Sustainable Low-Carbon Community Development: A Study Based on a Royal Project for Highland Community Development in Thailand

Kampanad Bhaktikul[a], Sayam Aroonsrimorakot[a,b*] and Meena Laiphrakpam[b]

[a]Faculty of Environment and Resource Studies, Mahidol University, Nakhon Pathom 73170, Thailand

[b]Center for Research Assessment and Certification of Environmental Management, Faculty of Environment and Resource Studies Mahidol University, Nakhon Pathom 73170, Thailand

[*]Corresponding author. E-Mail address: sayam.aro2560@gmail.com

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Abstract

Global warming and climate change from human emissions can affect the development of communities including highland communities in Thailand in terms of human life, growth and yield of plants and animals. So, the Royal Project Foundation, Highland Research and Development Institute (Public Organization) and Mahidol University unite together to carry out the Royal Project for Community Development with aims to develop the prototype of sustainable low-carbon highland community, reducing greenhouse gas emissions, while propagating sufficiency economy with the limited available resources in the region. The study is based on the Community capital framework for sustainable development using Ethnographic Delphi Future Research (EDFR) methodology, by collecting data for standardization from a panel of 15 community experts belonging to different strata, professions and organizations in Thailand. The evaluation level of the 12 Communities low carbon development project evaluation levels is estimated by comparing the development standards of four developmental dimensions as: (1) environmentally friendly agriculture; (2) forest restoration and conservation; (3) community health management; and (4) community strength to support changes in a period of 12 months. These dimensions are evaluation criteria for determining the standard of sustainable low carbon highland community development consisting of 19 items and 32 indicators. The analysis of Huai-Nam-Kuen community shows the availability of many features for low carbon community development, viz, low carbon economy, low carbon tourism resources and low carbon lifestyles which can be utilized to develop the community into a sustainable low carbon community. The study concluded that low-carbon community development is related to all dimensions of development and therefore an integral part of a society's sustainability.

Keywords: Highland, Low Carbon, Royal Project, Sustainable Community

Introduction

In the recent decades, there has been a growing awareness and concern about global climate change. This global climate change arises from using energy and burning fossil fuels that release more than 30 billion tonnes of CO_2 into the atmosphere in each year (Zhang, Yang, Sun, & Wu, 2017; Lazarus & van Asselt, 2018). Besides, emission of greenhouse gases can be occurred from other activities such as deforestation, livestock production, fertilization, land use change, waste management, and industrial processes (IPCC, 2014). This made many scientists, researchers, policy makers and academicians of many countries to be concerned and search for new steps to reduce CO_2 emissions while maintaining sustainable economic development (Finance and Development, 2019, p. 7). Among these steps, the first developmental step which many countries have begun to initiate is low carbon community development for sustainability. It is necessary to understand the various concepts related to sustainable low carbon community development such as low-carbon energy, low-carbon life, low-carbon society, low-carbon city, low-carbon community, low-carbon tourism, low-carbon world. An analysis of these various concepts is relevant to understanding more on sustainable low-carbon community

development, as it would not only highlight their relationships but provide a theoretical foundation on the research of low-carbon community development (Yuan, Zhou, & Zhou, 2011).

The study on the Royal Project for Highland Community Development in Thailand has the following objectives:

- to describe the historical background of the highland community.
- to focus and promote on the low carbon economy, low carbon tourism, low carbon lifestyles and resources available in the region that are environmentally friendly along with significant reduction of greenhouse gas emissions.
- to integrate economic, social and environmental objectives in community development for sustainability.
- to study and develop the prototype of sustainable low carbon highland communities in Thailand through community integrative research and development.

