Sustainable Building

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Abstract: *This paper presents a conceptual framework aimed at implementing sustainability principles in the building industry. The proposed framework based on the sustainable triple bottom line principle, includes resource conservation, cost efficiency and design for human adaptation. Following a thorough literature review, each principle involving strategies and methods to be applied during the life cycle of building projects is explained and a few case studies are presented for clarity on the methods. The framework will allow design teams to have an appropriate balance between economic, social and environmental issues, changing the way construction practitioners think about the information they use when assessing building projects, thereby facilitating the sustainability of building industry.*

Key Words*: *Sustainable building; conceptual framework; resource conservation; cost efficiency; human adaptation

1. INTRODUCTION

1.1 General

The building industry is a vital element of any economy but has a significant impact on the environment. By virtue of its size, construction is one of the largest users of energy, material resources, and water, and it is a formidable polluter. In response to these impacts, there is growing consensus among organizations committed to environmental performance targets that appropriate strategies and actions are needed to make building activities more sustainable

"Green building" is one solution to the dilemma of our increasing need for built environments to accommodate population and economic growth while minimizing harm to the natural environment. The essay included in this lesson outlines the general principles of green building and posits solutions that further these goals.

The term Green refers to environmentally friendly practices from building design to the landscaping choices. It also optimist and Economic enrgy use,water, and storm water and west reuse.

Building industry practitioners have begun to pay attention to controlling and correcting the environmental damage due to their activities. Architects, designers, engineers and others involved in the building process have a unique opportunity to reduce environmental impact through the implementation of sustainability objectives at the design development stage of a building project.

1.2 Background of the study

Sustainable building is an important architectural concept in the 21st century. The key emphasis on the design of the building lies in recycled material, energy-saving, and nature conservation. 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. Thanks to the lead of certain advanced countries, it has become the mainstream of the architecture in the 21st century. As for Taiwan, the Green Buildings Movement is innovated and promoted by the government administrative system. National Council for Sustainable Development of Executive Yuan was established in 1996. It lists Green Buildings into their top priorities of urban sustainable development policies.

2. METHODOLOGY

In order to design sustainable building which includes energy efficiency, material saving, does not affected by rise in temperature and also it include use of recycled material. For all this environmental effect we discussed below some of the solutions for sustainable building.

BOTTLE WALL CONSTRUCTION- Plastic bottles are increasingly becoming a menace to the environment due to the chemicals used in the manufacture, improper use and disposal. Buildings with plastic bottles masonry is a possible solution to provide low cost housing. The research provides a basic structural data about the plastic bottle masonary notably the compressive strength in masonary and the type and properties of the soil used for the mortar joints as masonary distinct properties due to the influence of the mortar joints points out that the best way to provide adequate strength to soil is to stabilize it with stabilizing agents such as lime and cement in low quantity. Mortar has some binding characteristics which improve both shear and compressive strength of the wall. PETE bottles, plastic rope, soil, Portland cement and water are the main material components to produce the PETE bottle masonary. PETE means Poly Ethylene Terephthalate Ethylene bottles are thermoplastic materials. The size of the bottles amount to 60mm dia., 200mm length, the bottle top dia. 30mm and 500ml volume. Rammed earth is form of soil that is just damp enough to hold together. The soil is tamped between shutters well supported to prevent lateral expansion with pneumatic tamper or hand hammers and the compaction is normally done in 100-150mm layers.

FILLER SLAB-With the utilization of waste material in building construction and solving its disposal problem, a

technology has been developed at the Central Building Research Institute (CBRI), Roorkee, India to construct reinforced roof slab with various materials as filler material compared to conventional in situ RCC slab, this technique is economical and will result in saving of cement and steel. Light weight, inert and inexpensive materials such as low grade Mangalore tiles. Thermopolis Burnt Clay Bricks, Hollow Concrete Blocks, Stabilized Mud Blocks/Hollow mud Blocks, Clay Pots, Coconut Shells, etc. can be used as filler materials. These filler materials are so placed as not to compromise the structural strength, stability and durability. It decreases dead load of the slab. An internal cavity can be provided between the filler material improves thermal comfort for the interior. National Building Code of India 2005 specifies the filler slab is satisfactory. In 2008, Nilangan Sen Gupta explained that by adopting method of filler slab in construction the emission of carbon dioxide is reduced up to 20% as compared to conventional slab. It requires very little steel and can provide good performance over a long period of time. This results that 15-20% of the cost of concrete can be saved by this operation. There is no need of extra expenditure of interior decoration purpose. Also the lower dead weight transferred to the supporting elements and finally onto the foundation to further adds up cost saving in design of these elements.

