Look To The Future: The Green Building

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I. Introduction

1.1 Motivation and purposes of the study

A new educational building has just been built in our campus. Its construction is based on the concept of Green Building. Thus we started to have an interest in it, intending to understand the concept of Green Building and its actual application in the campus.

Have you ever seen or heard of Green Building? What kinds of houses are named Green Buildings? Do you know what influence it has on the environment? Many people may think that Green Building is eco-friendly, but do you know what kinds of design they contain? Can you recognize Green Building marks and their actual meanings? Green Building aims to improve the environment, but few people really understand it. So we want to introduce this idea. We would like to know why Green Buildings became so famous. For that reason, we conduct this study to search for the answers.

1.2 Background

Sustainable building is an important architectural concept in the 21st century. The key emphasis on the design of the building lies in recycled materials, energy-saving, and nature conversation. It is not only beneficial to human health but also protective for the earth, fulfilling the responsibility of sustainable development. This trend emerged in Europe, and then spread to Japan and America. Due to the leading of certain advanced countries, it has become the mainstream of the architecture in the 21st century. Taiwan's Green Building Movement is innovated and promoted by the government administrative system. Executive Yuan National Council for Sustainable Development was established in 1996. It lists Green Building into its top priorities of urban sustainable development policies.

II. Body

2.1 The defining indexes of Green Building

2.1.1 Green index: It includes ecology-greening, wall-greening, wall-greening watering, artificial structure greening technique, water-draining greening technique and windproof greening technique.

2.1.2 Daily energy-saving index: It includes building with energy-saving, proper rate of window-opening, a sun shading board, glass openings, heat insulation, air
density, building structure, materials, roof structure and a curtain of wall.

2.1.3 Water resources index: It includes the machine of water saving, the plan of water use, rainwater reuse and primary water source.

2.1.4 Biodiversity index: It includes the community green-net system, earth-saving system, ecology lake, ecology waters, ecology side slope, ecology palisade design and porous environment.

2.1.5 Carbon dioxide reduction index: It includes simple construction modeling, indoor decoration, reasonable structure system, reduced weight of structure and the usage of the wood materials.

2.1.6 Waste reduction index: It includes good use of the reused building materials, soil balance, dry partitions, bathroom and the reduction of air pollution.

2.1.7 Base water index: It includes permeable floor, scene-staying permeable lake, permeable-staying lot, permeable well, permeable cube and artificial structure staying.

2.1.8 Sewage and trash improvement index: It includes rainwater and sewage diversion, improvement on waste collection field, wetlands, wastewater treatment and kitchen waste compost.

2.1.9 Interior index: It includes indoor pollution control, indoor air purification equipment, green paint and green building materials.

2.2 The top three significant indexes of Green Building

Among the nine indexes mentioned above, three of them are most frequently discussed and accessed.

2.2.1 Green index:

The term “Greening” refers to gardening. The purpose of greening is to improve the phenomenon of cement-filling, and change it into an environment which makes people get relaxed. Greening could be conducted at the roof, on the streets, on the slopes or on the ground. The benefits of Greening include: improving the
appearance of the city, offering a space of resting, reducing the urban heat island effect, improving the quality of air, separating some graceless scenery as well as messy or destroyed environment, reducing noises, reducing the influence of dazzling sunshine, resisting desertification and reducing the death rate between poverty gaps.

2.2.2 Daily energy-saving index

Daily energy-saving index is accessed mainly by air conditioner and lighting power consumption. At the same time, it is defined as a combined power consumption of air conditioner system and lighting system. Air conditioning and lighting electricity occupy a large part of daily energy consumption. Thus, the most effective way to cut through the issue of energy efficiency in a building is from the perspectives of air conditioning and lighting.

Daily energy-saving index focuses on the design of energy-saving device for the maximum consumption of air-conditioning and lighting electricity. In addition, the emphasis of evaluation is placed on three dimensions: the building shell, the air conditioning efficiency, and the lighting efficiency. The emphasis on design of air conditioner includes: architectural space should be compartmented by its using time. An appropriate conditioner system should be made according to the predicted value of actual heat load, a highly efficient heat source machine should be adopted. Meanwhile, the emphasis on lighting energy-saving includes: using bright design at indoor walls and ceilings, using high efficiency lights, using natural lighting design, and using automatic daylight-saving lighting control systems.

2.2.3 Water resources index

Water resources index is the actual water consumption of building and the general average water consumption rate. Assessment of water consumption includes water-using rates in kitchens, bathrooms, and faucets. In the past, the design of water-use in architectures was improper, plus people had poor water-using habits, both of which led to the over-consumption of water resources. Water resources indexes are meant to make use of rain water actively and look for the methods of reusing domestic water. In addition, they aim to actively apply to building designs in order to conserve water resources.

