

Analysis of the Difference Between Two Approaches to Assessing Housing and Community Standards

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ABSTRACT

 This comparative study on housing and community comfortable living performance standards is a part of a participatory research conducted to meet the needs addressed by the Thai National Housing Authority to improve existing housing and community standards. The research team conducted a case study of the Rim Khwae Awm Community in Samut Songkhram Province. This community had been identified as a model of comfortable living. This article presents the results of an analysis of comfortable living standards derived from a review of related literature and standards derived from the participatory process with the community case study. This research found that the standards for comfortable living from the literature review gave priority to the physical aspect and factors which could be measured using scientific methods. By contrast, the community participatory standards gave priority to a holistic combination of the local ecology, environment, society, economy, and application of local wisdom.

Keywords: *housing standards, comfortable living, community, housing, participation*

INTRODUCTION

The Thai National Housing Authority (NHA) is the principal organization responsible for developing housing, communities and urban areas. The NHA has the important mission of addressing housing needs for the lower- and middle-income segments of the population so that they can enjoy a good quality of life (Jaruthat, T., 2007). In 1986, the NHA first proposed standards for housing and the surrounding environment. These standards were amended in 1988. Subsequently, the NHA applied these standards as a handbook for housing developments

under its aegis, especially the public housing projects (Ban Eua-Athorn). In 2017, the NHA commissioned a study of performance standards for comfortable living and communities, stipulating that this should be a participatory process with the local community. The findings would be used to generate revisions to the existing set of standards and to add to the knowledge base for housing and community comfortable living performance standards (Office of Natural Resources and Environmental Policy and Planning, 2005). This approach ensured that the findings would be locally relevant as opposed to using international standards which have been applied in the past.

OBJECTIVES

This article is part of a research project to develop housing and community comfortable living performance standards to upgrade housing development planning. The objective of this paper is to compare standards for comfortable living gleaned from the literary review and from a participatory process, and to apply those findings to recommended guidelines for improving living standards for Thailand in the future.

GEOGRAPHIC SCOPE OF THE STUDY

The locations for this case study are a seven km. area along both banks of the Khlong Khwae Awm Canal. The north bank is part of Bangkhonthi District, including Tambon Bang Kung, Tambon Bangsakae, and Tambon Ban Pramote. The southern bank is part of Ampawa District, including Tambon Khwae Awm and Tambon Muang Mai. These locations are in the Samut Songkhran Province. (Panitchpakdi, K., Pimwern, T. and Laohpiyawisut, T., 2018)



Figure 1.1: Khwae Awm



Figure 1.2: Banks of Khwae Awm Canal

Figure 1:
Locations of the study communities along Khwae Awm Canal, Samut Songkhram

Number of households in the study sites (Burana, A. 2013)

Table 1: Number of households in the study sites

Tambon	Total number of households	Number of households not on the Canal bank	Number of households on the Canal bank
Khwae Awm	181	143	38
Muang Mai	696	129	8
Ban Kung	198	142	56
Bangsakae	725	457	107
Ban Pramote	130	82	48
Total	1,663	846	257

The importance of the study communities along the banks of the Khlong Khwae Awm Canal are as follows:

1. **Geographical:** The Canal is an important waterway in the Samut Songkhram Province which links that province with Ratchaburi Province.
2. **Historical:** The Canal was a private waterway for Kings Rama II and V, with eleven venerable Buddhist temples along the route.
3. **Cultural:** There are many traditional Thai houses along the Canal which also reflect the lifestyle of the communities which populate both banks of the Canal.
4. **Environmental:** Waterside lifestyle, including the custom of *long khaek long khlong*, which means group labor helping one's neighbors in time of need.
5. **Economically:** The local residents cultivate gardens and orchards, applying principles of sufficiency economy. These occupations need to be perpetuated.
6. **Socially:** The communities along the Canal demonstrate solidarity of their residents who appreciate living together in harmony.

REVIEW OF LITERATURE

For this study, the authors reviewed documents concerning national and global guidelines for comfortable living and community development.

From the literary review, the authors were able to classify and analyze features of comfortable living using the most cited indicators from the various sources. The result was five levels are prioritized as follows:

Level 1: Most important are, cited by more than five sources, community features, such as walkways, children's playground, open public space, communication services, electricity and lighting, lighting in the household, street lighting, and access to security services.

Level 2: Very important are, cited by four sources, specifying the minimum usage area, house structure, systems for fire prevention, fire plugs, fire alarms, smoke detectors, comfortable temperature.

Level 3: Important are as cited by three sources, the proportion of the area for housing, car parking, volume of piped water, water supply system, air quality controls.



Figure 2:
The cultural beauty of the study locations

Level 4: Less important, cited by only two sources, are the density of the community, walkways and movement through the building, storage space, open space in the building, privacy, building materials, infirmary, parking and roads, sewage disposal, use of leaded paint, prevention and control of humidity, neighbors, and daily activities.