Literature Review

Low-Carbon Development

The concept "low-carbon development" has been defined in various ways but the common feature is concerned with utilizing less carbon to promote economic growth in the future (Mulugetta & Urban, 2010). Teske et al. (2008) defines low carbon development as similar to using fossil fuels, a type of low-carbon energy, with provision of economy growth and elevating the community welfare. There are three phases in low-carbon development as: *low-carbon economy, low-carbon society* and *low-carbon world* (Yuan et al., 2011). *Low-carbon economy* is the early phase during which reducing CO_2 emissions in economic development is the main target and low-carbon tourism and low-carbon industry are its indivisible components. To achieve this goal, a country needs to have a clear plan to promote low carbonization in its economic development. The second phase of low-carbon development is *low-carbon society*, which includes low-carbon life, low-carbon culture, low-carbon politics, etc. In this stage, policy makers or government should try to promote low-carbon life styles and consumption patterns such as encouraging people to use transport system with low-carbon effect and once a community follows low-carbon life styles in all aspects including economy, daily life, politics and culture, it can be defined as a *low-carbon community*. Jiang, Chen, Xu, Dong, & Kennedy (2013) describe low-carbon community as a form of organization, in which everyone acts as a citizen rather than a consumer, the citizens, aim to working hard for upgrading the community's energy infrastructure under the condition of the local economic development level. To be a low-carbon community, societies should maintain low carbon practices in its economy, daily life, and culture. After most countries in the world have become low-carbon societies, low-carbon development can be said to be matured and enter the third stage, that is, *low carbon world*. In the process of low-carbon development, many instruments are needed to track the performance of development, such as, carbon footprint, carbon label and carbon certification (Wiedmann & Minx, 2007).

Community Development

Having defined the various related concepts connected with the title of the study, let us define the concept of "community". According to Flora & Flora (1993), the term *'community' refers to a group of people bound by geography and with a shared destiny, such as a municipality or a town.* Cavaye (2006) defined *community development as a process conducted by community members with aims for local people to not only create more jobs, income and infrastructure, but also help their community in order to be able to manage change*. Community development is based on five capitals of a community–*social, human, financial, physical and environmental.* Social

capital is built through people's participation in their community activities or organizations, problem solution and creating network or relationships. Human capital is generated by people's increasing knowledge and new skills, along with maintaining good physical health and developing financial capital. With this, they can also manage their lifestyles to improve their environment. Employment generation and infrastructure development are the major aims of community development and these can be achieved through people's changing attitudes, mobilizing existing skills, improving relationships, thinking creatively for problem solution, and using community resources for sustainability (Flora & Flora, 1993).

Sustainable Development

Sustainable development has been defined in various ways by various scholars. However, the most commonly accepted one is the definition of Brundtland Report (United Nations World Commission on Environment and Development, 1987, p. 43) which is defined as *"meeting the needs of the present without compromising the ability of future generations to meet their own needs"*. Opoku & Ahmed (2013, p. 141) provide another modified definition as *"The adjustment of human behaviour to address the needs of the present, without compromising the ability of future generations to meet their own needs"*. Sustainable development has also been linked with sustainable use, such as use of renewable resources with a capacity for renewal and it requires changes and improvement to ensure that future generations will have benefits to use the same environmental benefits that current generations enjoyed. Therefore, sustainable development is closely associated with economic growth and environmental resource protection for the future. There are three dimensions of sustainable development namely: economic growth, social inclusion and environmental balance (United Cities and Local Governments (UCLG), n.d.). Thus, sustainability has three important components: the environment, the economy and society. To be a truly sustainable society, it should integrate wider question of social needs, welfare, and economic opportunity to environmental limits by supporting a balanced ecosystem (Agyeman, 2008). On the whole, sustainable development is about changing communities in qualitative ways to a level that is beneficial to sustain existence on the planet earth.

A review of literatures has led to the discovery of various theoretical framework by various community development scholars. Among them is the community capital framework approach in community analysis and development (Roseland, 2012; Cavaye, 2006). This framework is considered to be the foundation for sustainable development and it analyzes the various elements, resources, and relationships within a community and their contribution to the overall functioning of the community. The above scholars are in favor of small scale and self-reliance projects, designed with intensive public participation in order to improve society and the environment as well as economy. Roseland (2012) used six small forms of capital as: 1) Natural capital-ecology and natural environment; 2) Physical capital-infrastructure of the existing environment; 3) Economic capital-economic resources or financial; 4) Human capital-people's knowledge, skills and physical health; 5) Social capital-people's activities, organizations and network; 6) Cultural capital-culture traits, language, food, etc. This Community Capital Framework have been used in a variety of community types: big, small, rural, urban, developed, developing in many areas around the world with success with regard to sustainability principles and potential long time impacts of specific projects, policies and activities (Roseland, 2012). Some scholars asserted that low-carbon development is a new pattern of political and economic development aiming at reducing CO_2 emissions and achieving the sustainable development of environment, economy, and society using Delphi research method (Yuan et al., 2011; Hsueh & Yan, 2011). Similarly, Peters, Fudge, & Sinclair (2010); Moloney,