SOLAR PANALS-Electricity is one of the most essential needs for humans in the present. Conversion of solar energy into electricity not only improves generation of electricity also produced pollution due to fossil fuels. Solar panals absorbs the sunlight as a source of energy to generate electricity or heat. The output power of solar panal depends on solar irradiance, temperature. Energy comes in different forms. Light is a form of energy, heat and electricity. Often, one form of energy can be turned into another. This fact is very important because it explains how we get electricity, which we use in so many ways. Electricity is used to light streets and buildings, to run computers and T.V.'s, etc. Run many other machines and appliances at home and at work. The efficient conversion of solar energy is possible with Maximum Power Point Tracking (MPPT) algorithm. The proposed MPPT has several advantages: simplicity, high convergence speed, and independent on PV array characteristics. The algorithm was tested under various operating conditions. This method has high efficiency, lower cost and can be easily modified to handle more energy sources. Solar energy, being a renewable source, will also provide energy without pollutants and greenhouse gas emission.

RAINWATER HARVESTING-Water forms the lifeline of any society. Water is essential for the environment. The population is increasing rapidly and the issue of supplying adequate water to meet society needs and to ensure equity in access to water is one of the most urgent and significant challenges faced by the policy-market. Rainwater harvesting provide the long term answer to the problem of water scarcity. Rainwater harvesting offers an ideal solution in areas where there is sufficient rain. Rainwater is a free source of nearly pore water and rainwater harvesting to collection and storage of rainwater and other activities aimed at harvesting surface of ground water. It also includes prevention of losses through evaporation and seepage. Rainwater harvesting assures a continuous and reliable access to water. Rainwater stored for direct use in above ground and underground sumps/overhead tanks and used directly for flushing, gardening, washing, etc. Runoff may be harvested from roofs and ground surfaces. Rainwater usage would promote potable water saving of 60% approximately. The roof top rainwater was used to put into the ground using sand filter as pretreatment system. This lead to a reduction in the concentration of pollutants in ground water which indicated the effectiveness of increased recharge of aquifer by roof top rainwater.

BIOGAS-Biogas is a renewable as well as a clean source of energy. Gas generated through biodigestion is non-polluting; it actually reduces greenhouse emissions. No combustion takes place in the process, meaning there is zero emission of greenhouse gases to the atmosphere; therefore, using landfill gas as a form of energy production is actually a great way to overcome global warming. Another advantage of biogas is that biogas generation may improve water quality. It is also quite effective in reducing the incidence of waterborne diseases. Biogas can be produced from various organic waste streams or as a byproduct from industrial processes. The conversion of organic matters into biogas can be divided in three stages: hydrolysis, acid formation and methane production. The production of biogas contributes to the production of renewable and sustainable energy. Since, biogas work as fossil fuel. The production of biogas through anaerobic digestion offers major advantages over other forms of bioenergy production. A number of pretreatment methods have been suggested for enhancing biogas production from lignocelluloses biomass, which can be classified as, physical, physicochemical, chemical and biological pretreatments.

WATER LESS URINALS-People of ancient Indian civilization were among the first users to have well planned sanitary systems for disposal of human waste. Today, the state of public urinals in India has become a major cause of concern. A well developed city like Pune with a population 30lakh has only 352 public urinals. Over flowing urinals is a common sight in most of the cities and towns. Poor quality of construction and inappropriate designs of urinals led to misuse of the facilities. Requirement of water for flushing and major infrastructure needed for building conventional urinals are some important reasons for the inadequate number of public urinals in Indian cities and towns. Considering the above problems, under a waterless urinal project implemented jointly by Indian Institute of Technology Delhi and The Vigyan Vijay Foundation with the support of Stockholm Environment Institute, few innovative designs of public urinals and a Waterless Urinal Odor Prevention Trap have been developed. It can save enormous

qualities of freshwater. It also conserves electricity needed for pumping water and wastewater treatment. It can replace chemical fertilizer with urine to grow crops. Waterless urinals do away with the requirement of water for flushing and result in saving of between 56,800litres to 170,000litres of water per urinal per year.

GREEN ROOF- Modern green roofs are building elements designed to support living vegetation in order to improve a building's performance. Green roofs are made of layers designed to protect the building structure from water while holding & sustaining the plants. The average green roof needs a minimum of 2.5 to 3 inches of growing media. The base for green roof is a waterproof construction with appropriate load bearing capacity. Green roofs give cooler effect in summer & absorb heat in winter giving a warmer effect. Thus, these green roofs are emerging as important additions to the palette of construction techniques for creating healthy, ecologically responsible buildings.

BRISE SOLEIL- Brise soleil is an architectural feature of a building that reduces heat gain within that building by deflecting sunlight. Brise soleil gives passive solar protection reducing the reliance on mechanical cooling systems, generating reductions in energy consumption. It also helps in maximizing natural light into the building, reducing the need for artificial lighting. In the typical form, a horizontal projection extends from the sun side fecade of a building. Often louvers are incorporated into the shade to prevent the high angle summer sun falling on the fecade, but also allow the low angle winter sun to provide some passive solar heating.

3. Discussion

3.1 Benefits of a "Green" Building

Many of the benefits of green building technologies and practices for occupants, owners and the environment and society at large are quantifiable and well documented. These include energy savings, measurable reduction of waste, decreased water use, and improved indoor air quality. Other benefits are less tangible and harder to demonstrate statistically— while highly desirable. These include improvements in occupants' health, employee morale, productivity, recruitment, employee retention and improved public image for organizations and businesses that build green. Many building and health experts agree that the social benefits of green building technologies and practices can produce financial returns for employers and building owners that overshadow the savings associated with more measurable building performance gains.