Level 5: The least important is size of areas within a house for various uses, size of kitchen, size of bathrooms, sanitary facilities specifications, area within in the house.

(1) Study of standards of living and the environment, and the Handbook for Evaluation of Sustainable Comfortable Living Communities for the Lower-income of the National Housing Authority (2) Study of texts from other countries on indicators and standards of living and communities (3) Classification of indicators identified from the review (4) Analysis and ranking of indicators by level of importance based on repeat citation and reference to in the various texts and (5) Convene a panel of experts to review the indicators.

RESEARCH FRAMEWORK

The conceptual framework for this study has two components: (1) A study of international standards for comfortable housing used outside of Thailand and a review of related literature (2) A study of standards for comfortable housing and community through a participatory case study.

RESEARCH PROCESS OF THE LITERARY REVIEW

This study of comfortable living standards included a review of related literature which involved five steps,

PROCESS OF PARTICIPATORY RESEARCH

The process used in the study of standards of comfortable housing and community was participatory. The study participants included the Samut Songkram housing development partners comprised of the National Housing Authority (NHA), the provincial governor, the Non-formal Education Office (NFO), the Provincial Civil Works and Planning Office, the provincial branch of the Ministry of Social Development and Human Security, the Local Administrative Organizations (LAO), educational institutions (within and outside the study area), local sages, Buddhist monks, the Mae Klong Community, and local residents.

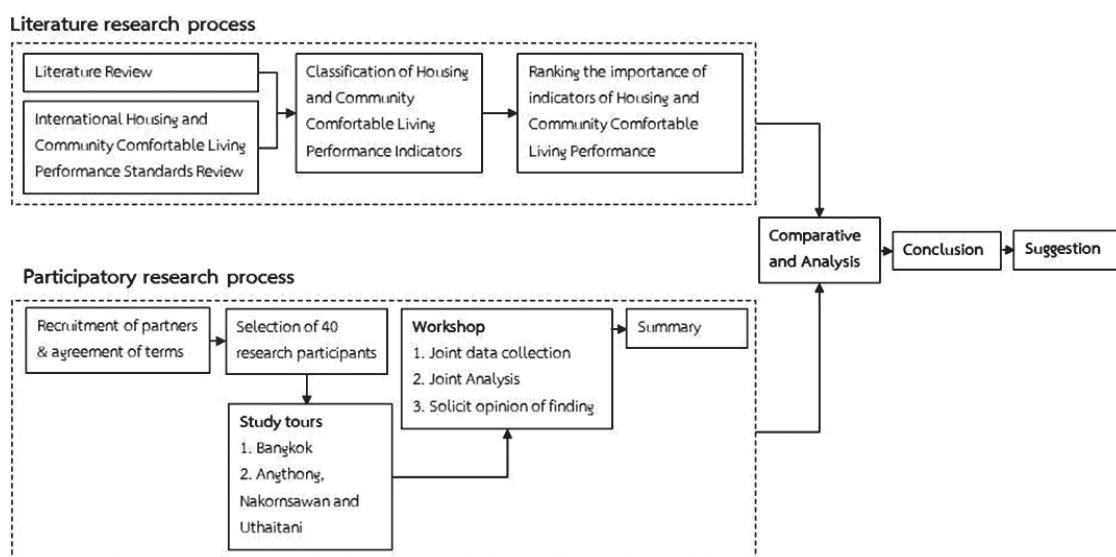


Figure 3:
Research framework

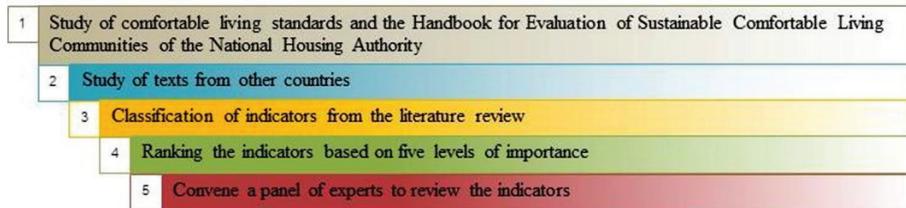


Figure 4:
Literary review process

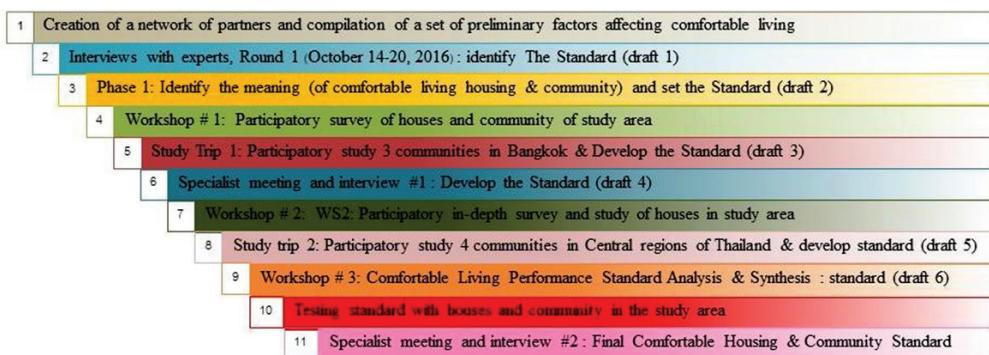


Figure 5:
Participatory research process

Together, these partners assisted with the data collection for the overview and in-depth studies. The partners helped with brainstorming, analysis and development of standards for comfortable living. The project involved numerous collaborative activities organized through eleven steps, as described below:

COMFORTABLE HOUSING AND THE RIM KHWAE AWM COMMUNITY

The Rim Khwae Awm Community is located on both sides of Khwae Awm Khlong (canal) in the northeast part of Samut Songkhram Province, abutting Ampawa and Bangkhonthi Districts. The community is comprised of five Tambon (sub-districts). The community extends about seven km from the mouth of the Mae Klong River to the Wat Kaew Charoen Monastery. The canal is an important link with

Ratchaburi Province. (Panitchpakdi, K., Pimwern, T. and Laohpiyawisut, T., 2018)

History of the community

In the distant past, this area was part of the Gulf of Siam. Over time, sediment built up enough so that settlements could be built. The Kwa Awm Canal is an important transportation link with Ratchaburi Province and, thus, is also a focal point for trade. Historically, there were important markets and communities in and around the mouth of the Mae Klong River and the Wat Keo Charoen Community. During the Ayuttaya Era, these locations were quite prosperous, as indicated by the large number of venerable monasteries. The locality was also the site of the Bang Kung military camp, which was a base of operations during hostilities between Siam and Burma. Then, during the Rattanakosin Era, the canal became a dedicated waterway for King Rama 1 and King Rama 5.

Characteristics of the natural environment

The canal was also an important waterway to nourish the three-water ecosystem. The environment was lush because of the alluvial terrain. The foliage benefited from the extensive network of canals and waterways which permeated the area. These canals helped to absorb flood waters when tides were high. This ecosystem had diverse variety of life forms, rich in flora and fauna. Looking around, there would be trees and canals as far as the eye could see.

Socio-cultural characteristics

At present (2017), the five tambons of Kwae Awm comprise 33 villages and 9,888 households, with a population of 3,201. The population density is very low, and most of the residents are Buddhists. There are 11 monasteries in the tambon and schools are also located within the temple grounds. Most of the households have at least one elderly member. The tambon is also noteworthy for being the birthplace of a number of famous actors and musicians. The residents are a peaceful community and give alms to monks who travel by boat on the canal.

Economic characteristics

Most of the working-age population are orchard farmers whose crops include lychee, pomelo, and coconut. The average land area is five rai

per household. Some of the families also conduct trade along the canal banks and roadsides at busy locations. Most of the residents live comfortably since they practice the principles of a "sufficiency economy." They are industrious, self-reliant, frugal, and save money as well. No one is unemployed if they don't want to be. There is plenty of work tending the orchards. This province has the second highest rate of taxes paid per capita after Bangkok.

Layout of the community

Throughout the seven kilometer stretch of the community, houses dot the Khwae Awm canal banks. Away from the canal, the interior consists of the fruit orchards and small roads which snake along the path of the canal. The southern bank of the canal is more densely settled than the northern bank. There are nine monasteries on the southern side compared to only two on the north. The communities can be classified as follows:

- 1) *Settlements at the mouth of the Mae Klong River.* Historically, these were merchant families with a dense concentration of wooden houses. There are three monasteries. At present, parts of this area are still kept-up, while other parts are a bit run down.
- 2) *Settlements along the middle section of the canal.* These consist of traditional Thai houses which are somewhat sparsely located along the canal banks. Shops are located opposite the monasteries or where the canals intersect. There are three monasteries in this area;



Figure 6:
Aerial photographs at Samut Songkhram province



Figure 7:
Rim Khwae Awm Community from the Pak Nam Monastery to Muang Mai Monastery



Figure 8:
Communities along the Khwae Awm Canal

3) *Settlements along the part of the canal around the Wat Keo Charoen Monastery.* In the past, this was an active trading center. At present, the settlements are characterized by wooden houses in rows, interspersed with shops. This area has historical features that are worth preserving.