Horne, & Fien (2010) and Heiskanen, Johnson, Robinson, Vadovics, & Saastamoinen (2010) highlighted the importance and challenges of communities engaging in low carbon activities with energy saving technologies and infrastructures of the communities and concluded with policy and programmes for low carbon development, including changes in individual's behavior changes in household. Similarly, many studies highlighted the importance of community's role for making pro-environmental change (Middlemiss & Parrish, 2010; Mulugetta & Urban, 2010).

There were a few studies for sustainable highland community's development in Thailand. However, there were many studies on different issues related to low carbon lifestyles and practices for environmental sustainability, including waste management (Pasukphun, Hongtong, Keawdunglek, Suma, Laor, & Apidechkul, 2018; Laor, Suma, Keawdounglek, Hongtong, Apidechkul, & Pasukphun, 2018), water security and livelihoods (Sangkapitux & Neef, 2006). These studies suggest with the need to train the attitude and perception of community people for pro environmental behavior along with incorporation of policy planning for environment management.

Thus, on the basis of an overall review of the strengths and weaknesses of various community solutions, implications are drawn for further research and for the design and support of low-carbon community development.

Methods and Materials

Methodology

Description of the Study Area

Huai-Nam-Kuen Village, Chiang Rai Province, is one of the highland communities included in the study. The origin of this village can be traced back to the remote past in 1882. The discovery of this village is given as:

A group of people from neighboring village, Ban Sa-Khan-Hom came to the forest and found a tea plant. Before the establishment of Huai Nam Kuen Village, the land was covered with dense forest with tea plantations in the surrounding area. They cleared the grass and tea plants at that area and settled down at the south of the village, about 200 meters away from the present village. In course of time, many villagers also moved into the present village as the space of their original village was small. This led to the establishment of village named as Huay-Nam-Kuen due to rapid influx from surrounding villages in 1932. Gradually, many other villages also were formed as: Ban Pang-Ma-Kad, Ban Pang-Kula, Ban Pang-Mon-Wat, Ban Pang-Mae-Chedi, Ban Pang-Klang etc. in Chiang Rai Province. On September 13, 2000, the government of Thailand approved to set up a separate village as Huai-Nam-Kuen Village, Wiang-Pa-Pao District, Chiang Rai province, Thailand. There are four contact zones of Huai Nam Kuen Village, divided into north, south, east and west as: 1) Northern border: Ban Huai-Sai, Moo 9; 2) Southern border: Pang-Makad, Moo 8; 3) Western border: Ban Mae-Sai-Pa-Meang; and 4) Eastern border: Ban Thung-Yao, Moo 7.

The total area of the village is about 0.012 x 0.0016 km^2 or 1,200 x 1,600 m^2. The total workplace and dwelling area are 0.002 x 0.0016 km^2 or 2,000 x 1,600 m^2. Most of the people who live in Huai-Nam-Kuen are Thai by Nationality and Buddhism by religion. The climatic condition in the region is very cold, especially in the winter season with temperature dropping as low as 0 degree Celsius or lower. Its distance from Wiang-Pa-Pao district is approximately 53 Kilometers. Currently, there are 118 households in Huai-Nam-Kuen Village.

