classes. This green ant youth group is located in Talat Krathum Baen sub-district.

1.2) The natural resources and environment protection village volunteer group (TSM) is located in the city. The people's network is a network of community organizations in the Talat Krathum Baen and Bang Yang subdistricts.

1.3) Water user group is a group of farmers in Thamai sub-district and Bangyang Sub-district. It is a group of water consumers of the Royal Irrigation Department. There is a conflict between shrimp farmers and orchid farmers in the area. When there is a meeting of water consumers, this group always send representatives to participate, namely the people's network in Thasao sub-district, Thamai sub-district and Bangyang sub-district.

1.4) Village security kit group is directly up to the village headman, the department of provincial administration. This group is a group responsible keeping peace and order of the village in all dimensions, including the issue of wastewater. The main mission is to monitor the water quality in the area, such as the release of water from industrial plants. This group is the people's network in Suan Luang sub district.

1.5) Other groups do not relate to a group of local leaders. These groups are the industrial sectors nearby or along the canal area, for example, the people's networks in Donkaidee sub-district and Khlong Maduea sub-district

2) Newly developed groups: From the history of this new public sector network, there is evidence that a group of individuals has lacked inclusion or has not had continuity until the present. There is no collective action to conserve water resources, although they have been carrying out water conservation activities in specific areas in different ways. These groups are the people's networks in Khairai sub-district and Nongnokkhai sub-district. These new groups need to be developed and should promote integration. They have already been interested in joining the people's network for water resource conservation, but there is a challenge because the conditions in two sub-districts are different.

Nongnokkhai sub-district used to have a group of orchid growers and farmers, but it lacked continuity and most of them joined together to form a network of people's sectors near Banphaeo district. They also wanted to participate in activities to conserve natural resources and the environment and to exchange experiences in solving environmental problems. Therefore, there were attendees who were representatives from every villages. All groups of Nongnokkhai sub-district as well as those of Khaerai sub-district are in an urban semi-agricultural area. These are new generation groups that are interested in conservation. Thus, currently people voluntarily participate in environmental activities in the area. It is interesting that this could be expanded into network groups at district and provincial levels.

There are now two additional groups competing with the others. This new group was formed from a network of local people who believe that "making people have a conscience" is a worthwhile goal. Therefore, garbage was collected by the group with the mentioned activity. Despite its limited size, the group has only just begun to operate. In addition, the group also invites Buddhist monks to take part in the activity in order to attract people to participate by having the monks as a focal point. Previously, the canal would be filled with water to make sure that it was in good condition for the rowboats to be rowed in the canal for collecting garbage. If bad water had not been released first, there would have been terrible smell from the water. This new group has been well known to the original group. *Participation patterns, roles, and driving force of the people's network*

1) Participation patterns: There were 5 patterns of people's network in water conservation in Krathum Baen district, Samut Sakhon province as follows:

- a) Regular meetings for maintenance network: There was a monthly meeting. The meeting venue might be changed depending on the availability of a suitable location.
- b) An open discussion forum allowed participants to share their ideas and thoughts with others. This helped to build awareness and encourage others to participate in the activities. It was usually held after events such as religious holiday waste disposal events, canal dredging, riverside waste PR events, etc.
- c) Educational campaigns and collective activity dissemination such as garbage disposal campaigns on religious holidays, canal dredging, and public relations campaigns about riverside garbage
- d) Liaison occurs when two or more sub-districts or villages are administratively separate from one another. The community leaders, who will relay the information to the community members, will communicate via telephone calls. Most members are related, have regular interactions, and live in the same or nearby neighbourhood.
- e) Participation is based on beliefs and rituals. The conservation of resources is an important part of managing the environment.

2) Roles: There are six roles of the people's network in water conservation according to different sectors that take part in the water resource conservation activities.

- a) Government agencies consist of the sheriff, office of natural resources and environment, Samut Sakhon province, office of environment region 5, and department of water resources department of agricultural extension district agriculture office. The role of this group is transferring knowledge, technology, and methods to support the work of environmental conservation.
- b) The local government consists of Samut Sakhon provincial administrative organization (PAO), city organization (CO), district Municipality organizations, tambon administrative

organizations (TAO), and village mayor. The role of this group is to promote conservation network activities into local development plans which lead to budget, knowledge and equipment allocation to support work.

