

# Eco-Design and Energy Saving Concepts for the Agricultural - Commercial Fringe Communities in Western Thailand

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**Abstract.** The purpose of this study was to develop planning for the communities along the agricultural -commercial fringe in the Special Economic Zones of western Thailand corresponding to the area's physical environment, activities and commuting patterns. In order to fulfill the purpose, this study has analyzed the significant activities and commuting patterns of the communities along the particular fringe area in the Special Economic Zones of 5 western provinces as well as the opinions towards community planning given by 400 residents living in the certain areas. The findings indicated that the establishment of an economic development plan for the development of commuting routes of the Special Economic Zone in the western part of Thailand is very appropriate. The plan will ultimately enhance economic development by optimizing all commuting routes, activities, and resources that originally exists in the local environment and economically impact all community throughout every region of Thailand.

**Keywords.** Eco-Design planning, Energy saving concept, Agricultural - commercial fringe area

## 1 Introduction

Soon after Thailand has entered into the ASEAN Economic Community (AEC) in 2015, international trade among ASEAN countries has grown rapidly [1]. According to the report of the Thai Board of Investment (BOI), the industrial market zone has been divided into six sectors that are North, Northeast, Central, Eastern, Southern, and Western.

In order to prepare Thailand's industry to be ready for the ASEAN Economic Community in 2015, the Industrial Estate Authority of Thailand (IEAT) had launched the project to develop Thailand's border areas in many provinces consisting of Mukdahan, Songkhla, Sa Kaeo, Trat, Kanchanaburi, and Tak. The project was expected to support the expansion of the industry, rise of hiring rates, and numbers of emerging factories, especially small and medium enterprises (SMEs) that became an important business group for each ASEAN countries.

The expansion of the industry in many areas has direct impacts on the area as land-use was transformed from agriculture to industry. For instance, the communities located around the industrial estate have to face with environmental issues occurred due to the lack of social responsibility and environmental awareness of many industrial estates operating across the country such as Map Ta Phut Industrial Estate in Rayong. In the past, the majority of the population residing in the surrounding villages earned their livings by farming and

fishing. Decentralization according to the 5th National Economic and Social Development Plan led to the implementation of industrial estates and deep-sea port that has an impact on the communities around them. For example, various kinds of toxic substance were released and polluted the environment of the communities, schools, and residences, close to each industrial estate.

Dawei Deep Seaport and Industrial Estate Development Project in the Special Economic Zone has caused changes in the socio-economic system, resulting in a large number of employment, country's infrastructure, transportation, and other facilities have been increasing. However, all the advancement happened by the industrial estates might follow by both direct and indirect problems to the community if they were carried without appropriate management planning [2]. Therefore, the approach to sustainable development and reduce the impact on communities around the industrial estates required research toward infrastructure planning for any emerging industrial estate to be environmental friendly and effectively decrease the impact on the community and the environment.

Economic growth has been a major reason for the spread of urban sprawl that invaded into nature and agriculture and caused a permanent loss in sources of food production and water retention. Every minute the city sprawls, the greater loss it becomes for the agricultural land. Every square meter of farmland lost is equal to the increase in food prices. Besides, the more agricultural area was pushed further from the city, the

fewer opportunities for urban residents to reach the quality and healthy food. Although we are happy with the economic growth, we have to stop the urban sprawl from invading the agricultural land for food security and quality of life [3].

Apart from that matter, there is also an urgent need for a lot of improvement. The remaining agricultural areas must be restored to be the food supply for the people. The education on value-added agriculture and increasing production productivity to develop the export potential in the groups of product with high export demands are very important as it helps generate revenue for the community. Moreover, the education on value added agriculture will further the knowledge and commercially benefits the local community and the public. In addition, the development of product quality regarding the Food Safety and Food Security Standard is a necessary part of the urgently required improvement as well.