Procedure of Data Collection and Evaluation

The low carbon team went to the study area, Huai Nam Kuen Village, Chiang Rai from January 15-17, 2018 to observe and interact with the highlander community of the village along with training of participating officers

and committee members of the region for mobilizations on low-carbon capital, both natural and social, low-carbon economy, low-carbon tourism, low-carbon society and low-carbon lifestyles to recognize the growing importance of low-carbon tourism for community's economic development through education, meeting and discussion. In the first phase of developmental attempts, there were 11 Royal Projects covering 12 highland communities in Chiang Rai. The Royal Project Foundation and Highland Research and Development Institute played an important role, as consultant of the various developmental activities and tourism operation in order to bring standard with development of infrastructures of tourism and availabilities of all facilities to the touring group. Secondary data of previous research report is also obtained from the Project Coordinator of Highland Research and Development Institute, Thailand regarding evaluation of 12 Communities level of development in 11 areas of the royal project development centers in Chiang Rai by comparing the development standards of 4 dimensions: (1) environmentally friendly agriculture; (2) forest restoration and conservation; (3) community health management; and (4) community strength to support change in a year. The research used mix research methodology incorporating both qualitative and quantitative data analysis techniques in different stages. Firstly, it employed Ethnographic Delphi Future Research (EDFR) technique of data collection, a combination of ethnography (van Maanen, 1996; Genzuk, 2003) where the main methods of collecting data were through observations, interviews and some documentary archives, and Delphi studies (collected from a panel of community experts belonging to different strata, professions and organizations in Thailand. For EDFR technique, the stages employed were as:

1) Defining and Preparing Expert Groups

Expert group, consisting of two academicians from the Faculty of Environment and Resource Studies, Mahidol University, two from Royal Project Foundation, two from Highland Research Development Institute, two Royal Project Community Leader and seven committee of experts (Third Party) having expertise in various fields. Details of the names of the experts and their organizations were kept confidential. It is more reliable because instead of using a sampling technique to represent a certain population, a group of experts and stakeholders with a deep understanding of the subjects are chosen to answer the questionnaire (Dalkey & Helmer, 1963; Adler & Ziglio, 1996)

2) Royal project communities that voluntarily participate in the project, consisting of 4 highland areas which grow Miang or tea leaves under four Royal Project Development Centers as: Pa Miang, Teen Tok, Mon Ngo, and Huai Pong; 2 rice growing highland areas under two Royal Project Development Centers as Mae La Noi and Thung Roeng; and 5 opium cultivating area under five Royal Project Development Centers as Nong Hoi, Mae Hae, Mae Sapok, Ang Khang and Inthanon.

3) Survey the area to assess the level of development of the initial participating community project to determine the framework for establishing standards for community development on highland low-carbon sustainable community development. There are 4 components criteria for low carbon sustainable community development assessment as:

I. Agriculture that is environmentally friendly; II. Forest restoration and conservation; III. Environmental management in the community; and IV. Strength of the community to support changes.

4) Creating Tools for Data Collection

The researcher used explicit criteria to select the panel of 15 experts and designed a well-structured questionnaire concerning the issue under consideration. Panelists were then asked to respond to the questionnaire during a series of rounds and all responses were obtained individually and anonymously. Detailed guidelines on

how to select the group of experts suitable for the Delphi study were explained by many scholars (Delbecq & van de Ven, 1971; Okoli & Pawlowski, 2004). The researchers contacted the experts and explained to them about the study subject and asked them to complete the questionnaire. Beside this, the researcher obtained additional in-depth information from three key informants, who were the actual beneficiaries of the Royal Project, who occupied positions as heads of the village, through telephone interviewing. After the responses were received, the researchers analyzed the responses by narrowing down the original list with all answers to a list with the most important answers. The data were then analyzed quantitatively in order to determine the ranks of the items on the list as well as qualitatively in terms of response quotation.

Community Selection for Joining the Project

1) Royal Project Development Center and Highland Research and Development Institute, Thailand explain the project detail, criteria, and indicator of highland sustainable low-carbon community development to the community and the working group in each area for consider the readiness to participate in the project.

2) Royal Project Development Center inform the list of participated community to Highland Research and Development Institute via the project coordinator.

3) Mahidol University and Highland Research and Development Institute survey evaluate the level of community development before the project starts (Preliminary result) by comparing to evaluation criteria and indicator.