- c) The network or people group consists of the water consumer groups such as volunteer network for protecting natural resources and village environment, village primary health volunteer, green ant youth group, village peacekeeping kit, civil defense volunteer, housewives group, elderly group, orchid farmers community organization council, and provincial people's patrol. The role of the network builder is to engage in thinking and participating in activities that the group has agreed to organize.
 - d) Independent organizations are composed of the community organization development institute. The role is to support knowledge and budget for organizing activities.
 - e) Educational institutions consist of schools, colleges and universities. The role is that the schools in the area play an important role in organizing activities and encouraging the youths to participate in various activities organized by this network such as activities to disseminate knowledge on river conservation at the elementary and secondary and levels.
 - f) The private sector consists of industrial plants, shops, and enterprises. The role is to support food and beverages for the people who join the events or activities.
- 3) Driving force: Driving force factor for the future of people's networks for water protection in Krathum Baen district is the cooperation of the government agencies and private agencies. In order to maintain its position and role in its further operation in the long term, the network should provide elements for its development by using catalytic mechanisms to increase the efficiency of people's networks. The guidelines are as follows:
- a) A working group should be established to work on behalf of the people's network. There should be a voluntary secretary per sub-district to help with important tasks, for instance budget planning, contacting with government agencies, and coordinating with the private sectors.
 - b) The meeting of the working group should be arranged in Krathum Baen district. The members of the meeting consist of two advisors, and the leader, secretary and four representatives from each sub-district.
 - c) The network works together to develop the circular economy concept and economic issues. This document contains a strategic plan for conservation and restoration of the Tha Chin river and canal branches, as well as a database of the causes of the river pollution in Krathum Baen district.
 - d) The potential leaders such as mayors, sub-districts leaders, village headmen, etc. should be encouraged to push the network's plans and activities to be embedded in local development plans.
 - e) Work plans and activities should be prepared and submitted to various organizations, such as the environment regional office, the natural resources and environment office, the community organization development institute, local administrative organizations, the royal ministry of irrigation, the water resources department, the fishery department, provincial agricultural offices, etc. These organizations are responsible for exploring the causes of the problem of sanitation in the Klong Phasi Charoen canal and the Tha Chin river.

4.3 SWOT and TOWS Matrix

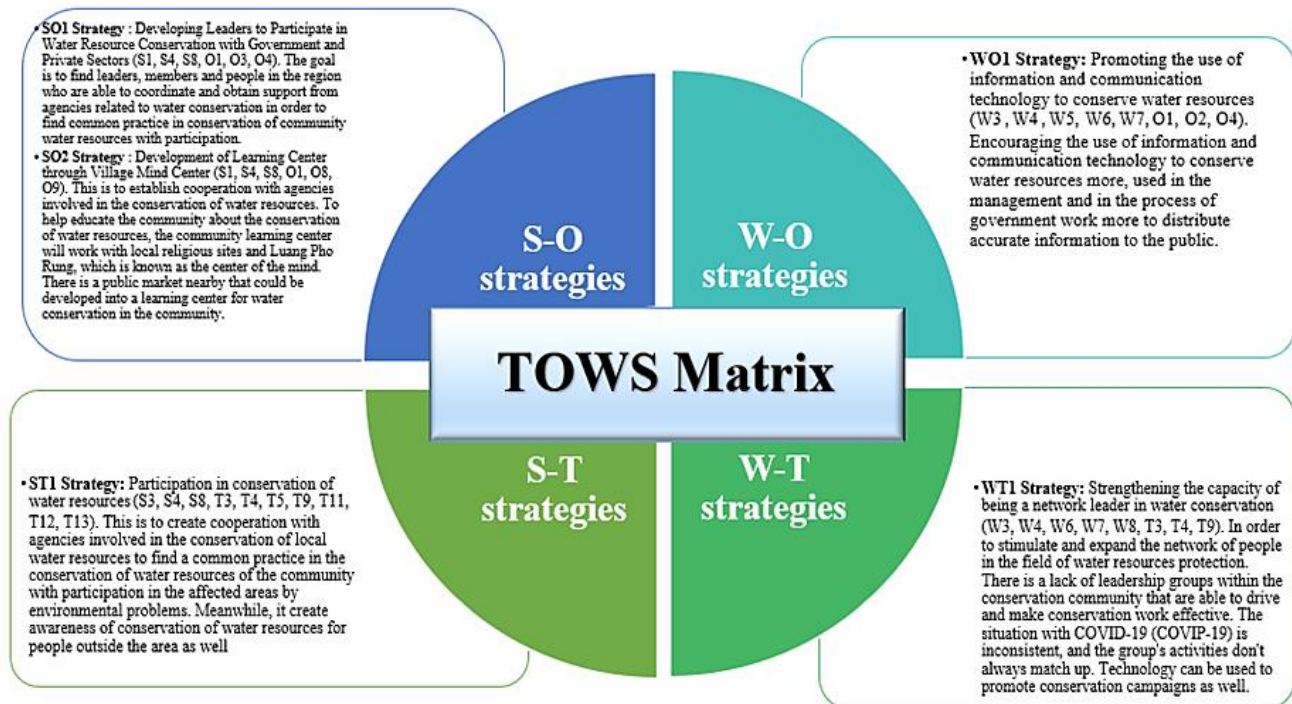
After the data collected from the focus group discussions had been analysed and presented to everyone, the research team worked together with the relevant agencies to verify the accuracy and reflect the image from the people's network to the relevant agencies. The obtained information was then summarized as problems, strengths, weaknesses, opportunities and obstacles in the protection of water resources by the people's network at Krathum Baen district, Samut Sakhon province as shown in Table 1.