Characteristics of the housing

The survey of houses along the canal identified 383 houses of four types: The majority 228 (59.5%)

are indigenous wooden houses; 96 (25.1%) are traditional Thai-style houses; 29 (7.6%) are row houses; and shop- house 30 (7.8%) are modern houses. The condition of the houses ranges from good 38.0% to moderate 34.0% to dilapidated 24.5% and uninhabitable 3.5%. A key feature of most households is that they are located in a shady area along the canal. The houses are raised quite high on stilts. The roofs are sloped with long eaves. The houses are spacious with good air circulation and natural lighting. Most of the houses do not have fences. The community tends to the waterways and conserves the natural environment. (Table 2)

Table 2: Types of houses along the Khwae Awm Canal

Type	Good condition	Moderate	Dilapidated	Uninhabitable
Traditional Thai-style (25.1%)				
Indigenous (59.5%)				
Row houses And shops-house (7.6%)				
Modern (7.8%)				

Comfortable living of the Khwae Awm Canal bank communities

The communities of comfortable houses on the banks of the canal are the result of all the factors cited above, which interact in a holistic way. This synergy works toward protecting the ecosystem, creating peaceful co-existence, having occupations which are in harmony with natural resources and the environment, practicing sufficiency economy, being frugal and self-reliant, and preserving and practicing traditional wisdom to live constructively within the surroundings. Most of the residents are satisfied with living in an environment dominated by trees and waterways, clean air, and peaceful co-existence. The residents are all linked by their social network and look after each other's interests, property and the community at-large.

THE COMFORTABLE HOUSING AND COMMUNITY STANDARDS

Comfortable housing and community standards from the literature review process

Through reviewing both domestic and international literature comfortable housing and community standards were gleaned. The relevant variables for the assessment of comfortable living can be classified according to the following four dimensions: (1) Physical aspect (2) Ownership status (3) Factors that are measurable using scientific methods; humidity, chemicals, radiation, energy usage and (4) Factors related to pollution and associated risks; noise pollution, risks from the changing environment and natural disasters. A total of 153 indicators were identified. Factors related to the economy, society, culture, customs, and development knowledge were not specified in the standards from the literary review.

Comfortable housing and community standards from participatory research process

Standards for comfortable housing

This component has five groups, ten standards, 70 indicators, and 192 factors. The factors include 21 quantitative and 171 qualitative factors. This study found that it was necessary to take a holistic view of the components; i.e., it is not advisable to analyze components independently of one another since there are nested inter-relationships among the factors. For example, residents and participants in the case study were unanimous in their belief that one indicator of comfortable living was most important: Preservation of the architectural landscape and geography of the locality. The established and most applicable qualitative indicators of comfortable living include the following eleven:

- (1) Preservation of the gardens, groves, and *Lam Pra Dong* (Traditional Agriculture Canal)
- (2) Preservation of the indigenous vegetation
- (3) Avoidance of the practice of landfill
- (4) Protecting and designing use of the land that is consistent with the original water flows of the locality
- (5) Use of natural material in treating the topsoil before construction, instead of pouring concrete
- (6) Cultivating plants which have multiple and diverse uses
- (7) Appropriately using dams to protect egg-laying practices of aquatic life
- (8) Use of a design of dams on the water banks which does not damage the canal-side ecosystem
- (9) Protect and preserve large shade trees
- (10) Cultivate plants which strengthen the environment, such as plants to protect the banks of the canal
- (11) Construct banks along the canal that are strong enough and can withstand wave action from motor boats that pass.

Standards for comfortable Community

Various components are recognized. These include six groups of 22 standards, 68 indicators and 322 factors; the latter of which can be divided into 59 quantitative and 263 qualitative factors. These factors are different and stand out when compared with the traditional standards of comfortable living. They give more importance to management and concern for the water resources. The local residents believe that the water resources are a key component for living comfortably. Water resources can be linked with all the groups of standards for comfortable living. By comparison, the traditional standard indicators and factors identified by the literary review tend to prioritize travel by roadways, not waterways. This means there will be a lack of consideration of canals and all the connected features of those with other indicators such as travel by waterways, utility of the canal, the flora along the banks of the canal, the flood barriers, management of the aquatic ecosystem, and the waterside spaces, among others.

Another observation by residents in this case study is the necessity of valuing and managing the local wisdom, the need to document that knowledge, share it, and apply it for comfortable, harmonious living in this locality. This includes traditional wisdom about customs, culture, and beliefs about what constitutes comfortable living. All of which are not addressed in the studies that were part of the review of literature.

The comparison of comfortable standards between literature review and participatory research

Comparison of comfortable housing standards

Table 3: The comparison of comfortable housing standards

Group	Standards	Indicators	Standards from Literature process	Standards from Participatory process
1. Layout and the environment	Location and use of the land	Site selection	/	/
		Building design	/	/
		Land plot		/
		Minimum width of the plot	/	/
		Age of the building	/	/
		Proportion of the building to the plot		/
		Protecting the architectural and natural terrain Features	/	/
	Design of the building interior	Proportion spacing of facilities	/	/
		Size of the facilities	/	/
		Height of ceiling	/	/
		Proportion to number of dwellers		/
	Style of building	Style		/
		Raised foundation		/
		Height and slope of roof		/
		Style of roof		/
		Overhang of eaves		/
	Features of the building	Porch		/
		Doors		/
		Stairs		/
		Durability of construction materials	/	/
		Construction technique	/	/
		Choice of construction materials	/	/
		Use of natural light	/	/
		Air circulation and temperature	/	/
	Utilities	Electricity and lighting	/	/
		Water for use and waste water	/	/
		Waste management	/	/
		Building's energy consumption	/	
	Security	Security from crime	/	/
		Security from man-made disaster	/	/
		Security from natural disaster	/	/

