

## **ECOLOGICAL DESIGN WITH URBAN CONTEXT –CASE STUDY ON “COMPASSO VOLANTE PRIZE - EDITION 2007” ABOUT INTEGRATIVE DESIGN OF ECOLOGICAL ARCHITECTURE**

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**ABSTRACT:** As a developing trend in architecture, ecological architecture takes aim at energy-saving, environmental protection, and providing a comfortable living place in harmony with nature. On the view of space and time, we propose two characteristics: humanistic green and technological green, which are based on the urban context, and we suggest that the green architecture design must satisfy the needs of these characteristics. Moreover we illustrate the idea of integration with urban context in practice by the award-winning scheme in “Compasso Volante Prize – Edition 2007”.

**KEYWORDS:** ecological architecture, integrate, humanistic green, technological green

### **1 PREFACE**

Architecture is a man-made material world. The original purpose of construction is shelter. And in addition to shelter, the ecological building construction has the aim at creating a livable space, which is suitable for living in, on, or with. In order to achieve desired goals, architects have to pay attention to the hypostases of architecture: these are the human activity and the natural material. One side, the buildings' function is human's living, so it must be compatible with the urban context; the other side, architecture with natural roots must be designed on the base of environmental analysis. So ecological architecture design must obey two principles, one is humanistic green and the other is technological green. The technological green is used to satisfy the based physical need. However, if "deficiency needs": physiological, safety and security, love and belonging, and esteem, which were suggested by Maslow, are not met, the body gives no physical indication but the individual feels anxious and tense. The humanistic green depended on urban context could meet the deficiency need. So this paper illustrates the idea of integration with urban context in practice by the award-winning scheme in “Compasso Volante Prize – Edition 2007”.

### **2 ILLUSTRATION OF THE DESIGN**

#### **2.1 Background**

This is a residential design. Participants have to design a housing project in group on the given site-Malacca of 9 acres for 350 to 650 inhabitants. Malacca is a small state in Malaysia with a reputed history as a trading port from the 15th Century AD, and it has multi-culture. The site used to be an amusement park, quite popular in the city, but was closed due to some negative elements. My concept of this project is “Living in the trees”. I wish to design an urban park with culture heritage and good ecological benefit. So there are two ways to design, analysis of urban context and analysis of nature.

#### **2.2 Analysis of urban context**

Urban context is the basis of the design to meet residents' deficiency needs. So I tried to study the local multi-culture and residents' lifestyle carefully, and wish to maintain life balance between custom and new community for creating a sense of belonging.

Malacca has multi-culture. The Portuguese and then the Dutch colonized them to control the spices trading from the east. The British dominated the modern colonization history with a brief occupation of the Japanese during World War II until Malaysia gained its independence in 1957. Malacca is dominantly from the Malay race but Chinese and Indians are predominant in the urban areas. Early Chinese settlers, as consort for princess from China married to the Sultan of Malacca, interestingly blending with the Malay culture.

Similarly the early Indian settlers absorbed the Malay culture too. So this is a cosmopolitan state with varied cultural societies. And just the culture tolerance eliminates my concerns about religion and national Customs.

Residents in Malacca have special lifestyle, such as “veranda culture” and “One roof, one community”. In the local houses, veranda plays an important role in local life. As a transition from outdoor space to indoor, veranda has a good condition of both aeration and temperature. In order to take advantage of this, Malay people always use veranda for reception. Moreover, verandas often serve as family room, porch and housework place. In the design of family unite, veranda life is strongly recommended and plenty of this kind of space is contained in the unit. In the “long house”, a kind of local house, private houses share one community public space beneath one roof. The concept of “One roof, one community” is a basic start of the design. Several units make up a group, where there are public spaces for the community.

