



EXPLORATION OF GREEN WALL & GREEN ROOFS DESIGNED ON ECOLOGY PURPOSES

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ABSTRACT

Cities under the burden of population growth present problems regarding connections to nature due to lack of green areas such as parks. As a solution to this problem, green practices in architecture has become more common as a tribute to ecology and a counter measure against global warming. City dwellers feel the lack of green in their lives leading them to place plants in relation to a buildings. The selection of plants mostly depend on the climate, costemics and life span.

The study provides information on green roof and green wall implementations as well as presenting significant projects in order to furnish an insight on the global importance of the subject. The main approach of the study is relating green practices with architecture and design related guidelines to be able to explore various qualities of such implementations. Literature provided in the study relate with the examples selected presenting regulations, goals, values, impact and advantages of green implementations.

Keywords: Green Roof, Green Walls, Sustainability, Architecture, Ecology.

INTRODUCTION

Plant life provide a sense of nature and ecology oriented feeling to wherever it can be perceived. There are many type of plants that can live outdoors and indoors, therefore suitable plants are used for adding a supplementary values to structures for many reasons. Vegetation implemented on buildings does not always render the structure an ecology centered building. Most implementations have been realized on buildings of a certain age. Obviously some contemporary buildings have adapted and upgraded the approach in order to enhance the performance of the structure. The term 'Green building' refers to constructions that have infrastructures specifically implemented for purposes and goals on sustainability. The study encapsules buildings with decorative green implementations rather than focusing on eco buildings. Green roofs and walls have a lower value degree regarding the goals on sustainability compares eco buildings.

Yeang (2000), has used the term ecoarchitecture emphasizing the importance of ecology centers adaptability on architecture in order to preserve nature and narrow the gap between humanity and the planet. Especially in some cases it is not practical to reconstruct the structure, green roof and wall implementations provide a sense of nature with small upgrades to the building.

Green implementations can be primarily realized on modern buildings enhancing the sustainability qualities of these structures and a secondary approach is converting a classic building into a semi-sustainable structure with the contribution of plants. The study provides explanation regarding wall and roof implementations in the upcoming sections.

1. GREEN WALLS

Green wall implementations applied vertical and horizontally contribute certain values to buildings. Besides adding aesthetical values, they also provide service for heating and cooling purposes. Interior wall plants may lower the temperature by 10 degrees, provide the filtration of air by 50% and function as a biofilter. Green walls can be implemented on outer facades (Köhler,2008) or interior walls of buildings. Apart from the perception of being covered in vegetation, buildings blend more to the general setting of the city. Especially in Singapore where the climate allows the growth of various types of plant life, urbanization requirements encourage buildings to use green applications. This strategy enriches the general scenery as well as adding a marketable aesthetic value in order to attract the inhabitants. The existence of vegetation provides a shell for a building securing protection against the elements. In Europe the choice of constructing high rises is related to the effect of contemporary architecture. High rises symbolize the progress of development in modern society (Tapan, 1984). In order to create a monumental structure some high rises are covered with plants in order to provide a greener perception and a place to gather especially on roof tops. Obviously height is an issue that needs to be regulated depending on urbanization standards mostly set by local authorities. Aytis (1996) refers to the necessity of regulate the height, plan and design of structures to be able to provide a more preferable result for urban planning purposes.

1.2 Green Wall Examples

Green wall implementations are iconic projects for sustainability. These structures are landmark objects for cities enhancing visual perception, providing a reference point and adding an aesthetical touch. The study presents a selection of award winning milestone projects.

School of Art, Singapore, designed by WOHA has won the Jørn Utzon Award for International Architecture in the 2011, National Architecture Awards. Green wall implementations enhance the perception of the building rendering it milestone project for the city.



Newton Suites, Singapore designed by WOHA boasts an aesthetical approach and deliberate randomness contributing a dimension of spontaneous playfulness. Vegetation plays an important role in blending the architecture with the landscape as well as adding a stylish iconic structure to the skyline.