Table 3: The comparison of comfortable housing standards (continue)

Group	Standards	Indicators	Standards from Literature process	Standards from Participatory process
2. Economy		Occupation		/
		Income, expenditures, savings		/
		Access to loan funds		/
		Ability to cover expenses		/
3. Society, culture and customs		Household member relationships		/
		Lifestyles		/
		Participation in the household		/
		Family customs, culture	/	/
4. Management		Roles of family members		/
		Management of the environment	/	/
		Management of technological advancement		/
		Management of house repair	/	/
5. Learning and development		Knowledge management in the household		/
6. Chemicals and radius		Chemicals and radius requirement	/	
		Types of Chemicals and radius	/	
		The number of contaminants from chemicals and radius	/	

From this comparison of standards obtained from the review of literature and those from the participatory case study, it is possible to classify the differences by the following:

- (1) Physical aspects: Both sources of data have identified many factors for this dimension compared to the others, and the physical aspects factors are 55% of the total. However, the literary review studies do not give priority to design of the domicile, e.g., the proportional sizes, the components, and materials used to make the domicile (e.g., doors, windows, stairs, etc.) The residents in the case study felt these aspects are important
- (2) Economy: The economic factors and income are not cited in the review of literature since they did not define comfortable living as physical comfort and emotional comfort
- (3) Socio-cultural
- (4) Management
- (5) Knowledge and development: these were not in the international standards; the residents in the case study gave more importance to the lay-out factors which conferred physical comfort
- (6) Chemicals and radiation: Some of the standards cited in the literary review refer to these. However, in the case study, the participants felt that these were factors which did not directly affect comfortable living. It was also felt that these factors are hard to measure by non-specialists and, thus, did not cite these as a priority

Comparison of comfortable community standards

Table 4: The comparison of comfortable community standards

Group	Standards	Indicators	Standards from Literature process	Standards from Participatory process
1. Layout	Location	Settlement	/	/
	Size and boundaries	Population	/	/
		Size and boundaries	/	/
		density	/	/
	Proportional land use	Proportion for housing	/	/
		Proportion for transit	/	/
		Proportion for shared use	/	/
		Adequacy		/
	Diversity of housing styles	Diversity of housing	/	/
	Community plan	Plan	/	/
	Standards of utilities	Commercial area	/	/
		Educational institutions		/
		Public health	/	/
		Religious institutions		/
		Official caretakers of the environment	/	/
		Disaster prevention		/
		Economic assistance center	/	/
		Community management center	/	/
	Standards of public utilities	Transportation	/	/
		Electricity and public lighting	/	/
		Potable water	/	/
		Waste water management	/	/
2. Environment	Natural environment	Water	/	/
		Earth	/	/
		Waterway flora		/
		Air		/
		Trees and foliage	/	/
3. Economy	Community	Community member income		/
		Community savings		/
		Occupation		/
4. Society, culture, customs	Society	Society/social	/	/
		Types of people		/
	Participation in the community	Activities to encourage participation	/	/
		Types of activities		/

Table 4: The comparison of comfortable community standards (continue)

Group	Standards	Indicators	Standards from Literature process	Standards from Participatory process
	Customs, culture	Type	/	/
		Activities	/	/
	Preservation of the culture and customs	Value of	/	/
		Preservation	/	/
	Historical features of the locality	Heritage	/	/
		Participation in the heritage		/
5. Management	Community	Role of the community		/
		Community relationships	/	/
		Community participation	/	/
		Sense of community ownership	/	/
		Jointly-established community rules	/	/
		Health promotion activities	/	/
	Management agency	Role of the agency	/	/
		Role of the community	/	/
	Support from external agencies	Local, provincial, national		/
	Management of utilities	Water supply	/	/
		Electrification		/
		Disaster prevention		/
		Security		/
	Waste management	Waste disposal	/	/
		Recycling		/
	Management of the environment	Environmental conservation		/
		Protecting the environment	/	/
		Protecting the waterside environment		/
		Protecting air quality	/	/
		Protecting the trees	/	/
	Managing technological advancement	Appropriate technology		/
		Screening of which technology to apply		/
6. Learning and development	Knowledge management of the locality	Recording the knowledge		/
		Community database and mapping		/
		Creating a sense of concern community development plan	/	/
		Preserve and disseminate knowledge		/
		Preserving traditional wisdom		/

At the community level, it is possible to summarize the differences across the following six dimensions:

