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"Cultural Sustainability in the Built and Natural Environment"

Cultural Behavior: Climatic adaptive approaches of traditional housing in Vietnam Northern lowland area

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Abstract

This paper presents the cultural behavior to Nature of traditional housing in Vietnam Northern low land area and the discussion around the following issues: (a) Characteristic of climate in Vietnam Northern lowland area, (b) Approaches on environmental sustainability and climate adaptation through the analysis of traditional housing in Vietnam Northern lowland area and (c) Status and architectural trends of rural housing development in Northern lowland area today.

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Keywords: Cultural behavior; climate adaption; Vietnam Northern lowland area; environmental sustainability

1. Introduction

Architecture is a synthesis of material culture, spiritual culture and behavioral culture. Understanding and recognizing the distinctive elements of this culture is a critical basis to promote traditional values in a modern architecture with the means and tools of the era. Cultural sustainability will create the values specific to the architecture of the country, compared with other countries in the architecture in the region and on the international scene. However, in many developing countries, cultural sustainability is difficult to maintain and in many cases showed "doped mixed" more private personality.

In recent years, the issue of cultural identity in contemporary architecture has had a pivotal role in creating own and local characteristics in a competitive environment at the global level. Many countries have begun to check the unique culture by studying the traditional rules and values. This process has had

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the impact on the work of contemporary architecture and broke out fierce debates about the "own" that the local architecture can create rather than "why" these details from the past.

Architecture in each region gives us precious lessons of the perception, behavior and specific solutions to natural environment which formed the regional specific culture.

The traditional rural houses are characterized the representative architecture of 80% of Vietnam agricultural population. Viet people resided in the three large low land delta parts of Vietnam. Especially, Northern low land area is the cradle of Viet age-old culture. The traditional housing in Northern low land area is an intact architecture model and an important part of Vietnamese vernacular architecture. They contain profound characteristics of folk culture through furniture disposition, decoration, function, direction and campus. The traditional housing in Northern low land area represents lifestyle, kinship, religious opinions, economic foundation, social structure, the characteristics of the ecological environment, the aesthetic concept, etc. The house associated with fluctuations in human life is an important component of the architectural heritage and cultural heritage of Vietnam in general.

Along the evolution path, houses in the Northern rural area have learned how to respond to adverse climate conditions and put together valued lessons in climate adaptation. In times of urbanization with the challenges of global climate change, building on these valuable experiences and integrating with advanced technologies is what it takes to look to modern green rural housing models.

Fig. 1. “Doped mixed”

2. Natural, cultural, social and economic conditions of the Northern lowland

The Northern lowland is the cradle of the Hong River civilization based on paddy rice farming. The Northern lowland now encompasses 10 provinces and cities: Bac Ninh, Ha Nam, Hanoi, Hai Duong, Haiphong, Hung Yen, Nam Dinh, Thai Binh, Ninh Binh and Vinh Phuc.

