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"Sustainable Vertical Growth: Case Study of Skyscraper"

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ABSTRACT: -
As the world population is increasing day by day it can be estimated that the world population cab be reached 10 billion by year 2051, by which 75% of the world population are living in urban centers.
For that the construction of the new sustainable skyscraper is global phenomenon. This process of sustainable development is more relevant in developing countries with increasing population and where government are already working towards the urban growth of their "citizens" and high standard of living.as the rapid increasing of industrialization the demand of the skyscraper has increased in urban centers.as this rapid growth results poor quality, speedy construction and short-term return on investment in liability and sustainable urban life. This research paper shows the construction of more sustainable skyscraper for steady development of the country.
KEYWORDS- *Green building, Tall Buildings, Sustainable Township, Sustainable Skyscrapers*

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I. INTRODUCTION

A skyscraper is a large continuously habitable building having multiple floors. Modern sources currently define skyscrapers as being at least 100 meters or 150 meters in height, though there is no universally accepted definition. Historically, the term first referred to buildings with between 10 and 20 stories when these types of buildings began to be constructed in the 1880s. Skyscrapers may host offices, hotels, residential spaces, and retail spaces.

As of January 2020, only nine cities have more than 100 skyscrapers that are 150 m (492 ft) or taller: Hong Kong, Shenzhen, New York City, Dubai, Shanghai, Tokyo, Chongqing, Chicago, Guangzhou.

A sustainable sky scraper, also known as green construction or Green building refers to both a structure and the application of processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from planning to design, construction, operation, maintenance, renovation, and demolition of the structure. The Green Building practice must be design concerns of economy, utility, durability, and comfort.

A sustainable sky scraper is the structure which are energy efficiency, including the use of renewable energy sources such as wind, water, or solar; creating a healthy indoor environment; implementing natural ventilation systems; and using construction materials that minimize the use of volatile organic compounds (VOCs) in the home.

1.1.1 NEED OF PROJECT

Buildings are generally the main energy consumer in the urban contacts the approximate consume 42% of the total wall annual energy usage this energy is mainly used for heating, cooling, providing electricity and air conditioning. According to the data release from the energy balances of the general directorate for energy and geology, 30% of the final energy is accounted by the residential and service playing and more than 60% of the electricity that is consumed at the national level that reflect in a greater weight in a distribution of the primary energy by sector and also a greater share of admission of gases. A possible solution in the building sector which helps reduce energy consumption is designing building, which consume less energy, applying passive measures, particularly nature or hybrid ventilation in order to considerably reduce primary energy consumption.

The growing consumption of the energy and environment problems appearing every day have lead to great concern on the renewable energy and ecology and environment control. The report says that building industry is responsible for 34% of the whole environment pollution and 50% related to the energy consumed in a building industry by developing for technology and applying is specific method we can have friendly look towards their ecology and have equal building which are more "environment friendly".

1.1.2 CASE STUDIES

First, the literature was surveyed in order to study designs. Due to the novelty of the field, as well as the small number of relevant publications, there were limited number of designs to select from various papers. Different model has been select from the different literatures.

1.2 Shanghai Tower: -

Located in ponding finance district of Shanghai, China, the 128-floor Shanghai tower rises to the height of 632 m (2037ft). when the complete in 2015, it become the tallest building in China and second world largest tallest, ranking that it returns to the present. As an exemplary mixed-us tower, it is divided into 9 vertical zones which retail at the bottom, offices in the middle, and hotels, cultural facilities, and the observation desk at the top. Designed by architectural firm Gensler, the tower features numerous green designs elements, including the tapering, twisting from that reduce wind loads by 24%, offering a significant savings in overall building materials. The building transparent inner and outer skin admit maximum natural daylight, thereby reducing the need of need for electric light. The tower's outer skin also insulates the building reducing energy use for heating and cooling. Further, the tower's spiral parapet collects rainwater, which is used for the towers heating and air conditioning system. The council on tall buildings and urban habitat (CTBUH) recognized shanghai Tower as the "2016 Best Tallest Building Worldwide".