- (1) Physical aspects: This category had the largest number of factors with 32% of the total. Both sources of data gave importance to public utilities and essential amenities for the community. The standards from the participatory case study give more weight to the proportion of land use in the community and concern for convenient access to educational institutions and places of worship
- (2) Environment: Standards regarding water resources were not found in the literary review. By contrast, the residents in the case study gave top priority to this factor. For example, they see the waterway as a transportation route, and as a resource which benefits the community, a source of flora, flood walls, an aquatic ecosystem that needs to be maintained, and source of vegetables along the canal bank
- (3) Economy: The studies in the review of literature did not determine economic dimensions. However, the case study residents did give importance to economic factors as they support livelihoods in the community, such as income, occupation, and community savings

- (4) Socio-cultural and customs: The secondary research only referenced space to conduct cultural activities. The case study participants gave importance to the history, traditions, and indigenous culture of the home community
- (5) Management: The studies in the literary review gave importance to public utilities and amenities for the most part. By contrast, the case study participants gave priority to a more holistic outlook and integration of systems, whether the environment, or community participation in local management;
- (6) Learning and development: The written references relates to creating a concern for the community and community development planning. However, in the participatory case study, the priority was on systematically recording of the local wisdom, sharing this, and preserving it for future generations

CONCLUSION

1. In conducting a participatory survey, joint analysis, and collaboration in defining recommended guidelines to address challenges with community members is an important approach

The concept of housing and community comfortable elements

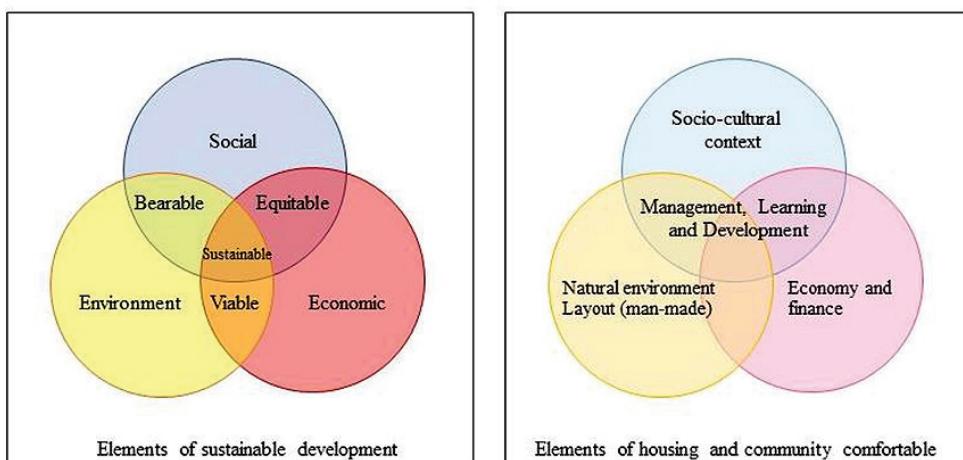


Figure 9:

Applying concepts of sustainable development as a framework for defining components of standards of comfortable housing and community

in determining standards of comfortable living. That process produces improvements and solutions to housing and the community which are tailored to the needs of residents. In addition, this participatory approach helps strengthen the community.

2. The standards cited in the studies in the review of literature give priority to factors related to the physical aspects more than other dimensions. By contrast, the participatory case study gives priority to all the dimensions, with a special emphasis on holistic and integrated approaches that relate to the concept of sustainable development and refers to development that is in balance with the environment, society, and economy. This principle can be further classified into factors for comfortable living in the context of the natural surroundings and man-made layout. There are also standards of management, learning and development.

3. The standards from the literary review are mostly based on quantitative measures which use scientific methods, e.g., temperature, humidity, water quality, etc. However, in the case study, there are both quantitative and qualitative standards. In that study, the qualitative factors are given higher priority.

4. The standards from the Participatory process give more importance to the social dimensions and relationships between neighbors as a top priority. That differs from the secondary research which gives more importance to buildings' lay-outs and factors which can be measured using scientific methods.

5. This study produced standards with involvement and input from local wisdom such as the following:

- 1) A settlement of houses and community needs to be consistent and supportive of the ecosystem of the locality, and must minimize the adverse impact on the environment, especially water resources.
- 2) There should be a minimum amount of land filling activity and only when necessary; loose soil from outside the locality should not be used for land fill; houses should be raised above ground level instead of using land fill to raise the building; that will augment comfortable living.
- 3) The waterfront household pavilion pier is an important component of comfortable living. The pier is a place to congregate and have cultural exchange among the generations. It embodies the importance of conservation.

- 4) Houses located on the sites which face the waterway and are surrounded by tall shade trees, is a key factor for creating a comfortable living environment. The breeze is cooled by the water and the trees help purify the air that flows into their houses.

RECOMMENDATIONS

The standards derived from the case study are only applicable to communities with similar characteristics.