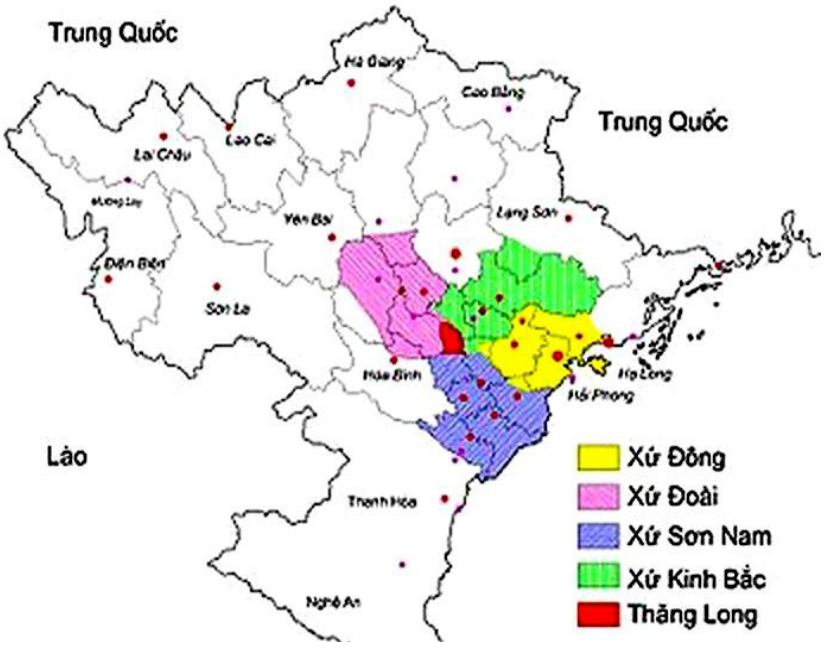


Fig. 2. Vietnam Northern lowland area

2.1. Natural conditions

The Northern lowland has both tropical and subtropical monsoon climates. The average annual temperature there is about 22.5 – 23.5 Celsius. The average annual precipitation is 1400-2000 millimeters. The winter is cold, with low temperature and high humidity. The lowest temperature rarely goes below 0 Celsius in winter of the Northern lowland). In summer, the highest temperature may reach the 40 Celsius. There are heavy rains with relatively high intensity. Typhoons may directly affect coastal provinces as well.

2.2. Cultural, social and economic settings

The Northern lowland is an economic hub of special importance in Vietnam. This land has geographical and natural advantages, wide-ranging and abundant natural resources, large population, bounteous human resources and high education level.

The Northern lowland is a vast area and the home of a large population, mostly Vietnamese at an advanced level of development, and therefore, it is considered as a source and native land of the Vietnamese nation and culture.

Culture researchers compare the traditional rural house in Vietnam Northern lowland with many images. The image of boat associates with Vietnamese culture as it plays a major role in the natural conquest. The carvings of boats and oceans on Dong Son drum express the cohesion of ancient Vietnamese with this image. The roof tiles in the Vietnamese house associate with fish scales or a wavy water surface .The roof is like a boat of Vietnamese ancient people on sea.

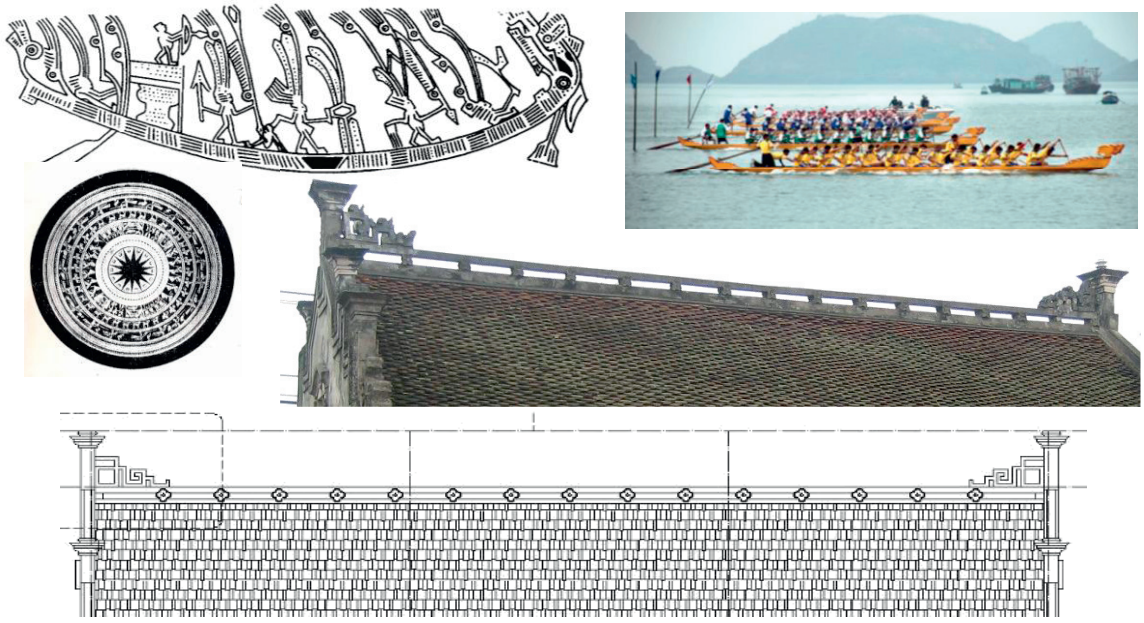


Fig. 3. The image of boat on Dong Son† drums and in Vietnamese traditional rural housing

