

Konstruktives Gestalten und Baukonstruktion

Master thesis – Nguyen Ngoc Quynh Thanh

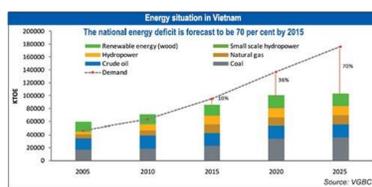
Application of Green Building to Ho Chi Minh City, Vietnam

Case study of Can Gio District, Ho Chi Minh City

1. Introduction

Vietnam has highest urbanization rate in Southeast Asia, facing many serious consequences:

- Environmental pollution
 - Accommodation lacking
 - Hurry construction with conventional method
 - Soil erosion, land slide, air pollution
 - High energy consumption. Total energy consumption has risen 400% over the past decade
- A huge portion of electricity consumption is resulted from air conditioning
- Power shortage
 - Serious consequence resulted by power cut solution
- Finding green solutions for architecture that save energy and other resources is very essential and urgent***



Problem statement

- The green building topic hasn't yet been widely publicized
- Process of building green takes place very slowly
- Limited understanding about sustainable building
- Green architecture has been carried out slow and asynchronously
- It needs proper orientation and timely advocate

Research objectives

- Approach **green building factors** in tropical zones considering ecological, economic and social aspects (case study in HCMC)
- Propose the **crucial criteria** and **principles** of green building issues to the research area. Hence, suggest suitable types of green building concept in design and implementation, in order to reduce energy cost, raise living standard as well as protect the environment, to applying to Can Gio District as a case study.

Research questions

- What is **green building** and why it is important to the sustainable development of HCMC?
- To what extents the green building is **concerned**?
- What are **suitable criteria** of green building that cope with the social and economic context, housing demands and weather conditions in HCMC?
- What **possible solutions** for green building in the research area and how they meet the criteria which are formed in this study?

2. Principle

- Learning the green building concepts all over the world
- Studying the contrary factors that are high technology methods and low impact methods which both strongly influence green building success
- Aggregating all the profitable building components which benefit green elements of a building in tropical climate
- Applying into a case study

Mixing the beneficial factors of several green ideas needs:

- Study the *main elements* of a green buildings
- Study the *factors* that affect the green elements
- *Analysis* the housing development context and demand
- *System of objectives* is settled to develop a chain of criteria
- Propose green building *designs* that cope with the system of criteria and the specific context of the research area
- *Evaluate* the proposed green concepts

System of objectives method is used in this research as an instrument for accessing the targets

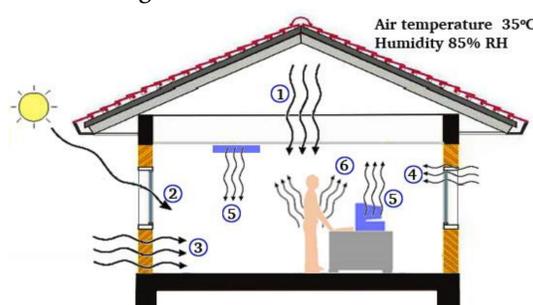
Survey about green building interpretation and its demand of HCMC citizens is conducted

- Impartial assesment

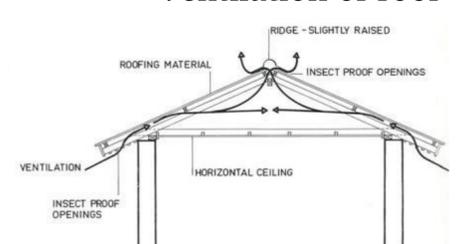
3. Approach Green Building in tropical countries

The building shape has strongly influence to the cooling load

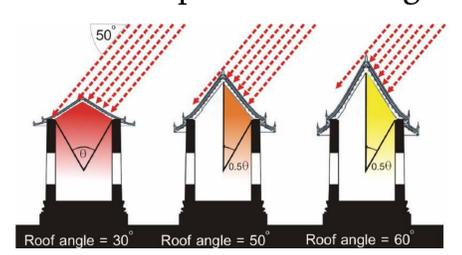
1. Cooling load from roof
2. Cooling load from glazing
3. Cooling load from envelope
4. Cooling load from infiltration
5. Cooling load from equipment
6. Cooling load from human