Here are some financial, economic and environmental benefits of green building technologies and practices.

No increase in first cost-Many green buildings cost no more to build or may even cost less than conventional building alternatives because resource efficient strategies and integrated design often allow downsizing of more cost mechanical, electrical and structural systems.

High-performance green buildings are cost-effective. Even for projects loaded with high value features, higher first costs often are recovered within three to five years through lower operating expenses and utility rebates for energy-saving equipment. Savings in energy of 20-50 percent are common through energy-saving technologies, integrated planning and downsized equipment.

Increased resale value of energy-efficient facilities. Facility owners can reduce their financial risk by making investments in energy-efficiency that earn a higher rate of return than the stock market or bonds**.**

Increased value for developers and owners. There is growing confidence in the industry that a high performance green building can either capture lease premiums or present a more competitive property in an otherwise tough market.

Improved health and productivity. Design features that enhance energy-efficiency and indoor air quality are cost-effective strategies for improving worker productivity and product quality. An increase of one percent in productivity can provide savings to a facility that exceeds its entire energy bill.

Enhanced occupant health and well-being. High-performance green buildings typically offer healthier and more satisfying work environments for tenants. A recent Lawrence Berkley National Laboratory Study reported that commonly recommended improvements to indoor environments could reduce health care costs and work losses from communicable respiratory diseases by 9-20 percent, among other benefits.

As per the US General services administration research output and compared to the national average values green building uses 26% less energy,54% less water consumption,13% reduction in aggregate maintenance,27% of higher occupant satisfaction and 33% of less CO2 emissions.

3.2 Green Building material

Aside from the defining indexes, we also learn about the significance of Green Building material during the survey.

3.2.1 The definition of Green Building material

Green Building material is a kind of building material which would not cause damage to human body. In other words, Green Building material is low-pollution, low-stench building material. The poison in the building material would spread

through interior decoration and attach to the indoor environment. To those who stay indoors for a long time, due to long exposure to this kind of toxic environment, there is an extremely negative impact on human body. To identify the beneficial building material that protects people from poison and danger, assessment of building material is mostly based on indoor construction material and decoration material. Those building material which is qualified for the evaluating standard would be given the marker called "Green Building Material." In sum, Green Building material improves the wholesome of living environment and the quality of indoor environment, and has multi-function value.

3.3.2 The features of Green Building material

The internationally recognized features of Green Building material can be summarized as reuse, reduction, and low-emission. 3.3.3 The advantages of Green Building material There are three major advantages of Green Building material. First, it reduces the ecological load and energy consumption of the chemical synthesis material. Second, it reduces the production of energy and resource consumption by recycling. Third, using natural material and low volatile organic building material may reduce the danger of synthesis material.

3.3.3 The necessity of Green Building material

The interior decoration material and floor surface material should be Green Building material. According to Wikipedia, we know the rule that the percentage of Green Building material should take up at least 30 percent of the total interior decoration material plus floor surface material. Therefore, the use of Green Building material is by all means necessary to Green Buildings.

3.3.4 The four categories of Green Building Material

Green Building material is divided into four types: the ecological building material, the healthy building material, the high-performance building material, and the recycling building material.

3.3.5 The ecological Green Building Material

In comparison with other building material, the Green Building material is the least processed, thus the most natural, ecological material; it consumes the least energy and resource.

3.3.6 The healthy Building Material

Is of low pollution, low order, and low physiological hazard. It aims mainly at low volatile organic compounds, such as water environmental friendly paint, water-wood paint, and epoxy resin paint. In sum, Green Building material improves the wholesome of living environment and the quality of indoor environment, and has multi-function value.

3.3.7 The advantages of Green Building material

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3. CONCLUSIONS

Sustainable building is considered as a way for the building industry to move towards protecting the environment. The promotion of sustainable building practices is to pursue a balance among economic, social, and environmental performance in implementing construction projects. If we accept this, the link between sustainable development and construction becomes clear; construction is of high economic significance and has strong environmental and social impacts. With the growing awareness on environmental protection, this issue has gained wider attention from construction practitioners worldwide. Implementing sustainable building construction practices has been advocated as a way forward in fostering economic advancement in the building industry while minimizing impact on the environment. In order to reduce these detrimental impacts of construction on the environment and to achieve sustainability in the industry, three principles emerge: resource efficiency, cost efficiency and design for human adaptation. They form framework for integrating sustainability principles into construction projects right from the conceptual stage. The framework has considerable potential to accelerate the understanding and implementation of sustainability in building construction. It provides a brief overview of sustainability principles, strategies and methods, and emphasizes the need for an integrated and holistic approach for implementing sustainability in building projects. It is intended to provide a general framework for improving the quality and comparability of methods for assessing the environmental performance of buildings.

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