Community Participation Network Guidelines for Water Hyacinth Removal in Khlong Rangsit Pathum Thani

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Abstract

This study proposes the guidelines for community participation network focusing on water hyacinth removal and leveraging such aquatic weeds in Khlong Rangsit, Pathum Thani province. The methodology used in this study is of qualitative research and the samples are 8 associates related to water hyacinth removal at Bung Ba swamp, Nong Suea District, Pathum Thani Province, selected among community leaders, locals and private and government sectors agents. Semi-structured interview is constructed as the research instrument; in-depth interviews data collecting and content analysis. The consequences regarding knowledge and insight on water hyacinth removal and community participation highly rely on estimated fund, instruments and methodology which require attentive planning and agreeable collaboration from all sectors.

Keywords: participation, community, water hyacinth removal

Introduction

Rangsit Prayunsak Canal was first constructed under King Chulalongkorn's royal edict, stretching from west to east between Chao Phraya River and Nakhon Nayok River covering approximately 56 kilometers from Thanyaburi district, Khlong Luang district, Lam Luk Ka District and Nong Suea district. The sluices were installed at both ends of the canal; the Chulalongkorn Sluice in Pathum Thani and the Saovabha Phongsri Sluice at Ongkarak District, Nakhon Nayok Province. The canal was originally designed as one of the first irrigation project in Thailand. Owing to this project, Thailand has since become the world's leading rice exporter (Institute of Thai Studies, Chulalongkorn University, 1994). However, the importance of this canal on agricultural use is immensely reduced; mainly used nowadays in manufacturing estates as a water channel. Thus, the considerable amount of maintenance along the Rangsit Prayunsak Canal is still highly required.

Having numerous waterways and extensive number of agricultural areas, water hyacinth is considered noxious weed in Pathum Thani due to its rapid propagation impeding irrigation. Hence, installing knowledge and insight for further understanding and collaboration between local communities, government and private sectors are favorable. By doing so, certain areas had been designed for the removal and control the amount of water hyacinth in each community. Waste areas were established and people involved are expected to follow certain methods and process for maintain and improving local environment; the cooperation would therefore install and endorses a large-scale environmental awareness in the society for further cooperation and successful operation.

Upon constructing the research, it is established that presently water hyacinth is considered noxious weed harmful to waterways in which to operate the removal of such plant would require collaboration from all sectors. Not only constantly carry on an eradication project of such weed would be beneficial to waterways, but also the plant could be leverage to commercial products, adding values to handicraft and encourage careers for locals. The efficient learning process would then be enacted; beneficial to communities in terms of knowledge and learning which were to be adapted to suit each community. The operation was carried out by all sectors, government and private organizations, including community leaders, local administration and local students. In terms of community development focusing on academic knowledge, there are procedure and proposals for community management by mobilizing community leaders, local Buddhist organizations and academic centers to assisting the sustainable maintenance of local canal.

Objective

To study the methods and guidelines for community participation network in removing water hyacinth and leveraging the aquatic weed in Khlong Rangsit-Pathum Thani, Pathum Thani Province.

Review of Literature and Conceptual Framework

1. General knowledge on water hyacinth removal

1.1 General characteristics of water hyacinth: a buoyant bulb-like Monocotyledon aquatic plant commonly found in both natural and local aquatic sources. Its name varies depending on the areas such as Ya Yawa in Pathum Thani, Pak Pod, Sawa plant and Pak Tobpong in central region. While people in the

Northeast would often dub it as Pak Pong, those in the South refer to it simply as Pak Tob and Northerners call it Pak Bua Loy (Prakongwong, 1991). Water hyacinth usually gives impressive outlook at the early stage and would later propagate beyond control into waterways (Regional Environmental Office 5, 2011).

1.2 Botanical characteristics of water hyacinth: An Herbaceous plant with grass-like monocots. It leaves are often green with reddish tints. The bulbous stalks are generally green and consist of 95 percent of water with spongy bulb-like nodules to keep it afloat above the surface. Its rootlets are free hanging at roughly 30 cm in length. It reproduces by stolon and its fast-growing nature would flourish during rainy reasons. Water hyacinth is resilient to all conditions; thus, it could reproduce even in polluted waterways (Phukhajorn, 2003). However, water hyacinth usually becomes dry during dry season and winter and would repopulate afterward (Regional Environmental Office 5, 2011).

2. Growing stages of water hyacinth

The growth cycle of water hyacinth is categorized into 3 stages depending on seasons as follow.