Highland sustainable low-carbon community development has 4 dimensions and 32 indicators as follows:

Dimension 1: Environmentally friendly agriculture 7 evaluation criteria and 9 indicators

- Good agricultural practices in crop cultivation 1 indicator
- Organic farming 1 indicator
- Soil fertility restoration 2 indicators
- Appropriate pattern in water usage for agriculture 2 indicators
- Maintaining water quality 1 indicator
- Good and suitable animal raising system on highland 1 indicator
- Using agricultural machinery and/or vehicle that use fossil fuel 1 indicator

Dimension 2: Forest restoration and conservation 4 evaluation criteria and 6 indicators

- Reforestation 1 indicator
- Local plant restoration and conservation and biodiversity 2 indicators
- Roadside planting and/or public area in the community 1 indicator
- Conservation and/ watershed forest restoration 1 indicator

Dimension 3: Community health management 5 evaluation criteria and 12 indicators

- Good health 3 indicators
- Waste management in community/household 4 indicators
- Wastewater and sewage management from livestock 2 indicators
- Energy and resource saving 1 indicator
- Smog reduction 2 indicators

Dimension 4: Community strength to support change 3 evaluation criteria and 5 indicators

- The introduction of the sufficiency economy philosophy to practice 2 indicators
- Strengthening community organization as a learning community 2 indicators

- Strengthening village against drug 1 indicator (Mensin, Bhaktikul, Aroonsrimorakot, Krajangtimaporn, WannaProm, & SinghBoon, 2018)

The research employed the framework of Ethnographic Delphi Future Research (EDFR) methodology, a combination of ethnography (van Maanen, 1996; Genzuk, 2003) where the main methods of collecting data were through observations, interviews and some documentary archives, and Delphi studies (collected from a panel of community experts belonging to different strata, professions and organizations in Thailand. Details of the names of the experts and their organizations were kept confidential). It is more reliable because instead of using a sampling technique to represent a certain population, a group of experts and stakeholders with a deep understanding of the subjects are chosen to answer the questionnaire (Dalkey & Helmer, 1963; Adler & Ziglio, 1996). The present study was conducted in the following manner: The researcher used explicit criteria to select a panel of 15 experts and designed a well-structured questionnaire concerning the issue under consideration. Panelists were then asked to respond to the questionnaire during a series of rounds and all responses were obtained individually and anonymously. Questionnaires were administered through hand mail and e-mail, and panelists were unaware of each other's identity and interact only with the researcher or small research group (two to four members). Detailed guidelines on how to select the group of experts suitable for the Delphi study were explained by many scholars (Delbecq & van de Ven, 1971; Okoli & Pawlowski, 2004). The researchers contacted the experts and explained to them about the study subject and asked them to complete a questionnaire. After the responses were received, the researchers administered the questionnaire by narrowing down the original list with all answers to a list with the most important answers. The data were then analyzed quantitatively in order to determine the ranks of the items on the list.

Discussion and Results

Analysis of Huai-Nam-Kuen community shows the availability of many natural resources along with the available infrastructure and changing lifestyle of people for low carbon tourism development in the region which can be utilized for the community's sustainable low carbon economic development. Some of the findings available in the region are:

Low Carbon Tourism in Ban Huai Nam Kuen

In 2013, the community recognized the growing importance of low carbon tourism and prepared itself for the community's economic development through it. The community has a unique identity with productive forests and watershed and follows the philosophy of a Sustainable Self Sufficiency Economy and Learning Center of His Late Majesty, King Bhumibol Adulyadej, with aims to continue to have harmonious, happy and peaceful life. So, they had cooperated with Huai Pong Royal Project Development center and Highland Research and Development Institute. The community prepared itself for tourist homestay to accommodate tourists for development. Thus, the first tourist home, Ban Huai-Nam-Kuen homestay, was set up to welcome touring group. In the first phase of development activities, the Royal Project Foundation and Highland Research and Development Institute played an important role as consultant of the various developmental activities and tourism operation in order to support the touring group and to develop the community infra-structures and facilities to a standard. In 2015, Ban Huai-Nam -Kuen homestay had passed the Thai homestay standard certification from Department of Tourism. And in the next phase, group of Huai-Nam-Keun homestay aims to develop community tourism to obtain other standards

including network creation in order to make a sustainable tourism by their community. The following are some of the features of low carbon tourism development available in the region:

1. Agricultural Tourism: Here, the tourist can visit the orchard such as sweet passion fruit, cape gooseberry, and avocado berries, flowerbed such as cymbidium, orchid, potted plants, beverage plants such as tea, and coffee, medicinal plants, backyard garden along the road side and front yard of each household and also local plants such as wild custard apples.