† **Đông Sơn drums** (also called **Heger Type I drums**) are bronze drums fabricated by theDong Son culture, in the Red River Delta of northern Vietnam. The drums were produced from about 600 BC or earlier until the third century AD, and are one of the culture's finest examples of metalworking.(Wikipedia)

The traditional rural house in Vietnam Northern lowland is a skillful combination of architecture and decorative arts. The decorative arts on the traditional Vietnamese house have become a profound style meaning best wishes and provided an impressive aesthetic. The typical wooden sculpture feature in the traditional Vietnamese house tactfully hides conjunctive components and eases the feeling of heavy bearing structures. The motifs of the decorative arts are often herbs, flowers, and fruits, which reflect the desire of the owners. For example, the peach symbolizes longevity and the pomegranate symbolizes the flocks of children. These decorations show the Vietnamese spirit of harmony and towards nature.


Decorating in structure


…in roof


…in window and wall

Fig. 4. Decorating motifs of a traditional rural house in the Northern lowland (Owner: Le Huu Di, Ngoc Loi, Ngoc Tu, Bac Ninh)

3. Planning and architecture of traditional rural Northern lowland housing

The Vietnamese residences are divided into the following scales: villages, hamlets and curtilages (campus).

3.1. Village

Vietnamese selects their village's location in high land areas or/and near water sources, which is favourable for farming or hunting. Boundaries of the village are normally protective and surrounded by green bamboo ramparts. In particular, a typical village usually has a public axis. It includes a village gate, a banyan tree, a well, a market, and a temple, which can be considered as the stem of a leaf. And the veins of the leaf consist of village houses that are normally owned by people in the same clan. Along the village's main street are strips of ponds and artificial lakes. In addition to breeding interest, they also serve as the surface water drainage, the landscape and the coordinator of the micro-climate environment. The types of land for setting up a traditional Vietnamese village usually include river sides, hills, lowlands, coastal areas, etc.

3.2. Hamlet

In Vietnam, the hamlet is a traditional neighbourhood of the Vietnamese ethnic group, but it is not classified in the government's administrative system. Hamlet is a collection of a group of families that live near each other and may have blood relationship with each other.

3.3. Curtilage (Campus)

The traditional house site of the Vietnamese people is usually organized with the principle of "ecological circle". In most of traditional Vietnamese houses, the main layout is (from front to back): a front garden (pond), a patio (yard), a main house and a garden. With this organization, the traditional

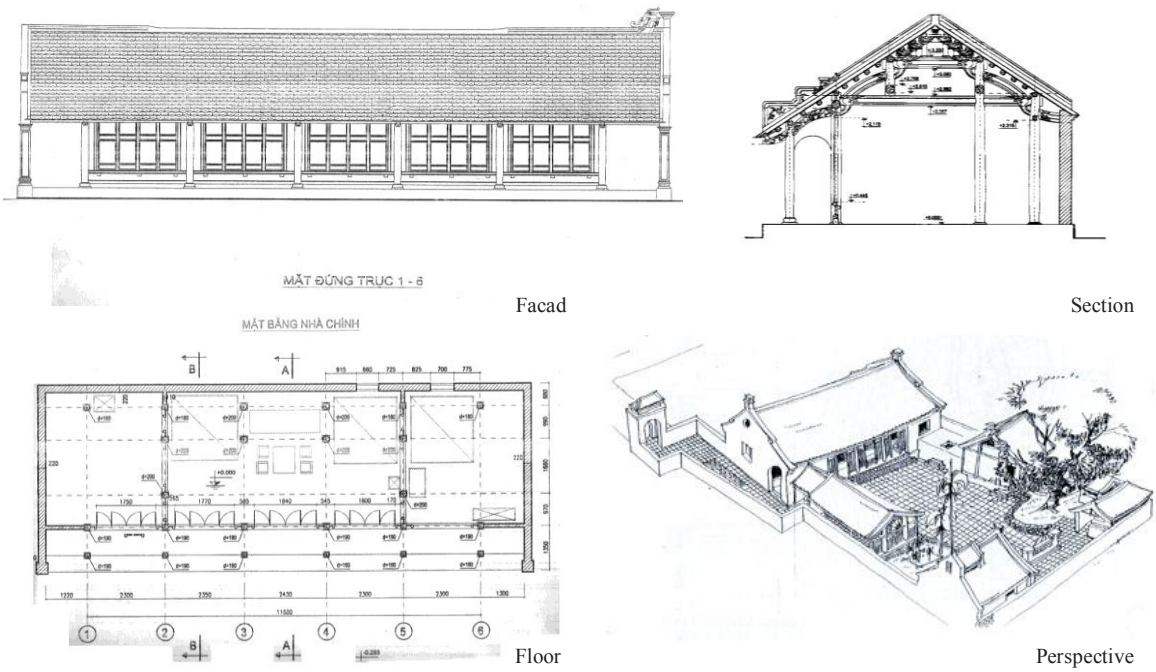
Vietnamese house consists of three basic elements expressing the human concerns and the long-standing cultural practices which are:

- Building elements, e.g. main block and ancillary block
- Ecological elements, e.g. garden, pond and barn
- Associate elements, e.g. fences, gates and yard

Village Hamlet Curtilage

Fig. 5. Planning in Northern lowland area

A traditional rural house in Vietnam Northern lowland often comprises a main block, an ancillary block, a patio, a fish pond, a garden, livestock houses and toilets. There are often an odd number of house compartments (the gables are sometimes lean-tos). The load-carrying structure is often made of wood, with a sophisticated carved and highly artistic truss system.



Facad Section

Floor Perspective

Fig. 6. Drawings of a typical traditional rural house in the Northern lowland

The house is often wrapped inside earth or brick walls, with wood partitions separating the compartments. The middle compartment of the main block houses the altar and guest room. On both sides of the altar compartment are the sleeping quarters for the house owner and the eldest son. The next two compartments include one as the bedroom for women and the other as the storeroom for paddy, food and valuable properties. The main block often faces the South direction to fetch cool air, as illustrated in the saying *"Marry a gentle wife, build a South-facing house"*. The ancillary block is often used as cooking space, accommodation for the help and shop for farming support and handicraft work.

Fig. 7. Traditional rural house in the Northern lowland (Owner: Le Huu Di, Ngoc Loi, Ngoc Tu, Bac Ninh)

Traditional rural houses in Vietnam Northern lowland are distinguished from traditional urban housing in the surrounding environment and it is typically surrounded by evergreen trees. The garden has many implications for Vietnamese such as the adaptation to natural disasters, the improvement of habitat and climate and the economic benefits.

House – garden – pond has become a complete, balanced and ecological model of human life and its interaction with plants and cattle. This is a natural adaptation from Vietnamese long-term experiences in this tropical land. In the traditional Vietnamese house, people often include an area for vegetables that provide the seasonal products, an area for fruit trees, an area for timber trees, an area for medicine and spice plants and an indispensable part - an area for flowers and ornamental trees.

The traditional Vietnamese rural housing has a good relationship with the surrounding landscape. As a result, the coordination between the inside and the outside is arranged to create a close and flexible environment. The Vietnamese believe that the harmony of houses, trees and the landscape is very important in life. They often try to recreate the nature in the house through a small landscape in the garden or yard.

4. Lessons learned from tradition

An evolution process that spans multiple centuries has brought substantive ***valuable lessons on climate-adaptive housing*** in the Northern lowland.

4.1. Lesson of developing building site.

Under circumstances of relatively high rainfall, house clusters in the Northern lowland are often positioned high and dry, and near lakes and ponds to ensure quick drainage. The land reclamation experience, preparation of building materials showed a longstanding culture in creation of habitats.

4.2. Lessons of space organization

The internal setting of the house is also considered to best respond to the climate. The front garden (pond) – patio – main block – back garden forms the typical design chain of most rural houses in the Northern lowland. The main block and wings are all single-storied, at right angles to each other and looking to the patio. This setting creates a good microclimate for the house and convenience in daily life. Both the main and ancillary blocks can take in plenty of cool air and sunshine, while being protected from cold wind.