Bio Hotel, Bogota with its ecological interior and a living facade has a LEED inspired concept that implies to the adaptability and support on sustainability.



Vertical gardens bestow life to a city (Lambertini & Leenhardt 2007). Bosco Verticale, Italy designed by Stefano Boeri Architects are a massive double high rises with green walls, terraces and roof. The project is one of Europe's biggest redevelopment projects designed as a part of rehabilitating the historic district.



La tour Des Cedres, Lausanne designed by Boeri Architects is a contemporary version of Bosco Verticale. As stated by Boeri the project reflects architecture able to introduce a significant biodiversity of vegetal species in the middle of Europe.



The line between architecture and concerns on ecology is a thin one requiring the expertise of a studio composed of designers as well as botanists. As mentioned by Yeang (2000), eco architecture can help narrow the gap between the nature and urban life. The projects presented are contemporary examples of humanity's attempts to get closer to nature.

2. GREEN ROOFS

Many cities are under urbanization problems due to population growth resulting in stacks of buildings without sufficient green areas for the inhabitants to connect with nature. Green roofs are mostly used to provide a place of gathering especially in overcrowded settlements. They convey a sense of privacy yet transfer the feeling of freedom under the sky. Sustainability related properties of green roofs are listed below.

- 1) Protecting biodiversity of the environment.
- 2) Decreasing the effects of urban heat islands.
- 3) Increasing the energy performance of structures.
- 4) Increasing the effect of cool wind.
- 5) Filtering wind blown particles.
- 6) Ensuring the exchange of carbon dioxide and oxygen.
- 7) Noise reduction.
- 8) Effect on rainwater.
- 9) Electromagnetic radiation reducing effect.
- 10) Increasing the life span of the roof membrane.

Green movements effects on ecology, ecosystem, urbanization, human perception and aesthetical values contribute strongly to the quality of life as well as aiding the planet in overcoming recent concerns.

2.1 Impact of Green Roofs

UE COMMITTEE has specified regulatory content regarding buildings on sustainability and ecology in 2000. The projection contained decisions such as all buildings producing own energy, usage of heat pumps and solar panels in order to reach a sustainable outcome. Unfortunately these kinds of transformations take time and the world has still a long way to go. Nevertheless some changes can be realized through the use of green implementation on roofs and walls. Socializing on green roofs is a common choice especially in mega cities where parks are scarce and population is large. Aesthetical and privacy oriented values provided by these applications enhances perception and offer an alternative way of socializing. The advantages of implementing a green roof are listed below.

- 1) Carrying additional weight. Insulating the roof against water and steam.

- 2) Storing the moisture necessary for plant survival and releasing the moisture when it is not needed.
- 3) Housing the soil required for plants.
- 4) Providing climatic protection by maintaining a sustainable plant coating.
- 5) Providing atmospheric, thermal and social benefits for the public and the environment.
- 6) Providing protection against thermal and ultraviolet effects.
- 7) Supporting energy budgets.
- 8) Contribution to the city heat island.
- 9) Contribution to storm water management strategies.
- 10) Contribution to city air quality and cooling.
- 11) Contribution to health and landscape.
- 12) Garbage recycling, sound reduction, property values, city agriculture etc.
- 13) Supporting biodiversity, support to natural life.
- 14) Bird and insect species life extension.

Green movement promises to provide a healthier and a more productive environment, regulates green roof, wall and interior implementations, provides financially cost effectual solutions and enhances the environment aesthetically.

2.3 Green Roof Examples

The section presents global and local examples of green roof implementations. Examples selected are milestone sustainability projects that have a unique conceptual approach as well as carrying a symbolic value.

Meydan Mall, Istanbul designed by the architect Alejandro Zaera Polo. The structure has the capacity to collect water with its ground source heat pump for energy production in order to use for structural services.