Stage 1 January- April: The weather becomes dryer during these months. The amount of water in waterways gradually reduce; resulting in the high density of water hyacinth within those waterways. In some areas, the dense water hyacinth could impede the flow of water and later cause pollution due to the lack of oxygen by blocking the surface and the flow.

Stage 2 May – August: Active attempts to remove water hyacinth are highly encourage during rainy season. Although, the level of water is scarce, water hyacinth could promptly reproduce and propagate. Apart from removing them and allow to dry along the canal banks, herbicides would also be used in some areas.

Stage 3 August-December: the removal operations are frequently carrying out during this time of the year. Thus, the large amount of water hyacinth grew in rainy season are drastically reduced and would be reproduce at the end of the year due to lesser watercourse causing the residue of remaining water hyacinth in each area.

3. Issues caused by water hyacinth: As an aquatic weed, water hyacinth generally brings issues to any public water resources namely those used in fishery, general consumption, public health and agriculture. The associates involved in the removal of water hyacinth. (Urban Development Training Institute, 2018) The overgrowing issues affected by uncontrollable water hyacinth propagation highlights the strong connection between human and water sources. Occasionally, communities along waterways are affected by fast-growing water hyacinth in their local water sources. Due to the aforementioned reasons, the community participation plan and collaborating projects between associates had been launched. The plan and operation differ depending on each community context. The following descriptions are core methods of this collaboration (Ngarmwitroj et al., 2012).

1) Surveys of water hyacinth in canals, watercourses and agricultural areas require precise number of the aquatic weed in certain area to calculate whether the plant would obstruct local waterways. In case the water is blocked by the plant, it would soon be polluted by the fast-growing water hyacinth.

2) The excessive number of water hyacinth in waterways are to be reported to related agencies. Agencies and organizations should encourage the use of water hyacinth as consumption goods and distribute knowledge regarding natural fiber research and community product development in order to endorse local incomes and develop methods for further water hyacinth removal.

4. Development and Removal Methods of Water Hyacinth

4.1 Raising awareness and participation in community by the collaborations between agencies responsible for local water hyacinth management are necessary. Water hyacinth should not be allowed to grow excessively and efficient management methods for practical collaboration and competent operations. (Chairit et al., 2020) The production of water hyacinth as local goods would impact people's perceptions on this aquatic weed. It could also be beneficial to the community e.g.; fertilizing local soil, mulching and developing handicraft products. (Urban Development Training Institute, 2018)

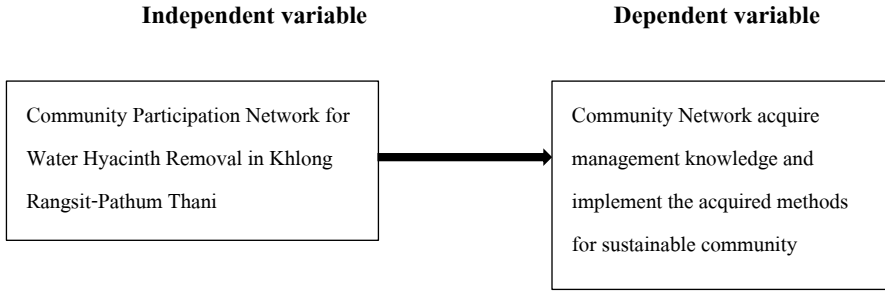
4.2 Career development from water hyacinth materials: Known. for being vigorous grower, water hyacinth usually obstructs and pollutes watercourses. It is burdensome to eliminate this aquatic weed; thus, some had developed this weed to its maximum potentials; unprocessed products, animal feed or fibers for textile products. Water hyacinth fibers are considered lightweight, comfortable, reflecting environmental awareness. Garments, furniture and home decoration from water hyacinth are considerably favorable products.

Upon reviewing of literature, the research team had synthesized the conceptual framework for community participation network in water hyacinth removal in Khlong Rangsit-Pathum Thani as displayed below.

Conceptual framework

Figure 1

Research conceptual frameworks



Methodology

The methodology implemented in this research is qualitative research with the following details.

Qualitative Research the details are as follow;

Samples: 8 associates with Bung Ba Subdistrict Administrative Organization; officials in charge of Bung Ba water hyacinth removal, community developers, community leaders and Tung Ruangthong village, Bung Ba sub-district, Nong Seua district, Pathum Thani province. The selection criteria are to select people responsible for and experienced in water hyacinth and natural material removal, also equipped with knowledge or insight in supplement vocation from water hyacinth.