Ventilation of roof

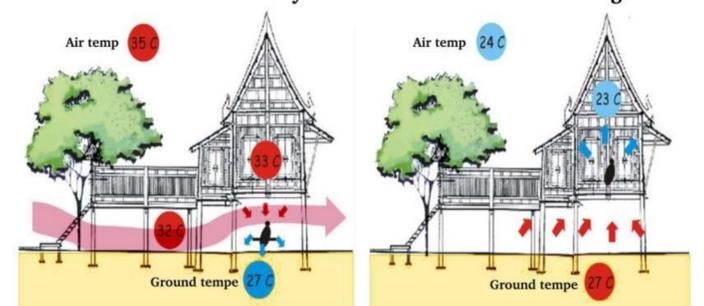


The impact of roof angle



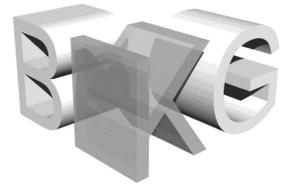
Day time

Night time



House on stilts, a typical building has particular traits against hot and wet climate and flooding.

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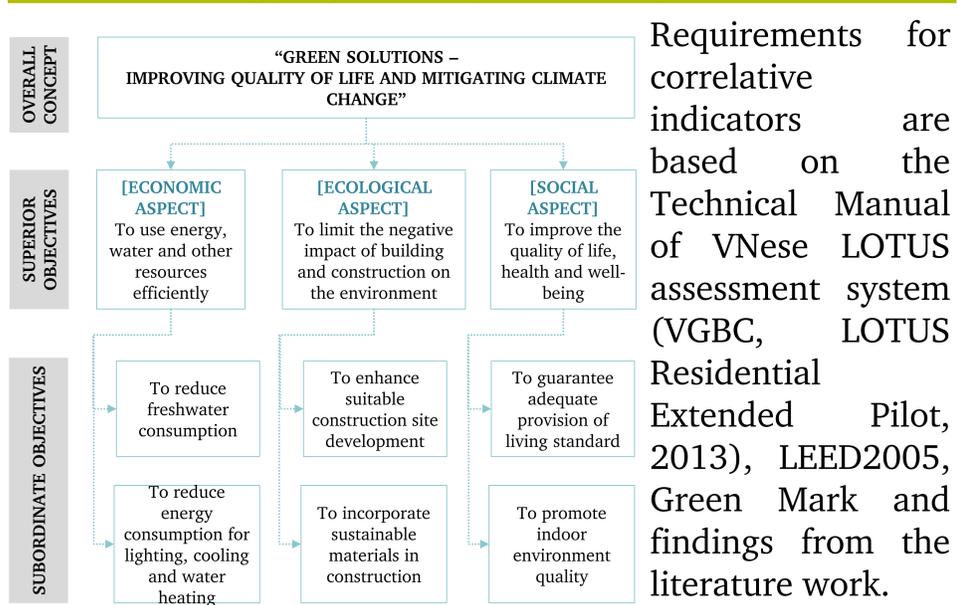


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4. Aggregated targets and objectives



5. Case study: Can Gio District

Can Gio in the metropolitan area of HCMC



Can Gio Mangrove Biosphere reserve



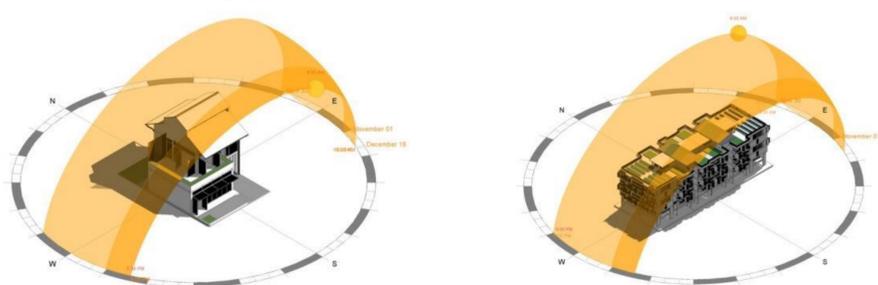
Can Gio District is chosen for case study since it is a green lung of HCMC that has mangrove forest located in the core.