Table 1: SWOT analysis of people's networks classified by local administrative organizations

Issue	Local Administrative Organization								
	1	2	3	4	5	6	7	8	9
Strengths: S									
Leadership									
Strong community leaders	✓	✓			✓		✓	✓	
Being a leader in activities	✓	✓							
Membership									
Members gathered due to problems, impacts, and need to solve problems in the same direction				✓				✓	
Member cooperation in doing good activities, having strength in their work, and working with a volunteer spirit.	✓	✓		✓	✓	✓	✓		✓
Management Inside Organization									
Regular meetings and discussions on issues	✓					✓			
Continuity of activities	✓	✓							
Problems are presented to the responsible agencies	✓	✓				✓			
Relationship in Community									
Unity and cooperation of the community in running activities	✓	✓			✓		✓		✓
People in the community have the correct academic knowledge and practice consistently.							✓		
Weaknesses: W									
Leadership									
Leaders have many roles. (Wearing too many hats)								✓	
Not having enough leaders for network operation							✓		
No group leader to drive activities			✓	✓	✓	✓		✓	✓
Lack of strong group leaders			✓			✓			
Membership									
Members do not participate in activities organized by the network.		✓							
Members still lack knowledge or understanding.	✓								
Members recognize the issues but do not take an action when issues are reported.		✓			✓				
Management Inside Organization									
Unclear operational plans	✓								
Not as developed as it should be		✓							
Opportunities: O									
Government agencies in the area									
Internal and external agencies cooperate to support knowledge, equipment, and budget for water quality measuring. There are agricultural clinics to provide knowledge and participate in activities including giving out gifts.	✓	✓		✓			✓		
There are other departments coordinating to help.	✓								
Local government authority									
Agencies in the area such as the Provincial Administration Organization taking care of digging canals, collecting water hyacinths, spraying grass, supporting budget, etc.								✓	
The municipality organizations cooperate and support knowledge, equipment, and budget. The TAO provides laws, knowledge, personnel, and an agency that is responsible for the environment.	✓					✓			
Private sector									
The industrial sector has supported the budget.				✓					
Community stores support food and drink when running activities.	✓	✓							
Others									
Law enforcement									
The public market allows people in the area to have more opportunities to build up networks.				✓				✓	
A respectful monk as the centre of the minds of the villagers							✓		
Treats: T									
Policy									
Leaders' policies change frequently.		✓							
Lack of serious law enforcement	✓								
Social									
Some people from both household and industrial sectors lack awareness of the canal maintenance.	✓	✓							
People from outside the area lack awareness of conservation of water resources.		✓		✓					
Not many people are interested in conservation work.		✓							
Economy									
Lack of supporting budget from relevant agencies	✓								
Natural food sources are dwindling.	✓								
A promotion of shrimp farming in the area								✓	
Environment									
The pandemic of COVID-19 has made it difficult to contact the responsible authorities and create the network meetings.	✓		✓			✓	✓	✓	
Based on geography, the river cuts through the central of the area which divides the sub-district into 2 parts, resulting in inconvenient communication.							✓		
Chemicals are much used in agriculture.				✓					
The smell of polluted water caused by wastewater from agricultural activities, household, and industry is disturbing.	✓								
Saltwater situation in the area	✓							✓	✓