Data collection instruments: The semi-structured interview is selected as the research instrument. The research team had developed the instrument from relevant methods, theories and research as follow.

1. Knowledge and community participation in the removal of water hyacinth

2. Approaches in leveraging water hyacinth and natural materials as environmentally friendly products.

Upon initiating the semi-structured interview, it has been reviewed by the advisory board for content validity. The reviewed interviews were further revised and rectified.

Data collection instruments: This research implement the semi-structured interview and content analysis for data collection.

Data collection methods: The research team had contacted those associated with water hyacinth removal to inform about the research objectives and request permission to collect data using In-depth interview which were to be conducted as the Face-to-Face interviews via phones and Line application.

Data analysis: Data collected from the mentioned semi-structured interviews were analyzed under content analysis methods.

Results

Community Context

Bung Ba Sub-district, Nong Suea District, Pathum Thani Province is located in an approximately 7 kilometers distance from Nong Suea District. It covers 28.43 square kilometer with 6 villages under Bung Ba Subdistrict Administrative Organization. The Bung Ba Subdistrict Administrative Organization is responsible for 28.43 square kilometer area or 17,769 Rai. The primary occupations in the area are agricultural and horticultural farming, self-employed and small industry. People in the community rarely seek occupations from outside of the area. Celebrated local

products of the area are rice products, handicraft goods and agricultural products. (Bung Ba Subdistrict Administrative Organization, 2021)

1. Issues and Community Requirements: Nong Suea district, being community villages and a district in Khlong Rangsit-Pathun Thani area, has since formed a network with Rajamangala University of Technology Thanyaburi sharing similar context and interests. Thus, the collaboration within the network in order to removal water hyacinth and leverage the aquatic weed for community's prosperity was initiated.

2. Community's Economic Indicators: The research team establish that, by initiating guidelines for water hyacinth removal, it would prospectively encourage community participation. According to the Development Plan of Pathum Thani Province, prominent feature of communities in the province is that there are a large number of industrial communities namely Navanakorn Industrial Estate and Bang Kadi Industrial Park. Therefore, an intensive labour demand is required. Chao Phraya River runs through the province resulting in numerous canals and waterways with rich history. The Rangsit-Prayunsak canal is one of the finest representations; beneficial for water transport, waterfront community tourism and serve as a connecting hub and routes for other regions. The province also has abundant variety of tourist attractions e.g.; cultural, religious and recreation venues, and distinctive local cuisine; Rangsit boat noodle, Mon ethnic group's Khao Chae and lotus petal-wrapped tidbits. Additionally, the Development Plan of Pathum Thani is considered 1 of 15 provinces which aims to be an Eco Industrial Town, a strategy to encourage local livelihood and environment by an active guideline for community participation for sustainability (The Pathum Thani Provincial Office, 2020).

3. Procedures for Community Learning Development and Innovation

3.1 The communication participation network between Rajamangala University of Technology Thanyaburi and Communities and districts in Khlong Rangsit-Pathum Thani canal has selected Bung Ba sub-district in Nong Suea district as this research designated area. The participation network and collaboration between relevant agencies and surrounding communities had been successfully launched and received consenting feedbacks which could further develop the management plan for water hyacinth removal and enhancing career within communities and each household.

3.2 The participation and collaboration network for learning and developing solutions for issues concerning water hyacinth is considered among the primary principles for water hyacinth removal since it would contribute to enhancing irrigation efficiency, reducing decomposing water hyacinth which pollute water sources. By removing water hyacinth and other aquatic weeds, such natural waste could be leverage as composed fertilizer, straw mushroom cultivation, paper and utensil production or using fibers for textile products. Nonetheless, to execute the issues regarding water hyacinth successfully, the consenting participation and collaboration between government and private sectors including regional, community leaders and local citizens are essential. Each associate is expected to engage in every step and agreeingly cooperate to resolve their local community's issues under the public water source's efficiency development methods by general public participation, enhancing community strength in actively protecting natural resources. (Weerapattananirand, 1999) Such method is correlated to the 20 Years National Strategy in terms of decent welfare and environmentally friendly. The water hyacinth would then be undergoing production enhancing sustainable career and welfare.

The associates chosen for the research among the Bung Ba Subdistrict Administrative Organization are officials in charge of Bung Ba water hyacinth removal.