Patio Pond Garden

Fig. 8. Traditional rural house in the Northern lowland (Owner: Le Huu Di, Ngoc Loi, Ngoc Tu, Bac Ninh)

4.3. Lessons about garden and plants

The bamboo range surrounding the village has long been an entrenched subconscious image in the mind of Vietnamese. The bamboo wall serves as a natural protection against pillagers, while also works as a wind and storm fence, and is a bounteous source of building materials.

Inside a Northern lowland rural house, vegetables and fruit trees are grown for the house owners' use around the year, and may also serve as building and repair materials when needed. The position and types of trees to be grown are also selectively considered in the order of "*areca in front, banana in the back*", and thus it can take in as much cool air as possible or the sunlight heat in Winter as well as fence off cold wind and limit heat loss.

Fig. 9. The pond in a traditional rural Northern lowland house (Owner: Tran Ngoc Ngoan, Vu Ban, Nam Dinh)

4.4. Lessons of improving microclimate environment

The interior space (except bedrooms for women and newlyweds) is also structured in a way to provide users with openness and flexibility as well as to help improve ventilation and control humidity and mould.

The porch is a transitional buffer space between the interior and exterior of the house that prevents flying rainwater and direct solar radiation, and it also provides a temperature and light cushion for the interior space. The porch in rural Northern lowland often comes with thatching structures to help reduce reflected heat from the patio and direct wind flows into the house. The entire front façade of the house is used for the door system (traditional multiple-panel door) that is designed to be tightly closed in winter or completely opened to merge with the exterior environment in hot seasons.

Fig. 10. Porch with "giai[‡]" in a traditional rural Northern lowland house

[‡] Giai: Bamboo screen in veranda of the traditional house.

The roof slants on both sides with high gradient help improve drainage performance. Roofing materials come from the nature (fan-palm, straw, sedge, thatch, boot-shaped roof tiles etc.), with high thickness and porosity to help improve insulation and ventilation. Roofing materials facilitate two-way air exchange; this allows the temperature of the interior microclimate always lower than the outside temperature in summer, keeps the place warmer in winter and makes it well-ventilated at all times even though all the openings are shut.

The walls are often made of earth (wood or bamboo frames plastered with a mud and thatch mixture), and also provide high insulation, although they do not have very high strength.

4.5. Lessons from structure and joining systems

Structure and joining systems in traditional Northern lowland house are not only firm in front of strong storms but also flexible when relocation moving required.