Since the present Western Special Economic Zone is still lack of clear composition to maximize the benefits for the people, this research aims to study the development of plan for the commuting routes in the 5 western provinces, namely; Kanchanaburi, Tak, Prachuap Khiri Khan, Phetchaburi, and Ratchaburi, together with the survey on demands of the local people. Therefore, the research concentrated on approach to support the expansion of the industry and link all regions of the country together for the sustainability of the communities along the agricultural - commercial fringe in the Special Economic Zones of western provinces in Thailand.

## 2. Objective

1. To study the physical characteristics of the community in the Special Economic Zone, Western Region

2. To study the composition in the community plan of green communications and energy saving of ones along the agricultural - commercial fringe in the Western Special Economic Zone

3. To propose a community planning scheme for the communities along the agricultural - commercial fringe in the Western Special Economic Zone

## 3. Scope of Study

The scope of the study of planning for the communities along the agricultural - commercial fringe for the sustainability of the Special Economic Zones in western Thailand is to study the physical characteristics of the communities, natural resources, arts, culture and traditions in the Special Economic Zone in the particular western provinces. Additionally, to propose a community planning scheme for the communities along the agricultural - commercial fringe in the western Special Economic Zone, studying the composition in the community plan of green communications and energy saving is also needed. The scope of study can be explained as follows.

### 3.1 Population and Sampling Scope

1. Population: 2,814,370 residents with 20 years of age and over in the 5 western provinces consisting of Kanchanaburi, Tak, Prachuap Khiri Khan, Phetchaburi and Ratchaburi

2. Sample: 500 participants were selected from all the population living and doing activities the 5 western provinces; 400 residents and 100 government officials taking charge of agricultural-commercial promotion and community leaders in the 5 western provinces

### 3.2 Content Scope

1. Physical characteristics of the community in the Special Economic Zone, western region

2. Composition in communities along the agricultural - commercial fringe in the western Special Economic Zone

3. Planning for the communities along the agricultural - commercial fringe in the western Special Economic Zones

Kerdmemoon has influenced the conceptual framework of physical planning for the communities [4] along the agricultural-commercial fringe, facility needs and local issues. In terms of location, he pointed the condition of current usage, public utilities and facilities including the uniqueness and lifestyle of the community are the physical characteristics of each community. It is an impression of the people who have seen the total picture of the communities and how they recognize them after visiting the area. These simply refer to how the image of the communities can be imprinted into people's mind.

### 3.3 Area Scope

The studied areas include the western region of Thailand which most part is basically an alluvial plain area so most people in the central western can earn their living from both freshwater and saltwater fishing. Trading is also popular among Thai westerners because they have very convenient land-water transportation great for trade. The western region consists of 5 provinces that are Kanchanaburi, Tak, Prachuap Khiri Khan, Phetchaburi, and Ratchaburi.

## 4. Literature Review

Regarding the theories related to local community, the term 'local community' refers to the place where people connecting to a geographic environment and social relation system. The social that based on generosity, engagement and interactions between the locals is an important method to make a good life together.

In other words, the local community also refers to a combination of people who spatially and socially have a long-standing relationship. Thus, this is the basic unit of self-reliance and self-management and it involves participation in social drive and a psycho-cultural unit that identifies the community in relation to ideology, rights, and authority. In addition, the meaning of the local community according to the sociological concept

refers to the social and physical unit such as neighborhood areas, village, and city. All of these share meanings as follows.

1. Local community as a territory unit having a concrete nature of the membership and the stable settled by geographical area

2. Local community as a unit / social system being a network of human interaction that correlates status, role, group of people, and community institution together in chains

3. Communities as a unit of cultural psychology focusing on the bond between community's members either psychologically or culturally

The meaning of the local community based on the concept of anthropology concentrates on the community as a cause of friendship, generosity, security, and commitment. Intellectuals who support this concept proposed that there was a need for small communities with a tight structure as it will help restoring social well-being and harmony. This concept reflects the dynamics of modern society, the expansion of the city that caused controversy and ignorance among the ideal community. Consequently, the sense of community will appear when people express their individualities, values, and relationships of those who live together. According to the concept of Kanchanapa, the main characteristics of community are composed of four factors which include;

1. Social and cultural values that are the value of generosity, interdependence, and honesty

2. The social capital that is a mindset toward knowledge management system in the community such as public resource usage and the arrangement of coexistent relationships, etc.