2. Cultural Tourism: Here, the tourist can visit the households to see the way of living, occupation, income and means of livelihoods of the communities. By visiting and interacting with the local community people, they can observe how to store roast, bind and ferment tea leaves. In addition, they can observe and learn other conventional traits such as method and procedure of making a specific formula of spicy chili, food processing from dried coconut, performance of local arts and culture such as Thai sword dancing and local music. The tourists can buy as souvenirs local products such as tea, dry fruits, handicrafts product, etc. Beside this, the tourists can enjoy natural tourism by walking along the natural footpath of Doi Mod-Doi-Chang to watch the Azalea roses, the diversity of vegetation that grows up in the forest region at altitudes ranging from 1,000 to 1,700 meters above sea level and a variety of birds living in the wild surrounding areas.

Low Carbon Community Products, Facilities, Other Infra Structures and Location

Following are some of the community agro-products as:

1. tea and coffee; 2. chilli paste; 3. passion fruit juice, dried gooseberry, dried coconut products etc. Regarding accommodation, there are currently, 11 homestays or guest house, 10 tents, 6 sleeping bags and 4 convenient stores. For the convenience of the travel of tourists there are shuttle bus service plying from Khun-Chae National Park to Ban-Huai-Nam-Kuen at 800 Baht per round trip. The distance of the community village to Chiang Mai is around 68 kilometers and it takes about one and half hours to travel by roadways along Highway 118. During the rainy season, travelling there on the muddy road is difficult. Figure 1 gives the village location map.

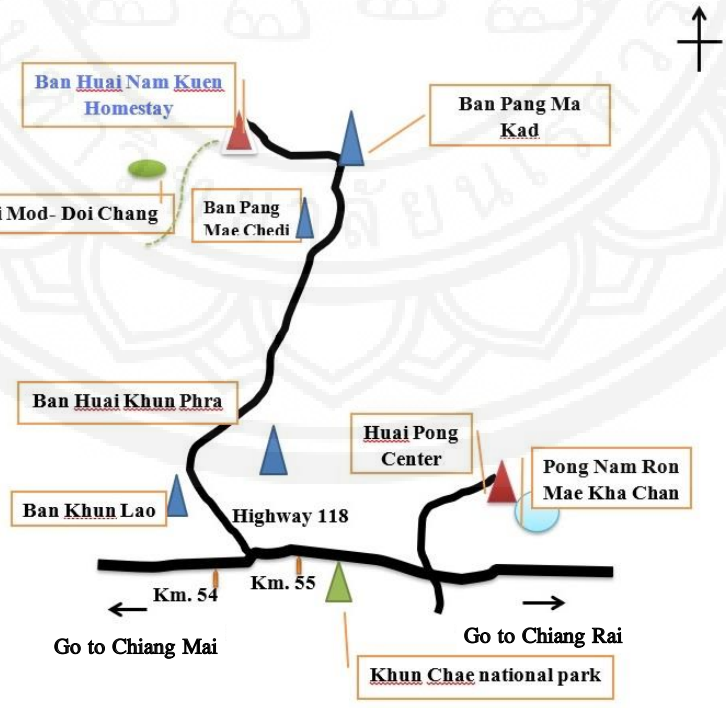

Figure 1 Location Map of Ban Huai-Nam-Kuen

Integration of Research and Development Work in Highland Community of Thailand

Assessment of the project performance is based on report of meeting or seminar and report. The following table gives the detail of indicator, unit, evaluation criteria for Highland Community Integrated Research and Development Plan for low carbon prototype communities in Thailand.