A result of SWOT analysis was applied to the TOWS matrix as shown in Figure 2. The difference of SWOT and TOWS analysis is that all four elements namely 'Strengths', 'Weaknesses', 'Opportunities', and 'Threats' are arranged differently. Insightful options obtained from all interviewees and the respondents were recorded and incorporated into this analysis. The matrix encompasses significant concerns of each level of people's network for water conservation in Krathum Baen District in different perspectives of different processes. Figure 3 describes the four strategies. Tags in parentheses indicate the SWOT factors that would be impacted by the strategy. According to the results presented in Figure 2, a strategic quadrilateral was built, which could directly reflect the orientation of the

best strategy for water conservation in Krathum Baen district. Based on the comprehensive SWOT - TOWS matrix analysis, possible strategies for the implementation of the water conservation were Strength-Opportunity (SO) which consists of firstly, the developing leaders to participate in water resource conservation with government and private sectors and secondly, developing of village learning centre. For the other strategies, the TOWS Matrix also showed a possibility, although more time was needed to solve their internal problems. Thus, the most effective strategies were SO1-2 which indicated the potential to motivate the people in Krathum Baen district to conserve water.



Note: 1. Krathum Baen Municipality 2. Don Kai Dee Sub-district Municipality 3. Tha Sao Sub-district Municipality 4. Khlong Maduea Municipality 5. Khae Rai Sub-district Municipality 6. Suan Luang Subdistrict Municipality 7. Bang Yang Tambon Administrative Organization 8. Nong Nok Khai Tambon Administrative Organization 9. Tha Mai Tambon Administrative Organization.

Figure 3: Strategies for improving the people's network for water conservation in Krathum Baen district, Samut Sakhon province

5. DISCUSSION

5.1 Guidelines for The Development of People's Networks for Water Conservation

Based on the findings of the focus group discussions, in-depth interviews, SWOT analysis and the TOWS matrix analysis, plans for the development of people's network for water conservation can be applied by using the following strategies and objectives:

1) Develop good leaders to promote conservation of water resources with governmental and private agencies. The objective of developing good leaders is that the members and local people are able to coordinate and access to supports from agencies related to water conservation and find common practice in the conservation of water resources from the participation of community. Public initiatives and subsidies offer financial assistance and can be used to sway public opinion in favor of adopting water-saving technology. Public initiatives and funding, including those that promote smallholder finance, might, for instance, be a key driver of adoption to get over financial barriers to investing in new technology (Drechsel et al., 2005).

2) Create participation in the conservation of water resources. The purpose is to establish cooperation with local water resource conservation agencies to find common practices for the conservation of water resource in the community. This involves the participation in the areas affected by environmental problems and raising awareness of the conservation of water resources for the latent population. Public initiatives and funds offer financial assistance and can be used to influence attitudes toward the adoption of water conservation measures. Public initiatives and funds, like those that support smallholder financing, can, for instance, be a key driver of adoption to get around financial barriers to investing in new technologies (Drechsel et al., 2005).

3) Encourage the use of information and communication technologies for water resource conservation. This is for promoting the use of information and communication technologies for the wider use of water resources and their wider use in government management to disseminate accurate information to the public sector. According to prior research, farmers appreciate the ecosystem services provided by their farms, and farmer-related variables including ignorance and a lack of access to sufficient information have been connected to low involvement in conservation-based initiatives (Momenpour, 2021). The results of this study's findings are consistent with those of which discussed how ecosystems affect conservation practices. Strengthen leadership skills and expand the network (Asah et al., 2014). The purpose is to maintain or integrate water resources in each sub-district, relevant sectors, networks, and association to deploy, and expand the carried-out work in any circumstances.

5.2 The Structure and Roles of Group

Regarding the study from the original group, it can be classified into 2 groups, firstly, the existing potential people's network and secondly, the new developed groups.