3. Righteousness which refers to rights everyone from every social class deserves including justice administration operated under the horizontal and vertical social relationships

4. Dynamic Learning focusing on learning and self-adjustment to create a strong and solid community that contains sense of unity and the ideology relating to rights in administration, adaptation and learning processes of some particular area to meet the needs of local people according to the horizontal and vertical social relationships.

As mentioned above, these community characteristics must share the same of components which are people, places or areas, social interest, social interaction, social relationship, social organization as well as social benefits. Boonplook [5] described the nature of the local community as an organization or social entity that is composed of 5 related and interrelated components as follows; 1. Having size based on human capabilities 2. Having a sense of identity 3. having a sense of possession and 4. having a bond with a rural culturally oriented society 5. Being close to a rural culturally oriented society.

The western part of the region is mostly mountainous, from both old and new eras. This mountainous area is the resources of mineral, forests, and watersheds but is not suitable for agriculture as it has less space. In addition, the mountains below this region are also located in the north-south direction forming a barrier of

wind and humidity from the Andaman Sea bringing less rainfall to the area of downwind. However, when the government has built a dam for irrigation and established the irrigation canal system for the eastern plains of the region[6]. The dam makes this area an important agricultural plain even though it is a rain shadow area. Since the western region is not far from the capital and it contains numbers of scenic waterfalls, rapids, coasts, shallow sea, islands and sandy beaches attracting many tourists to this region annually, the locals can create income from the above-mentioned advantages that encourage them to do agricultural profession.

## 5. Methodology

The study of planning for the communities along the agricultural - commercial fringe for the sustainability of the Special Economic Zones in western Thailand is non-experimental research carried out by the following methods;

1. The physical characteristics of the community in the Special Economic Zone, western Region

2. The composition in the community plan of green communications and energy saving of ones along the agricultural - commercial fringe in the western Special Economic Zone

3. Propose of the community planning scheme for the communities along the agricultural - commercial fringe in the western Special Economic Zone

- Population participating in this research consisted of 2,814,370 residents with 20 years of age and over in the 5 western provinces consisting of Kanchanaburi, Tak, Prachuap Khiri Khan, Phetchaburi and Ratchaburi

- Sample of this research was 500 participants selected from all the population living and doing activities the 5 western provinces; 400 residents and 100 government officials taking charge of agricultural-commercial promotion and community leaders in the 5 western provinces

4. The data collection instruments

- Quantitative data collection: the author had conducted survey and observation in a structured way by designing and planning the following procedures;

a) Collect all printed documents, maps, photos and data from related websites.

b) Draft case study observation covering the physical characteristics of the western region.

c) Examine survey instruments and observation given by 2 experts.

d) Survey and observe the western region of Thailand.

e) Summarize results of the survey and observations.

The data from the survey and observations above became the physical data that the author analyzed with the data from the first part of the questionnaire according to the research process.

- Questionnaires: the selected participants from 5 western provinces were asked to answer the questionnaires. The author had studied and designed methods for data collection as the following procedures;

a) Study data from printed documents, publications, websites and research related to the physical characteristics of the western region.

b) Study the design of community plan of green communications and energy saving for the communities along the agricultural - commercial fringe in the western Special Economic Zone

c) Draft the questionnaire according to the purpose of the study to ask opinions of the sample in the studied area. The questionnaire consists of 4 parts; 1. General information of the respondents 2. Physical characteristics of the western region 3. Components of the community plan of green communications and energy saving of the stated area 4. Planning scheme for the communities along the agricultural - commercial fringe in the western Special Economic Zone.

d) Consult with 3 qualified experts on the questionnaire for appropriate adjustments, and then carry a pilot survey in the non-sample area outside the study area.

e) Adjust the questionnaire to be suitable for data collection.

f) Collect data with completed questionnaire in the study area.

g) Summarize the results of the questionnaire.