Table 1 This is a Brief Label that Links the Table to your Discussion (Example)

Indicator	Unit & Criteria	Evaluation Criteria	Assessment or Evaluation
Percent achievement of Integrated research and development of low carbon prototype communities.	Percentage Success is based on percentage score of the Integrated Research and Development Plan for the low carbon prototype community in line with the plan.	**Pass:** If the low carbon prototype community score is 80 percent. **Fail:** If the low carbon prototype community score is less than 80 percent.	Meeting, Seminar and Report

The following are the Highland Community Development Projects in Thailand as:

1. Royal Project for Highland Community Development
2. Mae Klong River Camp Project for Highland Community Development
3. Wawee Royal Project for Highland Community Development
4. Mae Salong Project for Highland Community Development
5. Mae Moha Royal Project for Highland Community Development
6. Royal Flora Project for Highland Community Development
7. Mae Charim Project for Highland Community Development

Evaluation Results

The result of the study determines sustainable low carbon highland community standard by surveying 12 participant communities. The project performs the development works after meeting with community leaders and the working groups. The Royal project for community development focuses at low carbon highland community development which is located far away from the city. The main mode of livelihood of the community is based on agricultural, natural resources and environment, categorized into 4 dimensions as: (1) Environmentally friendly agriculture; (2) Forest restoration and conservation; (3) Community health management; and (4) Community's strength to support changes. These dimensions are evaluation criteria for determining the standard of sustainable low carbon highland community development consisting of 19 items and 32 indicators. The evaluation level of the 12 communities low carbon development project evaluation levels are estimated by comparing the development standards of four parts in a period of 12 months as given in Figure 2.

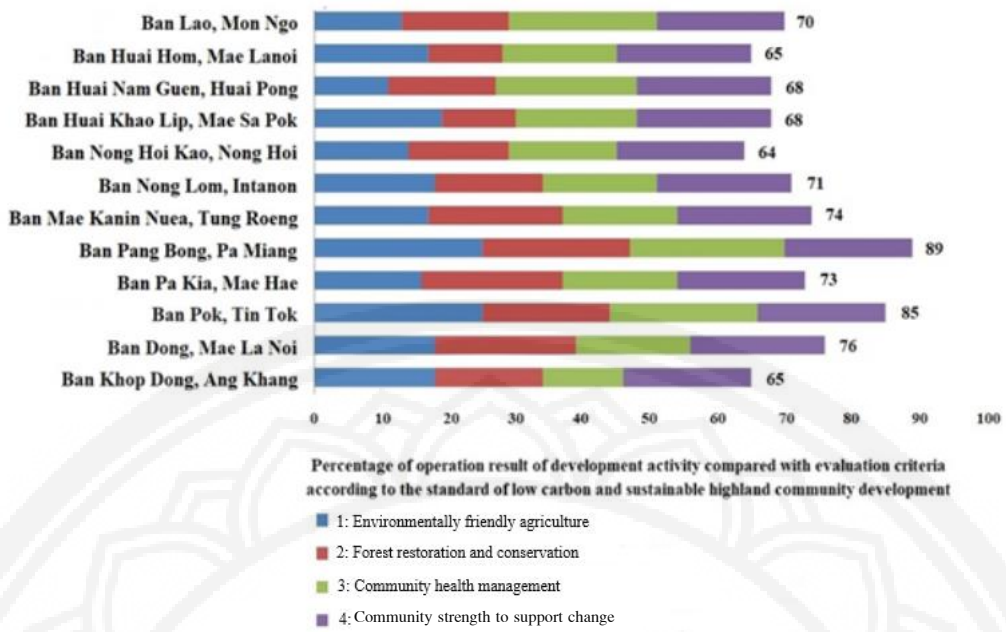

Figure 2 Evaluation of 12 Communities Development Levels in 11 Areas of the Royal Project Development Centers by Comparing the Development Standards of 4 Dimensions in 12 Months (Mensin et al., 2018)

From the evaluation result, it was found that the development resource of these highland communities, being located at a far-away distance from the city, were based on natural agricultural resources and the environment. It was found that Ban Pang Bong has the highest development level (89%), followed by Ban Pok, Ban Dong, Ban Mae Kanin Nua and Ban Pa Kia (85%, 76%, 74%, and 73% respectively) as shown in Figure 2. However, some development activities had to be operated as a solution of the prevailing problem and to promote development, and among these were 7 indicators, consisting of drip irrigation of vegetables, livestock farm certification, determination of forest boundary and agricultural areas, community water quality, household wastewater quality, sewage management from livestock farm, and wastewater quality from livestock farming and these require cooperation from members of the community.