Depend on the research of the culture and the lifestyle, I summarized several local building forms that would represent in my design. The first is building on stilts. In order to keep moisture away from house, local houses of Malaysia are usually built on stilts to keep a distance with the ground. Between the ground and the floor, there is a kind of open space, however, it seems so low and so negative to serve as a place to public life. But it is still a nice space for public life, because it is shaded by the house and much cooler than areas exposed to the sunshine. From this point, the design focuses on improving the ground space. By extending the scale of the space both in height and area, a positive ground space is introduced to the ecological park. Moreover, it helps to resist the flood of the site. The second is large roof. Large roof is the local ecological strategy in the design of local houses. Shadowing of verandas, plants, windows, and other elements, supplied by the roof, help to keep hot away from house. The last is Multi-window. Multi-window also plays an important role in the local ecology design. Enough windows are benefit to the formation of airflow. And different kinds of aerations help to cool down the indoor temperature and adjust the humidity of house.

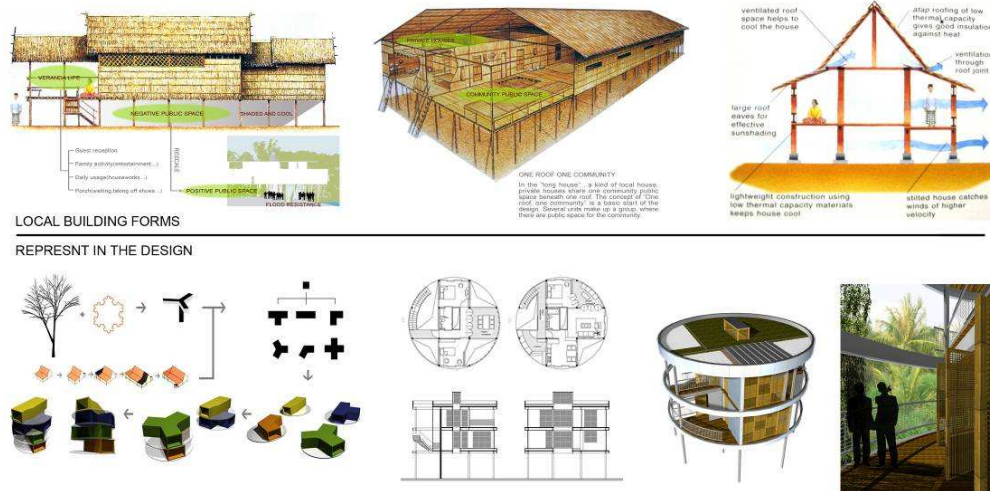


Figure 1 Local building forms and represent in the design

### 2.3 Analysis of nature

Analysis of nature is another major aspect in ecological design.

From point of the city’s green structure, green nodes made up of green field of the city form a steady net of green fields. The site is right at the position of a missing point. By adding it to the nodes system, the green net of the city is becoming more complete. Therefore, the character of the site should be a green park to serve the citizen and the city green system. The site has a good condition of marsh where the creatural and botanic situation can satisfy the needs of ecological park. The best way to keep the advantages of the natural site is to protect the marsh as a whole instead of separating it into fractions with common buildings. Therefore, a basic start of the design is to protect the marsh by land and turn it into an ecological park of the city, which citizens and tourists can enjoy their spare time in this public space. Regarding to the concept of ecological park, community of the site should use as fewer land as possible in order to make more space for the whole park. Moreover, houses should play an important role in the landscape of the park. Therefore, types of houses should come from not only the tectonic concept but also natural image. This design is derived from the tropical trees. Residents like the shadow of the trees, because it provides a cool space. And so will the

community, as it provides large shadow to the ground space of the park, which will become a pleasant place to stay. Mangrove has continuous crowns, and the lower space, where there are dozens of life and full of vital force, is vacant except the trunk and shadow. This is a nice origination for an ecological community.

From point of physical environment, the basic function of a house is to satisfy the physical need. The site located near the equator, and the weather is hot, humid and rainy. The strong sunlight in the afternoon seems to roast the land melting. Shadow and natural ventilation are the most effective methods to keep cool and to create an environmentally-friendly community. So both healthy light environment and good airflow are the major aspects in technological green design.



**Figure 1** Analysis of nature and the appropriate technology

## 2.4 Appropriate technology

Above analysis give us a general outline of the design. Then I suggested 17 detail appropriate technologies based on the analysis of culture and nature. This paper would illustrate 3 primary technologies following.

