

# Green Skyscrapers

Mohammad Afzal Qureshi

Kiran N. Hatwar

Nakul M. Bakde

Mayur T. Ghaiwat

Shashank Rawat

B.E. 3<sup>rd</sup> year

(Department of civil engineering)

K.D.K.College of Engineering, Nagpur

## ABSTRACT

“The paper presentation is about the study of integration of plants into skyscraper which is developing the idea of vertical forest in cities or metros. The presentation also deals with the study of effect of urban heat island. The study is about how these processes help in reducing the effect of global heat island and also help in reduction of carbon footprints. The rules and regulation of various countries have been studied. It is included with some case studies which have shown significant conservation of energy and better quality living than conventional skyscrapers. The provisions of integrating plants into skyscraper includes the four possible options like, Green roof, Green wall, Biofilter and Indoor potting plants which can be incorporated into the design. Recently, in various researches benefits and impacts had been studied in terms of energy savings and indoor environmental qualities. For example green roof can reduce 50% of cooling load; green wall can reduce 10 degree centigrade indoor temperature, whereas a biofilter and indoor plants purifies indoor air by 50% to 60%.”

Keywords: Global heat island, Urban heat island, Green Roof, Green wall, Biofilter.

## INTRODUCTION

A skyscraper is a tall, continuously habitable building of over 40-50 floors, mostly designed for office, commercial and residential use.

**Green Skyscraper** refers to the practice of creating tall buildings which are better for our health, environment and economy. It will be

environmentally responsible and resource efficient throughout its life-cycle, as well as a sustainable and high performance building for economy, utility, durability, and comfort. Definitions of green skyscraper vary but the green movement has three main goals:

- Ensure a healthy, productive indoor environment for occupants to work and live.
- Prevent negative impacts to our environment and improve its health.
- Reducing operating cost and increase profitability for building owners through energy and resource conservation.

## NEED OF STUDY

- To study whether the application of plants in skyscraper can reduce the Urban Heat Island effects.
- To study whether the application of plants in skyscrapers helps to reduce the effects of Global Warming.

## AIM

To Study Green Skyscrapers.

## LITERATURE REVIEW:-

The main goal of this study is to examine how green in skyscrapers can help in preserving environment. Therefore having green skyscraper rather than traditional one is becoming important issue in today's world. When there will be green skyscrapers built all around the world we can see

significantly decrease the impact that traditional skyscrapers brought to the environment.

Recently, some scholars are working on research and writing general on use of green in building. In the journal, *Green Buildings and Building Assessment Systems: A New is of Interest for Planners* by Rebecca C. Retzlaff, the definition of skyscraper is more advancly introduced. The articles also deal with discussion on planning of green in a building. In other many journals LEED system is discussed very briefly which is mostly used around the World.

Ken Yeang (a green architect) had presented so much efficient ways to make building green and had presented theory of “Bioclimatic Influence” which influenced many people all around the world. Many designers use his basis of theory all around the world. Many of green ideas are from his papers, theories and journals. In *Reinventing the Skyscraper: a Vertical Theory of Urban Design*, Ken Yeang, Green Architecture, said, “Applying the ideas of sustainability requires that we demonstrate and manage the regenerative capacity of the renewable elements in the new high-rise and in the city” (Ken Yeang, 2002, 183). His book tells us that applying green on high-rise building is very important and it will “lead to a more livable intensive urban environment” (Ken Yeang, 2002, 7).

#### METHODOLOGY:-

This study is based on the existing research from literature reviews, documented analysis and information from website, reports, and case studies. The aim was set for studying the contribution of plants to skyscraper design as described further.

#### CASE STUDIES

These are the case studies from the report for CRP 3840: Green Cities  
December 4, 2008 by  
Narie Foster | Samuel Luff | Danielle Visco

##### Case study: New York, NY

Manhattan can be considered the greenest place in America, if measured by energy use per inhabitant. If New York City were a state, it would be 12th in population and last in energy consumption. The first

green skyscrapers in the United States were built in New York City. The city contains the country’s most expensive real estate, and yet these costly projects are still pursued. The skyscrapers are generally high-profile corporate buildings. These buildings offer a model for an urban future with these “intelligent machines” that contribute to a cleaner city and global environment. In terms of governmental guidelines in the US, a LEED rating is considered a marketing asset. Corporations tend to look at LEED, or any publically-recognized example of “green washing”, as a source for brownie points. Many of their green projects are motivated by improving a company’s image. LEED offers incentives, sets goals, and gives distinctions, but doesn’t set any minimum building standards. The Battery Park City Authority’s green guidelines (created in 2000) are an example of localized minimum standards. In Battery Park, both residential and commercial/institutional buildings are required to meet environmental guidelines. In Ground Zero redevelopment as well, there is a focus on environmentally-friendly building.