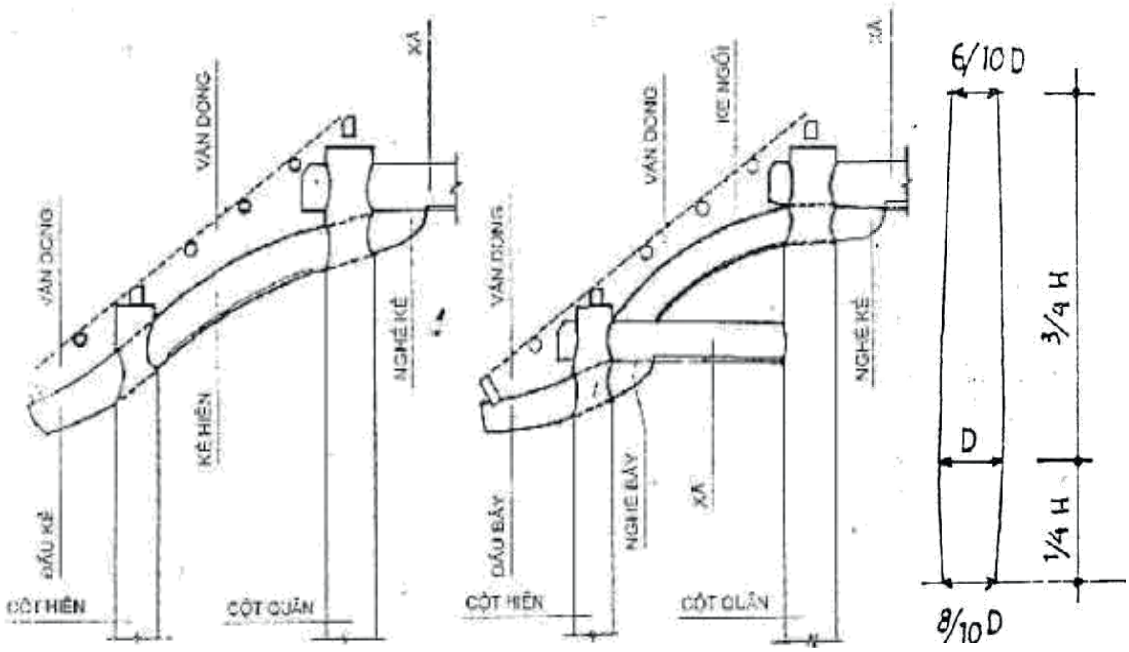


Fig. 11. Structure of the traditional rural Northern lowland house

In addition to lessons learned on climate adaptation, rural houses in the Northern lowland also give us valuable experience on ***sustainable development***.

4.6. Lesson from eco- system

Coupled with paddy rice farming, location selection and structural setting of a rural Northern lowland house are also beneficial to the improvement of the local biodiversity.
Green trees and water surfaces are linked together systematically to help moderate the microclimate and mitigate natural disadvantages such as solar heat and cold wind.

4.7. Lesson from advantage of sun light and the rain-water

The natural water source inside a rural Northern lowland house is often put to effective and sustainable use. Apart from the open well system, rainwater is also collected and kept in domestic tanks for use in daily living. Quick surface drainage helps gather water in the lakes and ponds of the village and provides an important replenishment to the water supply for farming activities.

Fig. 12. Rain water collection

4.8. Lessons about natural and environmentally friendly building materials

Most of the materials used in a traditional Northern lowland house come from locally available, natural sources, and are highly environment-friendly. These materials may be recycled as they are continuously refreshed and do not leave construction wastes when expired.

Fig. 13. Materials in Traditional rural house in the Northern lowland (Owner: Le Huu Di, Ngoc Loi, Ngoc Tu, Bac Ninh)

The climatic conditions are the basic elements to create characteristics in lifestyle, building methods and Vietnamese architectural culture. With that awareness, perhaps the lesson of climate adaptation and sustainable development of Vietnamese traditional house will be one of the foundations to build Vietnamese architecture which has sustainable culture.

5. Housing status and trends in the rural Northern lowland

As the country progresses further in its development path, urbanization will keep increasing. Changes created by urbanization can be seen most clearly through the facelift that rural areas are experiencing, and the most influences are felt in local culture, values and housing design.

Houses in the rural Northern lowland are not exempted from the changing rules of development, as village architecture alters to take on a more urban touch and lose the built-in benefits of the traditional ecological setting. Traditional villages have, in the process of modernization and urbanization, advanced from ‘tiled roof' to 'concrete roof', as a more service-based lifestyle is adopted to replace the traditional subsistence practice; gardens were chopped up to build houses on; bamboo ranges, banyan trees, village wells, vegetable gardens and fish ponds disappeared. While that is the case with traditional farming and craft villages, new rural residential areas (city outskirts, areas adjacent to concentrated industrial parks or new transport axes, among others) also develop in a spontaneous urbanized way (with streets and side-by-side tube houses).

Obviously, the traditional Northern lowland village and house pattern is under strong influence from the development and urbanization process, as this can be seen through various negative changes.

- The village structure changes and public facilities are squatted. The sizes of the houses either shrink or the houses are split up, as water surface areas and trees keep disappearing. Village bamboo ranges, once deep-seated in the farmer's subconscious mind, take turns to vanish or only exist in a handful number. The need for bamboo as a material in house building and repairs is diminishing.
- Water bodies, lakes and ponds, which play a vital role in drainage and keeping water for daily living and farming needs are reducing and getting contaminated over time.

- Single-storied traditional houses are being replaced by more urbanized accommodations. While the survey records continued adoption of the traditional housing style, expensive materials and carpenter's wage reduce households that can afford this type of house to a handful. Instead, a rising trend exists for single- or 2-storied, brick-walled houses. Wealthier households, on the other hand, would copy a random pattern of 2- or 3-storied villas with tile-laid reinforced concrete roofs from major urban centers.