The information obtained from the survey questionnaire was personal opinions of the sample toward the planning of the communities along the agricultural - commercial fringe in the western Special Economic Zone. The certain data was analyzed with the survey and observation data following the research process.

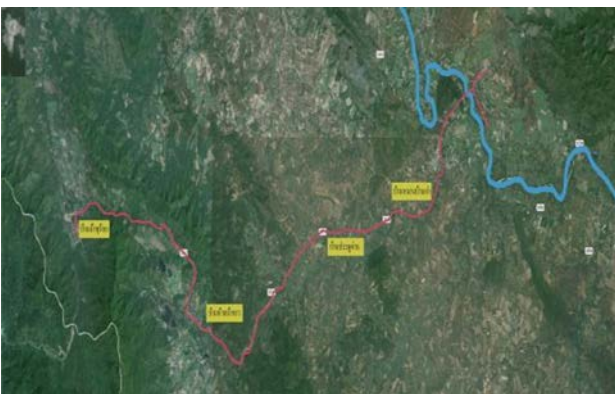
- Data collected location: Thailand's western region

5. The Qualitative Data Analysis used related computer programs such as Adobe Photoshop, Microsoft Excel, and 3D Auto Cad in order to process the data collected from the survey and observations on facilities of community in the 5 western provinces. The Quantitative Data Analysis also used the mentioned computer programs to process the data collected from the questionnaire.

6. Summarize the community planning scheme for the communities along the agricultural - commercial fringe in the Western Special Economic Zone with the basic information derived from the certain study.

## 6. The Result

Planning for sustainable community lying between



**Fig. 1.** shows Special Economic Zone, western part's route  
 Source: www.google earth.com

agricultural and commercial research in the Special Economic Zone of western Thailand was run by studying the sample population groups in the sample areas. We used the questionnaire and observation forms to be our instruments, then analyze the data according to the research's processes by dividing them into the following topics;

The study of the communities' physical characteristics in the Special Economic Zone, western part according to research objectives 1: As the data analysis from the surveys and observations, the west is not far from the capital. There are numerous waterfalls, islands, coast, reservoirs, shallow waters and sandy beaches. This is today, there are many beautiful sceneries, so it attracts many tourists which earn very good income. From the above mentioned environment, it is a factor to promote the local people to get various occupations according to the physical characteristics as shown in Figure 1.

From Figure 1, it was found that the current physical condition of the road leading to the village is ascent. The main road is a concrete road, and the road to Burma is constructing. The ways outside the residential areas which are along by the forest and agricultural crops have no street light.

From the link between the agriculture and commerce in the community. The western part is a border to Myanmar, so they do trading at the border which is areas of Tak and Kanchanaburi. Major products are consumer goods, processed timber, jewelry and forest materials. In a part of tourism service, this region has many tourist attractions such as waterfalls, jungles, reservoirs, islands, river, and beach. It is a popular tourist destination, especially in Kanchanaburi, Phetchaburi and Prachuabkirikhan.

Communities' economic development planning guideline in the Special Economic Zone, western region according to research objectives 2: Analyze questionnaire data in physical needs of the local communities and visitors to propose a layout of the Special Economic Zone as shown in Table 1.

**Table 1.** the relationship between the length of living time of the local people and the facilities they need

Length of living time	The facilities need				
	Hotel	Gas station	Market	Police station	Total
1. Less than 5 years	0	4	8	4	16
2. 5 - 10 years	0	8	8	4	20
3. 11 - 15 years	12	4	16	8	40
4. 16 - 20 years	12	12	24	20	68
5. 21 - 25 years	12	44	48	10	114
6. 26 - 30 years	4	8	16	20	48
7. More than 30 years	0	8	64	22	94
Total	40	88	144	88	400

From Table 1, it is found that those who has been living in the areas about 25-21 years prefer to have a department store the most. Secondly, those who has been living in the areas about 30 years prefer a security center such as police station the most.