The prevailing standards principles were aligned with standards for comfortable living issued by the NHA in 1988 and standards from other countries. By contrast, the standards in this study were based on the local knowledge and wisdom of only one community: Rim Khwae Awm, which is an agricultural community located along the banks of a canal in a lowland area of the central region of Thailand. Thus, the standards from this research are only applicable to other communities with similar characteristics.

The standards for housing and comfortable community living need to be improved which are more generally applicable.

This aspect will require additional research with the following attributes:(1) Research on other communities with similar characteristics as the case study site reported here (2) That research should be complemented by studies in other communities with different contexts to produce two sets of standards: One which can be applied generically, and one which is specific to community types.

The standards derived from this research should be applied as the following:

Applications by the NHA

The case study community and the houses in this study differ considerably from NHA housing developments. Nevertheless, there are many standards which the NHA can apply to its housing development projects. There should be an expansion of the set of indicators and targets across all the dimensions, with a special emphasis on holistic and integrated approaches that relate to the concept of sustainable development.

It refers to development that is in balance with the environment, society, and economy in the process of development. The standards principles provided in the research can also be applied by the NHA as principles of operations.

Application by local administrative organizations (LAO)

LAO in the study area and LAO in areas with similar characteristics as the case study site can apply the standards from this research in the following ways:

- 1) The LAO can use the handbook to plan housing for comfortable living based on the case of an agricultural, waterside community. These standards can be adapted for easy understanding and use as guidelines when requesting permits for constructing housing in the LAO's area of jurisdiction. The standards and guidelines can be shared with local residents as well.
- 2) The LAO can use the research's video to help explain the findings in an easy-to-understand format. This video can be used for public information dissemination and education, especially in schools in the locality.

3) Developing models of housing which conform to these new standards is a form of modern innovation which can serve as an example for community learning. There is an example of a model house on the edge of a body of water, owned by Surajit Chirawet and designed by Keukgong Seuadee. The house design applies the standards of comfortable living by taking the local knowledge of traditional-Thai house design into account. (Chiravate, S. 2015) The design addresses natural air circulation, natural lighting, connectivity between the sections by terraces, and having a space under the first floor for reducing humidity and as flood protection.

The compass orientation of the house takes into account the seasonal changes in the winds, rain and sunlight. The house has a convenient source of water and a constant breeze which is cooled by the body of water before reaching the house. Air circulation in and around the house is given top priority since that is a foundation of comfortable living. The design attempts to address all dimensions to facilitate air circulation, e.g., by raising the first floor above the ground, having a high and sharply angled roof, and designing ways for air to circulate well above the walls.