Traditional Urbanization 1 Urbanization 2

Fig. 14. New trend of housing development in the Northern lowland area

6. Recommendations on housing design and planning in the rural Northern lowland with a view to modern, green housing architecture

In search for an advanced and green housing model, rural planning and housing in the Northern lowland should be aware of changes in development management. The 'new country' in the Northern lowland needs to be developed by drawing from and building on traditional experience, as well as combining traditional wisdom with advanced technologies and know-hows. Accordingly, the following solutions are proposed based on the natural, cultural and social conditions in the Northern lowland area:

- The population density in the villages needs to be controlled, as rational land area and building density norms are introduced, so that each house in the Northern lowland area becomes an ecologically balanced unit that contributes to the well-being of the village's overall biodiversity. The traditional garden-pond-breeding model should be promoted. Given the limited land resources, housing for new households should be located in untapped areas or low-productivity farming land to relieve the population pressure.
- Green tree systems should be developed based on the traditional principle of taking in cool air and fencing off cold wind, protecting from gusts and storms and generating material sources for building and production. Existing lakes, ponds and water bodies need to be dredged and maintained. Appropriate actions should be taken to reduce contamination of these water sources.
- Efforts need to be stepped up to help create an awareness change among the public on the values of the traditional house. Promotion and technical assistance for preservation and rehabilitation of traditional houses are needed. Efforts building on and drawing from traditional experience should be encouraged for new developments. Use of urbanized (tube-shaped) houses should be restricted to prevent marring the landscape and causing the traditional rural image to disappear.
- Locally available building material sources, with priorities and incentives given to materials of low energy content and high recycling potentials, should be developed.

- Rainwater gathering and use are to be promoted. Solid and liquid wastes need to be managed in combination with technical solutions (biogas, microorganism fertilizers etc.) to ensure pre-discharge treatment. In addition, exploration and use of new energies should be encouraged, including solar energy, wind energy and so on.

For the above proposed solutions to come to life, it is vital that the following management considerations are taken into account:

- Policies for management and guidance of rural housing planning, preservation and architectural development in the current new development stage should be promptly released.
- Standard sample designs for various types of rural houses are needed (with preference to ecological models) to keep pace with the progress of the rural setting and over time, to raise the public awareness and guide building practice.
- Newly developed rural residential areas need to follow a master plan and construction management system from infrastructure to design and structure.
- Locally available building materials need to be selected in accordance with local economic status and unique climate conditions.
- Regulations and policies on occupying land area, building height, floor area, clearance from the zoning demarcation, building functions relevant to the new rural housing needs, percentage of trees and water surface in housing land and so on need to be put in place.

7. Conclusion

The traditional Vietnam Northern lowland house is an important architectural legacy and a great cultural heritage. Survey of the formation, development and metabolic status structure, function and the space in the traditional house suggests that uniformity in diversity.

It is the combination and skilful organization of components such as: space organization, method of use, decoration; the participation of the natural elements has formed and created distinctive characteristic of the traditional Vietnam Northern lowland architecture, which is different from the other houses.

The characteristics of the traditional Vietnam Northern lowland house have created individual nuance for the traditional rural residents and survive till this day. Experiencing many ups and downs in the history, the traditional Vietnam Northern lowland house has unique and outstanding architectural features and lessons learned on its development, history and meanings have great values to the current building construction.

In the context of a new phase, many pressing issues are posed for the traditional Vietnam Northern lowland house and these lead to the wear and tear on the material and spiritual values. This is demonstrated by the degradation of home and living in it.

- Fast metabolism speed and scale, with the impact of the many causes that are in danger of becoming disfigured heritage and landscape.
- Fast metabolism revealed antagonistic contradiction between conservation and development, between the old house and new life.

Rural houses in the Vietnam Northern lowland provide a climate adaptive traditional lodging and an ecology model. Facing the current trend of economic development and urbanization, drawing on lessons of climate adaptation and ecological solutions is vital to the development of a green and advanced architectural practice for the new rural Northern lowland area.

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