Manhattan offers a great example of the movements toward green skyscrapers within the United States. We will specifically look at the Hearst Tower and the Bank of America Tower.

##### Example: The Hearst Tower

The Hearst Tower on 57th and 8th, near Columbus Circle in Manhattan, was the first “green” high-rise in Manhattan. Rated LEED Gold, it set the standard for new skyscrapers being erected. The architect was Norman Foster, who is known for designing the Gherkin egg-shaped building in London, and for his work in environmentally-friendly design (his name will come up several times later). The “diagrid”



triangular framing pattern provides superior stability with less material than a typical steel frame. In the atrium, escalators run diagonally through a 3-story waterfall built with thousands of glass panels. The water comes from rainwater, and cools and humidifies the lobby air. Communal spaces called “sky gardens” offer a respite from work, in naturally lit and ventilated comfortable areas. When workers leave their offices to work in these gardens, sensors turn off their office lights. The last item of interest is the smart elevator system, which retains memory and optimizes paths based on previous data, headcounts, and floor request.

### Case Study: Guangzhou, China



In China, it seems more that the architects are driving the green push. However, the corporations still come into play, particularly when it comes to

impressing foreigners. The Olympic Games in Beijing and the Asian Games have influenced corporations to build faster to be in time to show off. The China Green Building Council outlines basic energy efficiency rules for building, and offers a 5-star labeling system as a market-based incentive.

#### **Example: The Pearl River Tower**

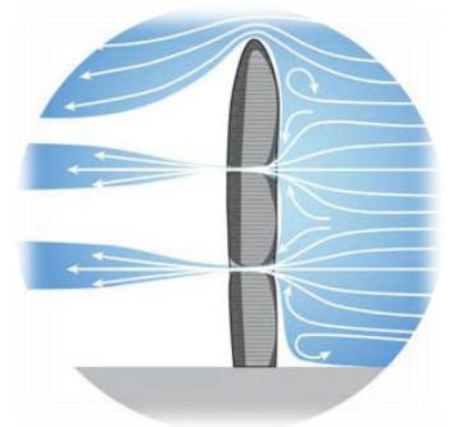
This tower is being built in Guangzhou, which is in the Guangdong Province in southern China. This skyscraper is known for its net zero- energy goal, meaning that it will conserve and generate enough power to meet its energy demands. The most interesting and unique aspect is the building’s structure that pushes rapid wind into the wind

turbines in the two openings, thus producing energy and alleviating some structural forces.

### **Green Skyscrapers in the local context of Guangzhou (China)**

Similarly to in the States, companies in China are driven by image. The Pearl River Tower architects themselves point this out: In addition to its superior performance, the tower also represents the pinnacle of quality for a world-class headquarters facility. The client desired a building that would represent and enhance their position as a global leader and an active participant in the sustainable design movement. Pearl River Tower represents a true symbol of progress for the 21st century: a self-sustaining, environmentally intelligent building that is a stunning new icon for the future of the region.

Eleven skyscrapers are in the works to be built in Guangzhou over the next few years. There are questions about whether these buildings will be filled, as Guangzhou is a



major manufacturing city, and manufacturers are looking more to be close to the factories than to be located in a fancy upper floor. Locals are hoping that the development of other higher-end industries will bring the profile, tenants, and money needed in Guangzhou.

### **INFERENCES:-**

- From above case studies it has been clearly proved that applying green to skyscrapers can reduce the energy consumption by use of alternative energy sources which are eco friendly.
- The plants also purify the surrounding air which reduces heating effect and ultimately reducing the Urban Heat Island effect.

**Modern researches:-**

Recently research is being conducted for the use of wood in place of concrete because of the excessive emission of the green house gases and material during its productions and many projects are under constructions.

**REFERENCES**

- [1]Al-Kodmany, K. and Ali, M. (2013). *The Future of the City: Tall Buildings and Urban Design*. WIT Press, UK. Baker, W. (2004).
- [2]“The world’s tallest building-Burj Dubai, UAE”, *Proceedings of The International Conference on Tall Buildings*, Seoul, South Korea, pp.1168, 1169. Beedle, L., Ali, M. and Armstrong, P. (2007).
- [3]*Skyscraper and the City: Design, Technology, and Innovation*, Edwin Mellen Press, Lewiston, NY. Binder, G. (2006).
- [4]*101 of the World's Tallest Buildings*. The Images Publishing Group Pty Ltd, Mulgrave, Victoria 3170, Australia. Blake, P. (1961).
- [5]Frank Lloyd Wright - *Architecture and Space*. Penguin Books: London, New York. Despommier, D. and Ellington, E. (2008)
- [6]‘The vertical farm: the sky-scraper as vehicle for a sustainable urban agriculture’, *CTBUH 8th World Congress on Tall & Green: Typology for a Sustainable Urban Future*, 2008, Dubai, 3–5 March, pp.311–318. Dutton, R. and Isyumov, N. (1990).