Stage 1. During the research, the research team had arranged the semi-structured interview as data collection instrument. According to the results, it is established that 8 selected associates responsible for water hyacinth removal in Bung Ba Subdistrict Administrative Organization; officials in charge of Bung Ba water hyacinth removal, community developers, community leaders and Tung Ruangthong village, Bung Ba sub-district, Nong Seua district, Pathum Thani province, are experienced with removing this aquatic weed and equipped with adequate knowledge for career endorsement from water hyacinth products and would be appropriate advisors for local citizens.

The Bung Ba Subdistrict Administrative Organization is an administrative organization under Department of Provincial Administration, Ministry of Interior. The Subdistrict administrative organization's structure divides into 5 divisions under the supervision of the Deputy subdistrict chief as displayed below. (The Bung Ba Subdistrict Administrative Organization, 2021)

Each division is responsible for distinctive field, yet, 3 divisions are in charge of the management and removal of water hyacinth in the area.

1. Civil engineering: responsible for machinery and removal of water hyacinth in water sources. The Bung Ba Subdistrict Administrative Organization oversees the course of Khlong Sip and connecting canals.

2. Public health: responsible for removing or determining disposing area for the collected water hyacinth to prevent decomposition and blockades in the water, including the use of chemicals or biochemicals on water hyacinth. The use of such

chemicals consequently affects surrounding environment; vegetation and trees along the canal might have been decay and aquatic creatures absorb the chemicals as well. The Bung Ba subdistrict community reflects the idea as some edible plants might be affected while fishing and cultivating aquatic animals are unpopular in the area due to being the semi-urban society.

3.Academic, religion and cultural agencies: responsible on hosting vocational workshops and distributing knowledge regarding water hyacinth removal and encouraging residents to process consumption products from water hyacinth materials. The activities would endorse community participation and enhancing career for residents.

To removal water hyacinth from Bung Ba subdistrict, the primary concern and effect on such operation is the need of annual funding specifically for water hyacinth removal.

1. Knowledge on the removal of water hyacinth

According to the interview, contemporary methods in removing water hyacinth from government agency is by dredging the aquatic weed on the canal banks or distributing to local farmers to produce fertilizer. Water spinach and mimosa are among edible plants gathered by dredging.

One of the interviewees suggested that “The areas where they disposed water hyacinth often sprung water spinach, quite abundant they could harvest it year-round. However, during late April when it starts to rain, water hyacinth would soon regenerate vigorously, thus, locals must quickly remove it” (Bung Ba resident No.1, water hyacinth management, July 9, 2020).

Interviewee pointed that “The amount of water hyacinth in Bung Ba area is excessive during rainy season, obstructing the flow of water. By complying with

official policy, it would benefit the water hyacinth removal plan in one way or another. It is important to solve the issues quickly with little effects on the community. Doing so could also protect local environment in the long run. Apart from being an aquatic weed, water hyacinth also has its benefits. Some local residents have developed products from water hyacinth in which the SAO have been supporting local professional development groups for further vocational incomes" (Bung Ba Subdistrict Administrative Organization officials No. 1, water hyacinth management, July 9, 2020).

Interviewee argued that "To remove water hyacinth from water source requires funding and heavy machinery since water hyacinth is an aquatic weed absorbing excessive water. Trucks for transporting the gathered weed to designated areas are required. The disposed water hyacinth would then be dried and fertilized, yet, this process demands a vast area since transporting until disposing the weed" (Rungsit municipal officials No. 1, water hyacinth management, July 9, 2020).

The interviewee indicated that "There has been an on-going operation to remove water hyacinth in Bung Ba area following the collaboration between relevant associates responsible for the removal. The community and development groups agreeingly participate and assist on developing the solutions for this community's issue" (Bung Ba Subdistrict Administrative Organization officials No.2, Community Participation, July 9, 2020).

The interviewee proposed that "Our organization readily support the removal of water hyacinth in order to clear our water sources. Some of the gathered water hyacinth could be used for vocational enhancement since there are a number of professional development groups who produce consumption products from water

hyacinth. This could help gain community and local incomes" (Thanyaburi municipal officials No.1, water hyacinth management, July 9, 2020).

The interviewee offered that "To establish a plan to remove water hyacinth in water sources, the coordination between all responsible divisions is needed. The civil engineering, public health and academic, religion and cultural divisions are expected to cooperate. The organization is prompt to deploy the dredging machines and other machinery required for the task. Community residents would also provide tools such as pitchfork, ploughs, boats or vehicles to transport the gathered water hyacinth to designated areas" (Thanyaburi municipal officials No.2, Community Participation, July 9, 2020).