### 2.4.1 Regulable light system

Healthy light environment is important for a green house, and sun protection solutions have a role to optimize the building environment and save the energy. This program uses the local material bamboo to make the printing shutter. One side it changes the sun ray into diffuse reflection. The other side, it economizes the price

### 2.4.2 Section indicating airflow

Environmentally-friendly community is a characteristic of this project. Greening, natural ventilation, cool wall, heat storage system, photovoltaic generation and so on are all the effective methods. Natural airflow is first considered as an important element in particular. Multi-purpose underground interlayer, approximately 90 cm, is constructed running through the house. This interlayer works as a cool tube by the agency of the stable underground temperature 15-20°C at all year around. The fresh air additionally arranges the fresh air and send it out to the under floor of each room and the cool wall in the house. And then that air is slowly blown out from the window side outlet, naturally drawn upward through the vertical void named “Wind Tower” to the exhaust outlet atop the house.

### 2.4.3 Eco pond

Malaysia is a tropical country, and there is abundant water resource around the site. So water is one of the most important elements in this project. Eco pond is planed in the site. Different kinds of hydrophytes are planted to purify the rainwater. And pond effectively serves some other multiple functions:

- Keeping the weather out;
- Connecting all the various spaces and creating an interface to corporate landscaping;
- Forming a high quality gathering space for contemplation and decision making;
- Making the air cooler across the water evaporation;

Ecological design is a hot issue in architectural field these years, and a great deal of theoretic models are advanced for the environmentally-friendly building. However, the necessary condition to guarantee the achievement of expected results is the detail design. This ecological design suggests not only the concept but also the 17 specific technical measures in detail, including the detail design of the liane wall, green roof and the water cooling wall.

### 3 LIVING ENVIRONMENT FORECAST

Computer simulation is an efficacious assistant tool for ecological architecture design in the Era of Pictures Reading. It supplies an effective way to predict the further for a non-experimental field, in order to make sure to come out architect's tentative design. In addition, if there are some problems in the physical environment, the architect could adjust the original design too. I chose CFD- Phoenix based on the appropriate technology to simulate the air condition of community and single unit. As we all know, wind pressure difference could promote the airflow in order to cool down the skin temperature by evaporation from the skin surface. In the process of the design, the wind environment has been simulated three times, and the architectural layout and form were adjusted for better physical environment. The project has been ameliorated, until the final result of the simulation shows that the environment of the community is comfortable enough.

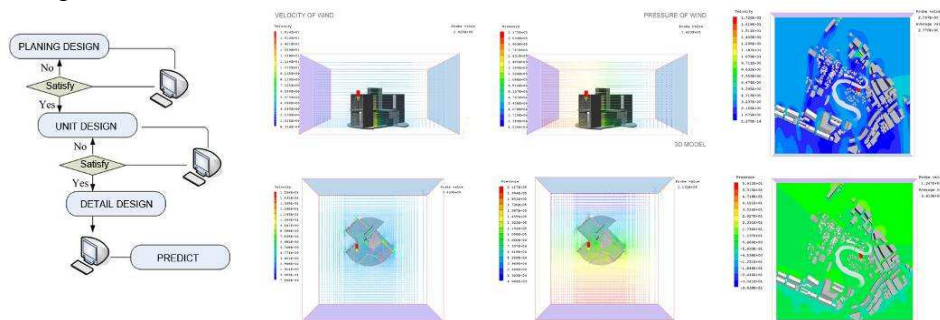


Figure 1 Computer simulation and the result

### 4 CONCLUSION

As human population expansion and the increasing scale of human activity on the earth, the environment impact brought by human has developed into global Environmental Crisis. Contemporary Architects have the responsibility to take account of environmental issues, to develop and implement effective design countermeasures, under the premise of urban context protection. “Compasso Volante Prize – Edition 2007” is a workshop for the students to advice the idea design of ecological community. And the process of design advanced some experiences as following:

- a) Human green, the prerequisite of creating a livable space, is major aspect in the design that cannot be ignored.
- b) Technological green, the root of ecological design, should choose the appropriated technology depend on the careful research of local nature and weather.
- c) Computer simulation is an efficacious assistant tool for ecological architecture design.
- d) Original ecological concept of architecture design must be sustained by the practical construction design.

The only way to achieve the satisfied ecological goal is integrated design concerning both human green and technology green.

### REFERENCES

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