

COMPARATIVE EVALUATION OF ENVIRONMENTAL BENEFIT OF GREEN ROOF AND GREEN FACADE

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ABSTRACT

This study seeks to examine all factors that are hindering the wide spread use of green facades and green roofs despite their many advantages. To achieve this, study seeks the market's perception towards green roofs and green facades. The study will also seek perception on artificial products used to compensate for green roofs and facades. This is ideal for the proper understanding and adaptation of the new methods to urban housing. The research aims to find more manageable ways in terms of expenses, implementation and creating awareness across the globe. This will eradicate, the use of unconventional building materials, and promote adaptation of more eco-friendly building concepts. the result shows that the, landscape technology has clearly depicted the lack of sufficient public awareness for green roofs in general and green facades in particular and green roof and green façade infrastructure could be a cost-effective and energy efficient way to help and solve some of urban environmental and human health problems.

KEYWORDS: Green Roof, Green Facade, Environment

INTRODUCTION

Climate change is occurring at high rate due to the environmental degradation through manmade activities of Industrialization, cutting of forests, urbanization of cities burning of fossil fuels in transport and energy sector.[1] Though the man is responsible for disturbing the natural cycle and ecosystem, he is discovering the technologies to prevent it. The extreme weather patterns have increased the cost of air conditioning and subsequently the increased energy consumption. This has led him to develop green roof and green façade structures to enjoy the natural weather in urban life, while conserving water, energy and landscape. Man is always contented with primitive life style of tropics, adding plantation to the houses provides him the psychological comfort. Greenery structure can act as an element which can balance the climate at the houses and in the cities. Green cover protects the building surface form the direct impact of pollutants, acid rains and day/night temperature fluctuations enhancing the life time of a structure. Pollutants and dust particles are entrapped in green layer and the clean water infiltrate into the soil profile after the rain. Green roof systems are much more sophisticated and controls water pollution by putting into the sewer a filtered storm runoff, also reducing the load on sewer system in case of excessive rainfall. Green roofs and facades are the important and crucial solution for increasing biodiversity and birds, microorganisms, insects can created by them, and habitat for endangered bird species supplied by using green roofs.

COMPARISON OF SPECIAL EFFECTS

Special effects of green roof and green façade on the environmental issues will be compared in this section.

Noise and Sound Pollution Prevention

The hard surfaces of buildings reflect sounds while the substrate of green roofs make insulates the building form noise pollution. Increased noise level from heavy traffics and industrial activates may cause sleeping disturbance to chronic heart diseases, While the sound of air through façade plantation increase the pleasant impact of greenery. In the areas of

high noise levels such as air ports green roofs are much more feasible. [2]quoted in [3], at Frankfurt airport Germany 10 cm substrate layer reduces the sound level by 40 db (Decibels).

Water Pollution Prevention

Water pollution is prevented and protected by green roofs in many ways.[3] In the green roofs water is absorbed by the soil layer and filtered through water system and then disposed of in the sewers. Green facades in other turn help in reducing the storm water runoff that may become a load on the sewers in rainy season. Green plant layers absorb the rain water and prevent the building structure from the harmful effects of acid rains, also checks the acid rain water to penetrate into ground water profile. On the second place green facades slows down the storm water and reduce the run off volumes. Green roofs are more beneficial for frequent treatment of rain water as it deploys a well-designed system of water treatment in the substrate layer. In case of average range of rain fall intensity in a particular area, green facades are the best options to conserve rain water.

Air Pollution

Plants cleanse the air; it is a well-known fact. Green facades frequently treat the air through carbon dioxide and oxygen exchange providing the fresh air to the inhabitants. Green facades of industrial buildings minimize their severe environmental impacts by reduced emissions. [4]has quoted in [5] according to a German study green roof can reduce diesel pollution significantly. [6]says that vertical garden leaf absorb the pollutant and further cleansed off from the plants through photosynthesis process. This is a potential health benefits for persons suffering from the asthma or other breathing problems removing the danger of summer smog in the big cities. [7] has calculated a 12% reduction in the carbon dioxide emission by green roofs and facades.

Climate Change Mitigation

In the present age of environmental awareness, developed countries like UK, USA, Canada, Germany, and France are looking forward to reduce their greenhouse gases emission to follow the Kyoto protocol. For that purpose a lot of research is being done to develop structures that could mitigate environment rather than spoiling it. These two landscape architectures are very much important in one way and other. In benefits analysis both go hands in hands with certain limitations of site specifications. Green roofs have certain limitations that it could be done only on sloped roofs, but the green facades could be done on walls too. Both the techniques could be used in combination to make a building environmentally compact.