Marine Bay Sands, Singapore designed by architect Moshe Safdie boasts with symbolic massive green roof housing a swimming pool and serving as a canopy over three buildings. 3 structures under a common canopy serve as hotel, mall and residence.



Skygarden, London designed by Rafael Vinoly is a public garden like roof terrace filled with plantation. In the heart of the city, the structure allows the public to enjoy the scenery from a vantage point covered with different plants.



Interlace Condo, Singapore is a building designed by Ole Scheeren. It is a groundbreaking structure from a classic tower design with its irregular stacked up posture and positioning.



In regular buildings green roof implementations are generally adapted in a modest way by use of plants on terraces and balconies. This approach also carries a significant value regarding global goals on sustainability.

3. SUSTAINABILITY

The term suggests the conveying of resources to future generations. Certain vital resources do not restore or regenerate, it is crucially important to preserve these materials. Elements such as water and air cleanse in long periods itself only if pollution and consumption levels decrease or completely stop. Population growth is the major cause on depleting resources. One of the primary reports by Club of Rome on sustainability refers to the fact that the relation between growth and consumption of resources is the factor threatening sustainability. As presented by the World Environmental and Development Commission, UN in 1987, sustainability has been used as continuous productive diversity with a guarantee of persistence.

Initial goals of green implementations are mostly focused on visual and perceptive values. Sustainability does not form the essence of green roof and wall implementations but provides a partial service on the matter. As a secondary substantial goal to these implementations, sustainability contributes a precious value to structures. Green implementations have the power to support the change for a cleaner planet, reverse global warming concerns and decrease greenhouse gases effecting the breathable air promising a bright future.

4. CONCLUSIONS

The study provides evaluation of the example projects in relation to the literature presented. Landmark buildings carry an iconic identity for the city as well as adding an aesthetical value to the skyline. Implementations enhance the visual perception and the urbanization value of buildings that do not have a particular architectural value. In many cities, urbanization goals has led to the construction of terrace like roofs that can be filled with plants and trees (Johnston & Newton, 2004). These implementations provide a shelter for bird and insect species as well as procuring an area of privacy where habitants of the structure may socialize. Humanity has to find ways to cooperate with nature under the rules of sustainability in order to preserve natural resources and hand over a better future for the new generations. Result of the study show that wall and roof implementations alter perception regarding the structure making the facades seem covered with gardens hung vertically or laid horizontally.

Examples presented in the study all provide an ecological interaction with human life as well as animal and plant species. The attractiveness of a green implementation narrows the gap between an artificial construct and nature altering the perceptive qualities for urbanization purposes. The study displays the importance of green wall and roof implementations relating the examples to literature selected content. For future studies green building focusing on sustainability and design can be a subject worth exploring in details.

REFERENCES

- Aytıs, S. (1996). 'Yüksek Binaların Yapım Kriterleri ve Bu Kriterlerin İstanbul Koullarına Göre Uygulamalı Analizi'. Doctorate Thesis. Mimar Sinan School of Fine Arts.
- Johnston, J. & Newton, J. (2004) 'Building Green: A Guide To Using Plants On Roofs, Walls And Pavements'. Greater London Authority. London, ISBN: 1 85261 637 7.
- Köhler, M (2008) 'Green Facades, A View Back & Some Visions'. Urban Ecosystem 11(4):423–436.
- Lambertini, A.& Leenhardt, J. (2007) 'Vertical Gardens: Bringing The City Of Life'. Thames & Hudson, London. ISBN: 978-0-500-51369-9
- Tapan, M. (1984). 'Liberalism in Architecture Modern Turkish Architecture' (eds. R. Holod, A. Evin, and S. Özkan), Ankara: Chamber of Architects of Turkey.
- Yeang, K. (2000). 'The Green Skyscraper: The Basis for Designing Sustainable Intensive Buildings'. Prestel Publication, ISBN-10: 3791319930, ISBN-13: 978- 3791319933 McGraw-Hill.