The district is located at the peripheral area where the current density is not very high. Almost housings are still very poor and have underprivileged appearance.

➤ Targets: To find suitable concepts of green housing that cope with background of the district in order to protect the local environment, contribute to mitigating climate change as well as reduce energy cost and raise living standard for local inhabitants.

6. Green housing proposal

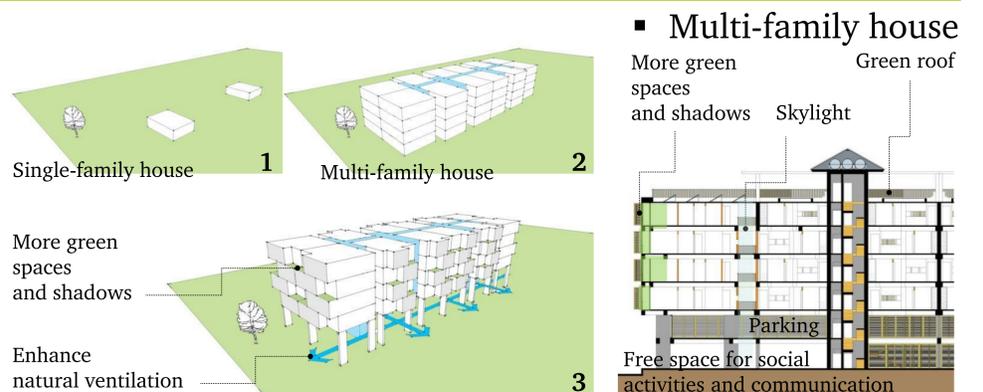
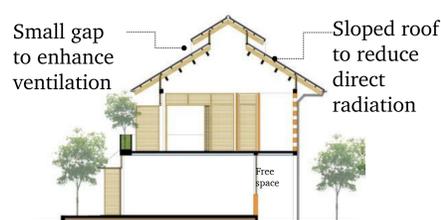
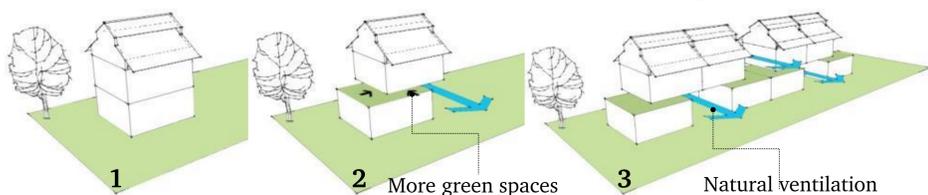
1. Two types of houses: single-family house and multi-family house will be approached according to the current demand



Sun path diagram for single-family house and multi-family house

Alteration in building shape to achieve more green spaces and enhance natural ventilation. The form and orientation of housing are initial essential concerns. Amount of surface that is exposed to direct sun radiation should be as less as possible. To achieve best-possible ventilation, doors and window openings should be as large as possible and oriented the major wind direction (West-Southwest and North-Northeast)

▪ Single-family house



2. The green building concepts and their implementation plans are proposed mostly based on the objective data and its relative criteria. Then, evaluation and discussion steps are needed in order to affirm the feasibility and usability of the concepts.

➤ The misconception of most Vietnamese people that green buildings are more costly could be changed by proposing green building concepts which have passive designs and imply no extra cost, or a little higher cost, if there is.

➤ For the climate type of HCMC that is hot and humid, people living in households should be protected against rain, heat, humidity that require the building to have good ventilation, cooling and shading systems. These factors could be mostly resolved by following lessons learned from traditional architectures.