The green landscapes are the most intelligent design of present age to revive green patches in the urban cities. These techniques make the roofs, walls and pavement of the buildings usable by selection of appropriate climbers, efficient water management system and the base building design. There are following advantages of these “green” structures.

Temperature Regulation

The climate of a roof is different to that of surroundings. The roof receives direct sunlight and the rest of the concrete building also irradiated heat after absorbing sunlight. A lot of capital is invested in cooling down the building there by emitting CFC's (chlorofluorocarbon) in to the atmosphere. Whereas the plant canopy around the building absorbs the heat a keep the building cool. [8]describes the absorption distribution of heat by plants; Of the sun's light energy that falls on a tree leaf, 2% is used in photosynthesis, 48% is passed through the leaf and stored in the plant's water system, 30% is transformed into heat (used in transpiration) and only 20% is reflected. Since a large amount of incident radiation

on a plant canopy is used for evapo-transpiration, plants on vertical and horizontal surfaces are able to regulate wild temperature swings.

Protection of Building Structure

By the direct impact of sunlight the structures are likely to expand while at night the trend varies. The green cover around the buildings prevents the day and night temperature fluctuations and enhances the building life. [9]has quoted in [10] that the diurnal fluctuations for a non-green roof to be 50oC, whereas a green roof's diurnal fluctuation was only 3oC. The green façade protects the walls of the buildings from thermal expansion.

Energy Conservation

Besides protecting the structure, the excessive plantation covering the vertical and horizontal spaces of the building reduces the urban heat island effect, which causes climate change due to the atmospheric imbalance with in a city or building. When the excess heat is controlled less energy will be consumed to control the environment of urban cities artificially. Thus green facades and green roofs help a great deal in energy conservation. [11]has calculated the reduction in the energy demand by the green buildings that is 9 percent.

STORM WATER MANAGEMENT

The concrete buildings has locked the land and the bare soil is absent in the cities. On the other hand the rapid climate change has increased the frequency of rainfall and thunder storm. These two facts have a combined consequence as excessive runoff in case of storm. [12]describes that Excessive runoff increases the chances for flooding downstream as storm water exceeds channel capacities, resulting in the probability of property damage and human harm. A high volume of storm water runoff can also overwhelm municipal sewer systems. The efficient filtration system of green roof absorbs the water and filters it before putting into the sewer, thus preventing the pollution.

The green facades absorb the water in leaf tissues and reduce the runoff eliminating the load from sewer. In some cases the filtration process of storm water through green roof retains water for a while and delays the run off. According to [13] the green roof has the potential to reduce storm water runoff by 3 % while green facades minimize the runoff by 6%. If any reservoir is attached to the green roof system, the filtered water could be stored for irrigation or may be used in flushing system of bath rooms. In arid regions where rain water conservation is an irrigation options, green roof is to be adopted.

METHODOLOGY

This study is a descriptive analysis in the form of a field study using survey design.

For this study, the main instrument used was a questionnaire.

- Six items are used to get information on the role of green roof and green façade in the climate changes.
- Two items are used to get information on which one of the green roof and green façade are greater effect in the society and the environment.

For the purpose of this study the researcher seeks to use sampling methods to determine the appropriate sample only is selected as respondents for research. Sampling methods are to determine that not all populations have the opportunity to be taken as respondents.

All analysis of this study was done using SPSS for window version 18. Descriptive analysis methods used to describe the frequency and percentage distribution on public data. While for a response from research objectives data analysis using non-parametric correlation (chi-square) was done.