To propose a planning for communities lying between agricultural and commercial guideline in the



Special Economic Zone, western part according to research objectives 3: Private section support. To develop the commercial system to be higher and expand the products and services distribution both domestic and international markets. Also, promote Thai people to be more interested in trading and service jobs. In addition, the state need to maintain the prices for domestic consumption which is a key factor in the cost living and economic indicator.

## 7. Discussion

The study of the communities' physical characteristics in the Special Economic Zone, western region according to research objectives .1

According to the physical characteristics, the areas mostly are agricultural areas which are located in a distance from each other. This is consistent with the communities' economic development planning guideline in the Special Economic Zone, western region [7]. According to the needed facilities observation, the trading routes and transportation in Ban Muang District, Amphoe Mueang, Kanchanaburi are convenient [8]. Communities' economic development planning guideline in the Special Economic Zone, western region according to research objectives :2According to the study, the current areas have no place to be a main center for economic development which is contrast to the importance and readiness of Thailand concept [9]. According to the basic infrastructure development guideline, we need to solve community problems, and improve trading and tourism. Including, develop the core infrastructure follow the Border City Development Action Plan as well. It also consistent with the concept of free trade in Thailand.

It is believed that when the drive increases, the trade will expand by at least %25 in some industries such as automobiles, tourism and transportation.

To propose a planning for communities lying between agricultural and commercial guideline in the Special Economic Zone, western region. According to the research objectives 3, the trade in the western Special Economic Zone will expand more which resulted to the capital sources[10]. Thus, the capital sources will be emerging such as hotel, tourism, restaurants and car rental industry. As there will be more roaming route and the communities lying between agricultural and commercial will develop more, the boarder areas will grow up more. The reason is there is a central of transportation hub in western part.

## 8. Suggestion and Recommendation

1.The results of planning for sustainable communities lying between agricultural and commercial in the Special Economic Zone in western Thailand will be three issues; physical characteristics, community plan of green communications and energy saving elements' design and planning for communities lying between agricultural and commercial guideline. The recommendations can be classified as follows; 1.

Physical characteristics of the community in the Special Economic Zone, western region.

2.Trading route and transportation in the zone. According to the study, there are constructing the trading route which is connected to Myanmar. Therefore, people in the areas want to have a career which is work in the

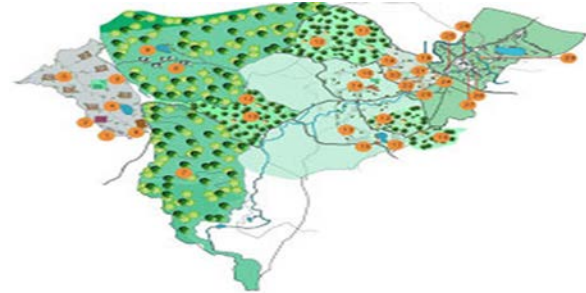


Fig. 2. shows planning for community lying between agricultural and commercial at Ban Kao district, Kanchanaburi

trade route.

3.The physical characteristics of the communities on traffic patterns for trading and transportation. According to the study, they are constructing the trading route to connect with ASEAN countries.

Community plan of green communications and energy saving elements' design and planning for communities lying between agricultural and commercial guideline. Layout of space utilization by dividing areas into zones which are agricultural, residential, commercial, green, industrial areas as well as roaming routes.

Figure 3 shows the zone arrangement for using the layout design. The area is divided into 6 zones to show the details of the designs in each zone.

4.Purpose the planning for communities lying between agricultural and commercial guideline. Layout of space utilization in different zones as well as roaming routes. The routes should be connected to the activities areas, and the commercial zone is given to locate in front of both sides of the Kwai Noi River which creates many activities as Ban Kao district, Kanchanaburi in Figure 2.

We study the plan for sustainable communities lying between agricultural and commercial in the Special Economic Zone of western Thailand to increase the value of agricultural products. Also, to develop export potential in agricultural products that generate very good income for the communities to cumulate their wisdom as well as quality development. To strengthen the compete ability and the communities' economy in order to earn income for the country and develop overall economy and socialment. It can build green communications and energy saving power in negotiating as well.

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