1) The existing potential group is a group that has a good relationship with the former network in Talat sub-district. They have expanded the concept of conservation through the networks of green ant youth group and volunteer groups such as village natural resources and environmental protection volunteers, village public health volunteers, village security kits, etc. These networks have activities in accordance with the original mission, social norm, and identity as a capital network of people in Talat sub-district. They are also a coordinator when organizing events and activities or having problems in the community. Thus, social norms and identity are the most effective when linking to group membership to encourage water conservation in a residential area (Russell and Knoeri, 2020). It can create effective communication according to social norms (Lede et al., 2019). Moreover, the existing potential group is combined

with the cognitive resource pooling which is also a variable related to environmental attitudes and the relationship of environmentally friendly behaviours (Langenbach et al., 2020).

2) According to the formation history of this network, a new group development is a group that lacks integration or may have been together in the past with no continuity. Until now, there has been no collective action to conserve water resources. They were doing water conservation activities individually in specific areas, and in different ways. They should be encouraged to join the people's network in conservation of water resources at the district level. However, there are some challenges to continue and expand into other network groups at the district and provincial levels. This empirical result is related to the self-efficacy, there should be some religious activities provided to increase the belief of water

conservation (Yazdanpanah et al., 2015). Also, both positive and negative experiences with the local river and natural water should be provided and shared for increasing the actions to protect biodiversity and the nature (Molinario et al., 2020). Finally, the sense of satisfaction and accomplishment that comes from helping to preserve nature can be a powerful motivator. Creating the sense benefits individuals rather than the community. It can lead to more environmental protection attitude and wider sustainable environment behaviour of a new group development (Leysion et al., 2021).

5.3 Patterns and Roles of People's Network Participation

From the empirical results, it was found that the patterns and roles of participation can be summarized to showed in Table 2.

Table 2: Stakeholders and roles of participation of people's network in water conservation at Krathum Baen District

People's Network for Water Resource Conservation at Krathum Baen District	Roles
1. Public sector:	1. Give support to the network with transferring knowledge, technology, and methods
2. Local government authority:	2. Drive the activities of the network into the local development plan to lead to the allocation of budget, knowledge and equipment
3. Network/People sector:	3. Take part in building a network and participate in the network's activities
4. Third sector/ Independent organization	4. Give support to the network with giving knowledge, providing specialists and the budget for water conservation activities
5. Educational institution:	5. Participate and send the youths to participate in various water conservation activities
6. Private sector:	6. Subsidize budget

Table 2 shows the participation of related stakeholders with different duties and roles. Certainly, working together as a network empowers the negotiations to manage the environment of the community as well as the solutions to the environmental crises. Improving the participatory river protection and community management program should involve local communities, environmental specialists, and the central government (Borreroa et al., 2021). Thus, sustainable solutions to problems require participation from multiple stakeholders. Local government must be an important stakeholder to frequently provide discussions and meetings for improving the adaptive and resilient governance of water systems (Lutz-Ley et al., 2021).

6. CONCLUSION

According to the overview of the people's network for water resource conservation at Krathum Baen district, Samut Sakhon province has been formed by the merger of many groups. Krathum Baen community network is the main network that has been formed by joining the members of the Krathum Baen market community organization council, Khlong Phasi Charoen group (KPCC), and the Rak Khlong Phasi Charoen group since 2013. There were six important factors that contribute to the water resource conservation network in the research area, namely group leaders, environmental problems, interaction, meeting the needs, participation, and activities. The structures and roles of the groups can be classified into two groups, namely, the existing potential people's network and the newly developed group. In terms of pattern and role of driving the people's network, it was found that in many sub-districts, the people's network developed to the stage of collaboration with both public and private agencies with the intention to maintain the network's status and play a role in further operations. In the long run, there should be a plan for network development by using the driving mechanism to increase the efficiency of the people's network operation and expansion. Finally, it was found that the patterns and role of people's network for empowering negotiation to manage the environment of the community as well as solving the environmental crises.

The COVID-19 epidemic has been likely to cause a large outbreak and prolonged health effects in Thailand. It was a major limitation to this study because it was a participatory action research project and relied on community input. Group activities were conducted such as group talks, discussions, and workshop. The original number of participants was approximately fifty people. Therefore, the method had to be reviewed and modified in accordance with the disease control measures of Samut Sakhon province. The modification involved various communications such as telephone, email, social media, and zoom meeting in order to monitor the situation. For further study, it is recommended that insights data about community behaviour and beliefs about conserving water resource should be used to encourage water conservation in residential and spiritual areas. In addition, studying the ways in which communication through cultural traditions and beliefs influences people's behaviours towards conserving water resources. There is great potential for connecting environmentally friendly behaviour with the social identity of a community.

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