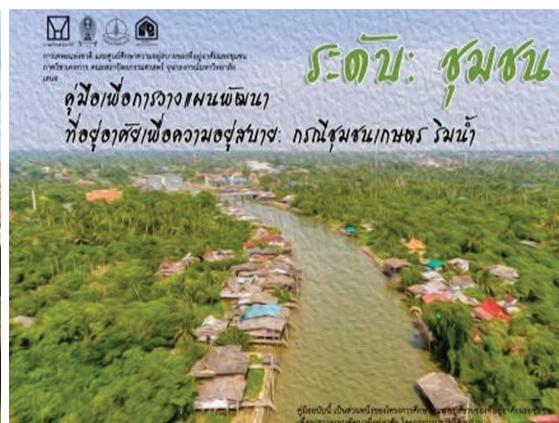


Figure 10:
Handbook for Housing and Community Planning

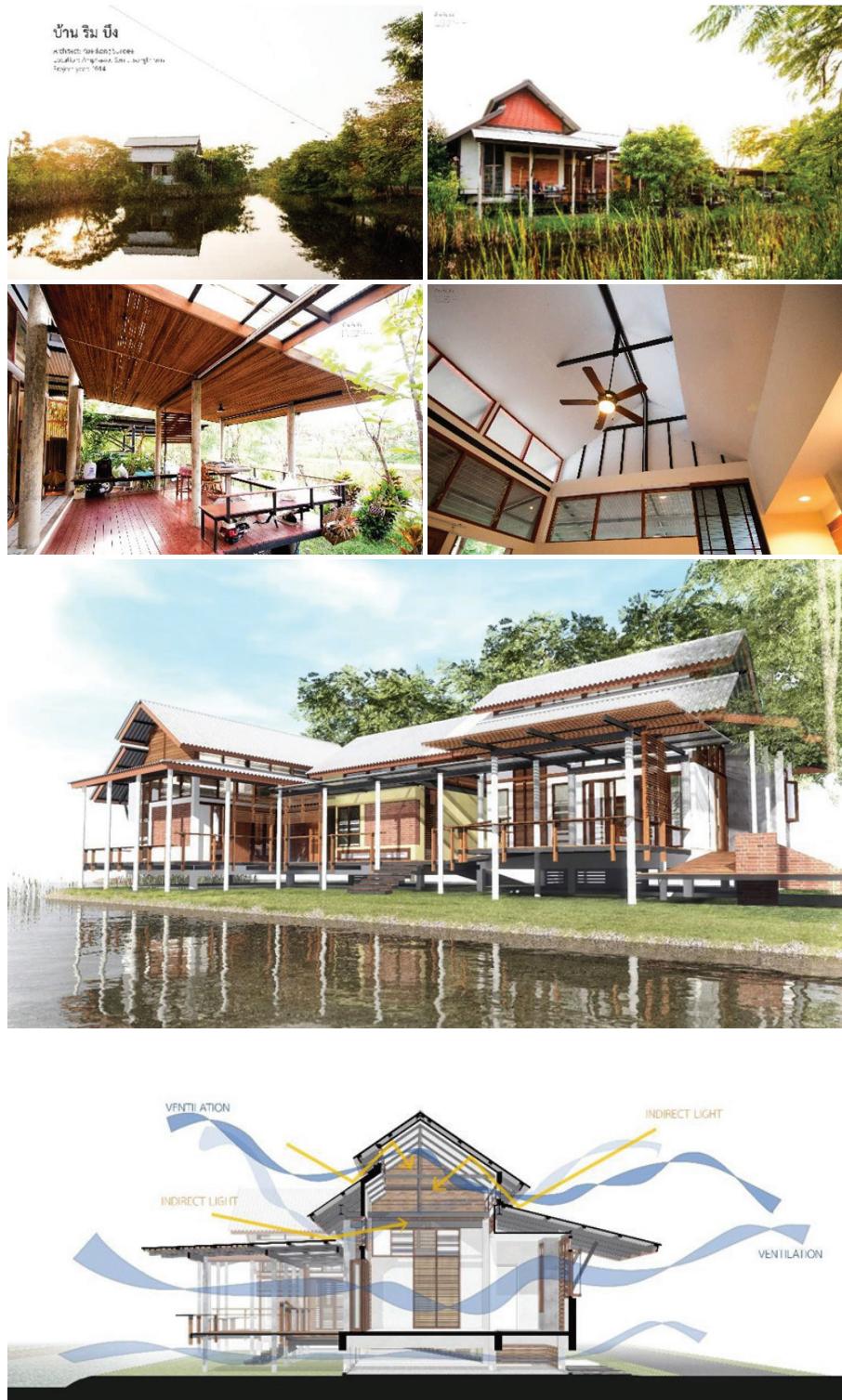


Figure 11:
House of Khun Surajit Chirawate. Modern house in conformance with standards of comfortable living. Designed by Keukkong Seua-dee

REFERENCES

Burana, A. (2013). *Study of environmental factors which impact on community conceptual thinking about restoration of the local architecture: Case study of Khlong Kuae Awm communities in Samut Songkhram* (Master's thesis). Department of Local Architecture, Faculty of Architecture, Graduate School, Silapakorn University, Bangkok.

Chiravate, S. (2015). *Maeklongian: Where are we going?, The Ordination Ceremony at Wat Pom Keaw*. Samut Songkhram: n.p.

Chula Unisearch. (2009). *Housing development plan and prevention plan / solution for slum area in fiscal year 2009: Lower Glamor Group 2, Samut Songkhram Province*. Bangkok: Chulalongkorn University.

Department of Environmental Qualities Promotion. (2017). *Sustainable urban environmental assessment guide book*. Nakornpathom: Sun Packaging 2010 Limited.

Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA). (2010). *The national community housing standards manual* (2nd ed). n.p.: The Queensland Department of Communities, Housing and Homelessness Services.

Jaruthat, T. (2007). *Monitoring the government's low-income housing policy and plan*. Bangkok: Department of Housing, Faculty of Architecture, Chulalongkorn University.

London Development Agency. (2010). *London housing design guide* (Interim ed.). London: n.p.

National Housing Authority. (1986). *Housing and environment standards*. Bangkok: The National Housing Authority.

National Housing Authority. (1988). *Housing and environment standards*. Bangkok: The National Housing Authority.

Office of Natural Resources and Environmental Policy and Planning. (2005). *Cultural environment traditional community conservation handbook, the project of development of quality standards of the cultural environment in old town neighbourhoods in the central and eastern regions*. Bangkok: Property Print Limited.

Office of Natural Resources and Environmental Policy and Planning. (2005). *The conservation of knowledge in development and old city management, volume 2: General concepts and criteria for conservation and restoration of the old town*. Bangkok: Property Print Limited.

Panitchpakdi, K., Pimwern, T., & Laohpiyawisut, T. (2018). *Development of housing and community comfortable living performance standards through participatory research*. Bangkok: Faculty of Architecture, Chulalongkorn University.

The American Public Health Association. (2014). *National healthy housing standard*. Columbia, MD: National Center for Healthy Housing. Retrieved from <http://nchh.org/tools-and-data/housing-code-tools/national-healthy-housing-standard/>

U.S. Department of Housing and Urban Development. (2001). *Housing choice: voucher program guidebook*. Washington, D.C.: The Office.