The interviewee referred that "The frequent surveys on water sources and community areas facing issues from water hyacinth is to seek participation and coordination within the community. Yet, to control and manage this plant demands decent planning and management in order to solve the on-going issues. Local residents also expect to acknowledge the issues and operations" (Bung Ba Subdistrict Administrative Organization officials No. 2, Community Participation, July 9, 2020).

The interviewee also added "The operations directly removing water hyacinth from community's farming areas are the accomplished operations and management plan in order to establish participation and collaboration within the areas considered as important incomes for local residents. Once the operations in communal farming areas are carried out, it becomes easier to manage local canals" (Bung Ba Subdistrict Administrative Organization officials No. 3, Community Participation, July 9, 2020).

One also added "Activities related to the removal of water hyacinth highly endorse environmental awareness within the community. Since water hyacinth might

pollute the water, the activities would help develop not only the waterways but also the local aquatic landscape. They would as well encourage communities to manage the issues wisely" (Bung Ba community leader No. 1, water hyacinth management, July 9, 2020).

Another highlighted "The cooperation, promptly collaboration and agreeable participation which, in turn, endorse and develop profession for local residents, have raise awareness in communities regarding communal participation and protection of local water sources for agricultural and other purposes" (Bung Ba district resident No. 1, Community Participation, July 9, 2020).

Lastly, one argued "This makes little impact since locals' primary use of water in local canals is for agricultural purposes and usually farmers have water clarifiers within their area" (Bung Ba district resident No. 2, water hyacinth management, July 9, 2020).

The summary on learning development and innovation regarding water hyacinth removal is the relevant associates had conceptualized development and management guidelines which would include local residents as key participants in order to develop the community. The integrative cooperation between divisions in the SAO (civil engineering, public health and academic divisions) who support the machinery and dredging machines with community residents providing pitchforks, boats or vehicles are beneficial to the community.

2. Approaches in leveraging water hyacinth and natural materials as environmentally friendly products

One interviewee pointed "Water hyacinth occasionally causes issues for agricultural cultivation since it could pollute water source. However, there are some who could benefit from such aquatic weed, turning it into baskets or bags. The SAO

took them on a field trip to where they cultivate and produce water hyacinth products in Ang Thong Province. So, they could develop their own among their groups" (Bung Ba subdistrict community leader No. 1, leveraging water hyacinth, July 9, 2020).

More proposed "It is essential to eliminate invading water hyacinth in local farms or gardens. Yet, if there were some areas that could be used for this weed cultivation, it would have been profitable for the community since we need to order this plant from other area for the production of local goods. Therefore, the proper management would have been favorable and helpful for the community" (Bung Ba subdistrict resident No.2, vocational enhancement, July 9, 2020).

The other pointed "If, by any chance, water hyacinth can be controlled within limited designated areas in the community, it would be very useful since this profitable aquatic weed would, thereby, become our new source of income" (Bung Ba subdistrict resident No.3, leveraging water hyacinth, July 9, 2020).

Other proposed "There are some areas at Khlong Cheom or Khlong An, which could be used as proper areas for water hyacinth cultivation due to the fact that the areas are barren and desolated, easy to manage" (Bung Ba subdistrict resident No.4, leveraging water hyacinth, July 9, 2020).

More indicated "It would be helpful to host some vocational trainings using water hyacinth materials for our community residents. It could spark decent participation and collaboration within the community. It would offer more chances for us to gather and communicate. We all know each other and are prompt to offer a helping hand for those needed" (Bung Ba subdistrict resident No.4, vocational enhancement, July 9, 2020).

The summary to this extent is the communities in Khlong Rangsit area use water hyacinth as;

1. Fertilizer or to fill other agricultural areas for higher nutrition in soil which would benefit the crops.

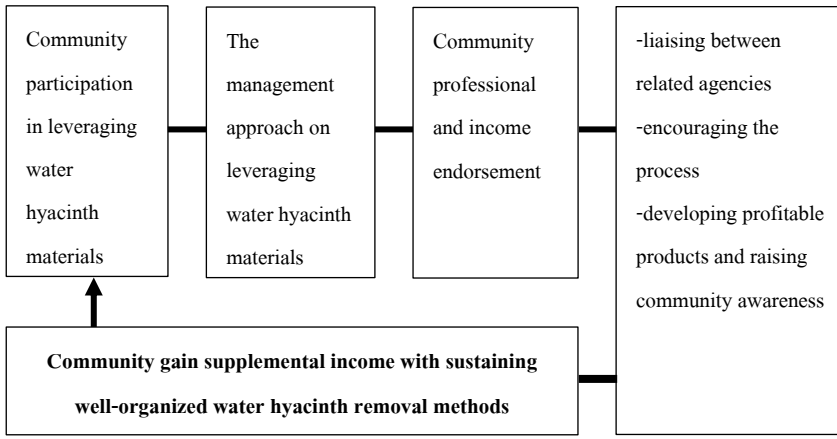
2. Innovative environmentally friendly products focusing on basketry from natural materials such as umbrella sedge, water hyacinth and bamboo.