In-Depth Interview Result

Furthermore, the authors have collected additional data through telephone in-depth interviewing from three key informants, holding position as heads of the village, who were the actual beneficiaries of the project and who were willing to spare time to provide in-depth-information related to the project. The following were the questions asked to the respondents during the telephone interview. The summarized interview quotes are given below:

1. Could you please tell something about the Royal Project Initiative for Low Carbon Highland Community Development?

The project is beneficial to the community both environmentally as well as economically. First of all, the project helps the village to provide better facilities for imparting education, development in roads, transportation leading to infra structure development for tourist access, economic development and overall improvement in the status of earning and living so as to become a sustainable community. At the same time, the project makes villagers aware that their community is responsible in improving air quality to be passed to all lower-areas of the country and it helps provide jobs or source of income, improving the economic status and many facilities to develop into a sustainable community.

2. What development work is done in your village by the Royal Project in terms of promoting low carbon economy for sustainable economic development of the community?

Initially, the village has no scientific knowledge of innovative agricultural practices, but after the arrival of Royal Project in our village, many initiatives have been done to improve agricultural practices, and lots of knowledge about innovative agricultural management have been learned. Due to this project, agricultural process is easier, more systematic and at the same time have increased in output of agricultural and processed agricultural product in terms of new techniques of food drying, coffee or tea processing, dry fruits preserving and packaging to be sold internally as well as externally. An innovative waste management system has also been initiated. Generally, most people in the village do not separate waste at home, especially waste that contains lots of plastic bags, kitchen waste, solid waste and other hazardous waste. Thai people are generally used to receiving services from local government, especially solid-waste management, almost free of charge, and generally ignore their own roles in improving the situation themselves. This inevitably leads to questions of management efficiency, cost recovery and accountability, so that all food wastage, agricultural or other solid wastage could be sorted out into recyclable or non-recyclable, in accordance with the initiative of royal project, and ultimately leading the community to maintain the standard of being a low carbon community for sustainability.

3. Could you please tell the social and environmental impact of the royal project to the local community?

There is so much social impact in the community after the arrival of Royal Project. Our village is a small village and the organization is to live like a large family, having mechanical solidarity, where everybody helps each other and knows each other. But with the arrival of Royal Project, economic activities expanded and people have more opportunities to pursue other occupation beside agriculture such as opening of Home stay for tourists. In addition, the Royal Project make initiative to impart better education, health care, development of roads and transportation, along with provision of economic facilities and this has a social impact in terms of avenue of tourist infrastructure, travel, accommodation and other site seeing facilities along with development of NGO organization, beside the Royal project membership and so on. In addition, this project makes the villagers have more public responsibility especially innovation in agricultural product processing, food packaging, and broadened other occupation with the availability of other source of earning or economic pursuits in our community. Similarly, our community has changed to be environmentally friendly through several aspects: waste management, waste sorting, wildfire protection, organic farm, eco-tourism and so on. Knowledge on environmental management has been acquired such as, reforestation, watershed forest preservation, trash sorting, soil improvement through composting, and wildfire protection.

Conclusion and Suggestions

The analysis of Huai-Nam-Kuen community shows the available low carbon economy, low carbon tourism facilities, low carbon lifestyles and resources available in the region which can be utilized for the community's economic development. Development activities that need to be upgraded includes 7 indicators such as, 1. drip irrigation of vegetables; 2. livestock farm certification; 3. determination of forest boundary and agricultural areas; 4. community water quality; 5. household wastewater quality; 6. sewage management from livestock farm; and 7. wastewater quality from livestock farming and these require cooperation from members of the community. Thus, it can be suggested that highland community can be developed through practice of low-carbon lifestyles, low carbon economy, low carbon tourism along with co-operations from all concerned agencies including government

law makers, tourism enterprise and the public. With this, the community's economic, social and environmental benefits would have a comprehensive improvement. It can be concluded at the end that low-carbon community development is an integral part of a society's sustainability and it is closely related to all dimensions of development. The project study, therefore, provides an in-depth insight into the contribution of the Royal Project Foundation to bring environmental, economic and social dimension of sustainable development to the Highlander Community in Chiang Rai, Thailand and to the conceptual development foundation for preparing and evaluating community development levels for certification of community development standards into low-carbon sustainable communities.

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