During the analysis, data were gathered from the questionnaire to the respondents, collected and coded in advance and then analyzed by using descriptive methods, cross tabulation and chi-square

DISCUSSIONS

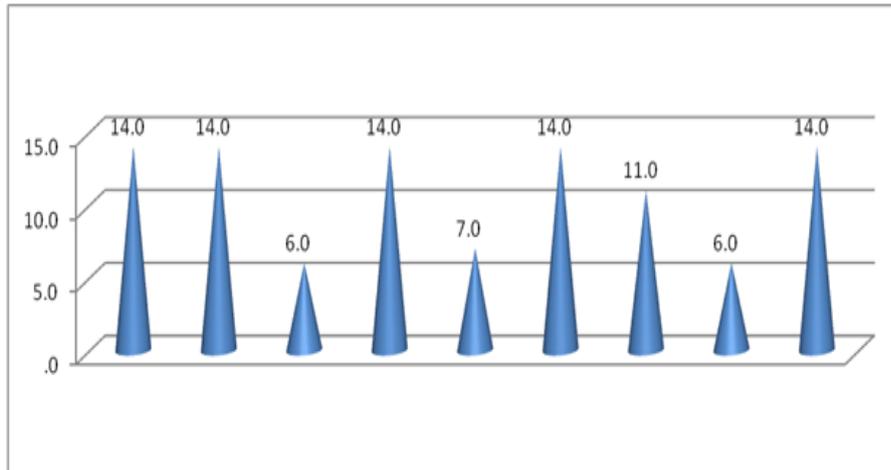
A survey was conducted to find out the popularity of green landscapes. It was turned out that people were more aware of green roofs as compared to green facades. Only 38% present people depicted their preference for green roofs because the term green facades were new to them. The pleasant effects of green roof in urban buildings are obvious for providing the shades and conserving the environment. Interview data shows that 41% people were aware of the greenery and their impacts on environment. People were aware of the benefits of plantations on the ecosystem. The figure rose to 89% of those people who were sure that green roofs and green facades would be beneficial against global warming; almost 29% people were of contrast view about the suitability of green landscapes. Greenery enhances the looks of the building as well as the property value, 47% people favoured this concept. The energy conservation aspect of green roofs and green facades was attractive to 83% people, 23% people favoured the technology with true intentions of environmental conservation, temperature regulation and water management.

With respect to environmental protection people supported different aspects of benefits of green roof and green technologies in the following way; 46% people preferred greenhouse gas emissions, 23 present indicate food supporting and urban agriculture and its economical advantageous of them as their interest to green roof and green façade, almost 46.5 percent people had indicated the green roof and green façade as the protection against noise pollution as the most important functional usage of the green roof and green façades. In the interviews 57.7% people showed their willingness to adopt green facades and green roofs. The interviewees comprised of 62% male and females the rest.

Q	Frequency	Percent (%)
Physical appearance	43	21.5
Environment protection	56	28.0
Pollution reduction	32	16.0
Temperature regulation & thermal insulation	45	22.5
Noise insulation	2	1.0
Efficient water management	2	1.0
Don't know	20	10.0
Total	200	100.0

Demographic Information

Respondents Criteria



According to the findings of this study, 14% of the respondents indicated that they had lived, currently live, maintained and installed green roofs, 7% of the respondents indicated that they were specialists in green roofs and green facades, while 6% of the respondents indicated that they live and had lived in houses with green facades respectively.

CONCLUSIONS

Growing concerns over environmental issues and climate change has turned the attention of masses and developed countries towards the mitigation steps. In order to cut their greenhouse gases emissions countries are investing a lot of revenues for environmental protections. The best answer of these increasing efforts lies in architectural landscapes in form of green roofs and green facades. The green landscapes and vertical gardens have been the symbols of beauty in the late history of mankind, today they are to adopt out of need. Green landscapes are needed in the urban cities constructed of concrete and steel suffering from the issues of noise and air pollution, water management, storm water management and the issues of land use. Green landscapes enhance the aesthetic look of the buildings, improving outlook and the value of the property, thus eliminating the money drain over the outlook maintenance of a building. These structures conserve the energy for air conditioning by temperature regulation. Thus these green structures are the fortunate prospects for the potential energy crisis of the future.

In the storm water retention and water management, green roofs have higher effect but in towers green facades can show better results and this depend on the structure. Water management system was designed for structure with green roof on top and green façade in two side of building. Designing green facades with utilizing plant textures, rhythm and shapes and patterns have special effects on the building climate besides aesthetic improvement. Plantation insulates the interior of the building from ambient noise, dust and smoke providing a clean atmosphere. Temperature regulation reduces urban heat island effects and save energy. Plantation has a linear relationship with the sound pressure level. More the plantation will be, the respective construction is more effectively sound proof.

Green landscapes has the potential to become an industry creating employment with special expertise of developing resistant and appropriate climbers, installation crew and maintenance crew. water conservation, air and noise pollution is a great success of man in environmental friendly activities. Both green roofs and green facades have helped in conserving the environment.

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