Hence, there is an immense obligation for cooperative integration from all related agencies and local residents to establish methodically procedures for water source management within communities. Likewise, it is essential to endorse environmental awareness and collaboration within the communities for sustainable water hyacinth management. The integrative participation would prominently contribute to the lesser annual funding on such matter. Furthermore, the knowledge regarding the profitable benefits of water hyacinth should be encouraged by academic agencies or relevant official organizations for circular sustainable community economy.

The study had initiated the procedures for professional development using water hyacinth materials as described below

Figure 2

Procedures for Professional Development using Water Hyacinth Materials



Discussion

1. In term s of the approaches in removal water hyacinth from local water sources, the study found that a large number of local residents within the community are equipped with general knowledge and awareness of the importance of public water sources and are prompt to conserve them. They usually collaborate rough community's network and Bung Ba Subdistrict Administrative Organization have been hosting activities related to such issues. Residents are well aware of the importance of public water sources for their loverhood and agriculture, their primary source of income. Thus, water hyacinth as the aquatic weed could also be profitable for enhancing local professions and could be extend to neighboring communities sharing similar community context for sustaining community network. The sustainability initiated from such approaches in managing water hyacinth is in consistent with the study conducted by Chairit, Sinthorngo and Khunkha (2020). They have proposed the approaches to resolve issues caused by water hyacinth through Community Participation Guidelines on Issues regarding Water Hyacinth in Theppharat Subdistrict, Ban Pho District, Chachoengsao Province such as fertilizer or straw mushroom cultivation. Not only it helps reduce water hyacinth in local water sources, but also enhance professions for local residents.

2. Development and Removal Methods of Water Hyacinth in this study established that all associates relevant to the removal of water hyacinth in the community; local residents, community leaders and Bung Ba Subdistrict Administrative Organization officials, highlight the necessary of removing water hyacinth and creating profitable products from water hyacinth materials. Workshops and trainings were hosted for residents in the community following the educational exchange with the accomplish areas. Such activities would encourage participation

and cooperation between community for sustainable community economy. Additionally, the learning development in raising environmental awareness for the community would endorse said activities and likely to expand to neighboring communities as well. Younger generation residents would consciously aware and continuously assist in the protection of water sources and community environment. The development approach would benefit public water sources in Bung Ba subdistrict area since there is high demand for agricultural use within the area namely for rice farming, orchards and palm cultivation. The approach in immensely essential to the successful operation in consistent with the study from Sa-yam et al. (2018) proposing in Management of Water Hyacinth in the Public Water Source Sustainably: A case study of Nong Phrao Ngai Sub-district administrative organization, Sainoi District, Nontaburi Province. The study established that most people who associate with water; for agricultural purposes or water transportation, are well aware of the necessary to remove water hyacinth and the sustaining management methods are required to serve the interests of local residents within Nong Phrao Ngai Sub-district Administrative Organization, Sainoi District, Nontaburi Province.

3. Procedures for Professional Development using Water Hyacinth Materials are initiated by processing natural materials into consumption products through the collaboration between community's network and academic network. The collaboration would contribute to the innovative products suitable for particular types of water hyacinth which would ensure the products' quality and establish distinctive identity for each business and operators. This also corresponded with *The Management of Water Hyacinth in Drainage Basins* by Ngarmwitroj et al. (2012). The study indicates that the approach in removing the aquatic weed and leveraging the materials from water hyacinth would favorably control the amount of water

hyacinth in public water sources and become a new source of income for related communities.

Recommendations

1. The professional development using water hyacinth materials would enhance careers for local residents and would, therefore, soon be adopt and adapt by neighboring communities. The collaboration from all relevant agencies would gain them sustainable prosperity and self-pride owing to the fact that home economic knowledge ahs been adapted as part of their professional enhancement.

2. By building up the network for managing water hyacinth, it would serve as a model for neighboring communities to adopt and adapt such knowledge to suit their communities' contexts. This is considered the BCG economic development method for community sustainable circular economy.

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