In green building design, the use of water-saving appliances includes: water-saving faucets, two-stage toilets, water-saving shower devices, and automatic flushing systems. There are quite a few water-saving tips that are worth noticing, such as storing water in a container to wash dishes, installing water in the bucket, washing the car with rags, doing

In addition, rain water storage system is the way to use a simple purification process and to recycle water for domestic water. As for rainwater, there are some useful devices. For example, rainwater collectors make use of the holes on the roof and the floor to collect rainwater. Rainwater can be used for toilet flush, irrigation, pasturage, plants watering and for the water of landscape pond. Last but not least, the water left after baths can be reused to flush the toilets, water flowers and trees, serve as the water for the fire engine, and as the water of landscape pond.

2.3 The advantages of Green Building

Green Building can save energy and reduce CO2 in order to save our earth. Also, Green Building can save other unnecessary repairing costs. What’s more, Green Building can provide health, cleanness and sustainability for life. We can present the advantages of green building with the following indexes.

2.3.1 Biodiversity index: It can retain original biology. With more creatures alive, the variety of genes may be preserved. (fig1)

2.3.2 Green index: Planting plants can effectively reduce indoor temperature. (fig2)

(fig1. Biodiversity index) (fig2. Green index)

2.3.3 Base water index: Water infiltrates into the ground and becomes groundwater. Groundwater can regulate underground temperature and terrestrial heat. So that volcanoes will not easily erupt. (fig3)

2.3.4 Daily energy-saving index: Reducing energy use avoids unnecessary waste. (fig4)
2.3.5 Carbon dioxide reduction index: Using wood structure Green Building materials can reduce the carbon dioxide emission. (fig5)

2.3.6 Waste reduction index: The lightweight dry compartment can reduce structures weight and junk. (fig6)

2.3.7 Water resources index: The reused rainwater devices can recycle and reuse rainwater. (fig7,8)
2.3.8 Sewage and trash improvement index: Green Building emphasizes on recycling and reusing resources. (fig9)

2.3.9 Interior index: Using ecological building materials does not endanger the environment and human body. (fig10)

(fig9. Sewage and trash improvement index ) (fig10. Interior index)

2.4 An Example: introduction to a Green Building in a vocational high school in Tainan.

We take our school as a modeling example for the application of Green Building on campus. We did a detailed research on the new building and found the following facts.

2.4.1 Classroom: The nature day-lighting is ample. Whole-wall windows are adopted so that all classrooms are full of sunshine. (Daily energy-saving index) (fig 11, 12)

(fig11. Classroom ) (fig12. Classroom)

2.4.2 The balcony of classroom: The balcony beside the classrooms are all ventilated and bright with natural daylight. (Daily energy-saving index) (fig13)

2.4.3 Corridor: The corridors are ventilated and bright with daylight. (Daily
energy-saving index)  The drain of the corridor could recycle rainwater effectively. (Water resources index) (fig 14, 15)

(fig13. The balcony of classroom )  (fig14. Corridor )

2.4.4 Toilet: Two-stage flush toilets are adopted. (Water resources index) (fig16)

(fig15. Corridor)  (fig16. Toilet)

2.4.5 Staircase: The staircase is always bright at day time; there is no need to turn on the lights. (Daily energy-saving index) (fig17)

2.4.6 Auditorium: The auditorium is built with good ventilation and lighting. (Daily energy-saving index) (fig18)
2.4.7 Shaped walls: Plastic walls increase ventilation and lighting. (Daily energy-saving index) (fig19)

2.4.8 Chain of water-permeable bricks: Water-permeable bricks conserve water effectively. (Base water index) (fig20)

2.4.9 Pond: The central pond of the school provides the formation of steam. (Biodiversity index) (fig21)

2.4.10 Outdoor: The campus is green with grass. (Green index) (fig22)

2.4.11 The water-saving machines: They collect the rainwater and reuse the rainwater efficiently. (Water resources index) (fig23, 24)
Look To The Future: The Green Building

III. Conclusion

From the data mentioned above, we’ve learned that green building has many benefits for our environment. Not only can it save energy, but also reduce the damage to the environment. With the nine Green Building assessment indexes, we can improve the appearance and quality of urban environment while increasing sense of comfort when people stay indoors.

Nowadays, the buildings on campus are gradually turned into the state of Green Building. Instead of simply planting green plants and applying simple water-saving equipments, people add more equipments that can effectively reduce the negative impact on the environment. This trend is a great benefit to our environment, and this situation is what we love to see.

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