Figure 1: The Shanghai Tower

1.2.2 Oasis Hotel Downtown

Designed by WOHA firm, Oasis Downtown (2016) boasts a 750 percent replacement "green value" by employing a façade of aluminium mesh covered in 20 species of flowering vines and creeper plants. These greeneries provide shade, absorb heat, and cool and purify the air. To facilitate natural ventilation, the architects punctured the vegetated façade by alternating 30 m (98-ft) open-air sky gardens and employed a series of energy-efficient fans to circulate breeze and cool air around the tower. Aesthetically, the tower takes different forms and shapes as plants grow and change colour over seasons. Importantly, the chosen plants that grow over the exoskeleton require minimum maintenance. Patrick Sisson, in his recent (2016) article titled "Tower as Trellis: A Plant-Covered High-Rise Reimagines Tropical Buildings" explains this maintenance issue. He states, "It's a departure from other experimental green high-rises, the Bosco Vertical in Milan, Italy, a celebrated green residential project that employs a team of flying gardeners to maintain the trees and shrubs spread across the

building's balconies" . Sisson cites in his article Richard Hassel, the cofounder of WOHA, the Singapore-based firm behind Oasis, explaining: "We're always a little concerned that it's tough to get a pool of labourers who are both Spiderman and gardeners. So for our projects, we always make sure they can take care of themselves without special maintenance or care". In May 2018, the building won the "CTBUH Best Tall Building Worldwide" award. Among the reasons for winning the award are "because it incorporates [many] stories of green walls along the exterior, because of its significant commitment to communal space. The tower has given over 40 percent of its volume to open air communal terraces in the sky".

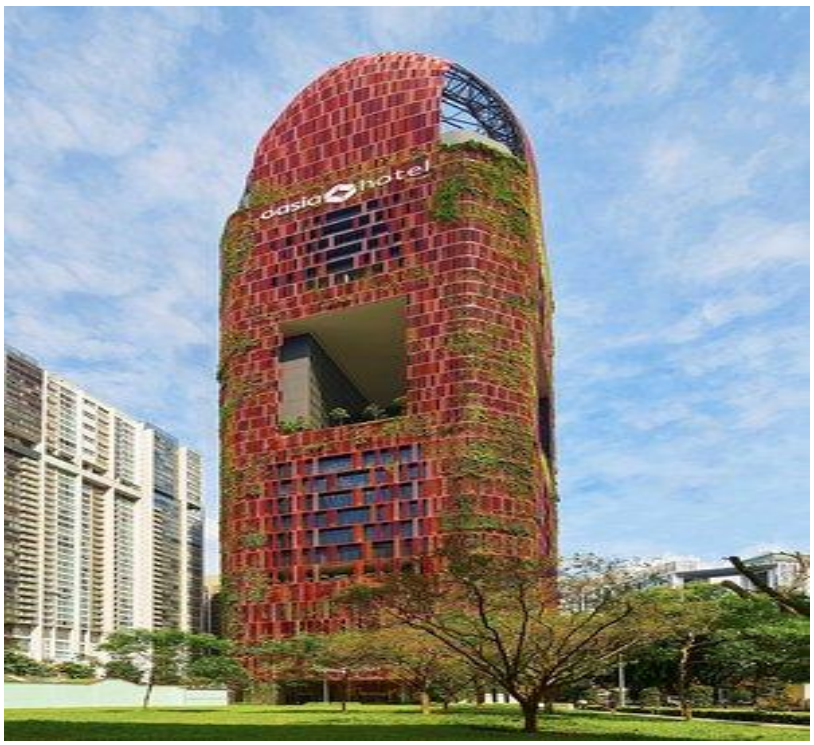

Figure 2: Oasis Hotel Downtown

1.2.3 Doha Tower, MIDDLE EAST

Doha Tower is a 46-story, 238 m (781 ft.) high-rise that is located in the West Bay of Doha, Qatar. Designed by Jean Novel, Doha Tower's cylindrical form was designed to consider multiple factors, such as efficiency, daylight, wind resistance, and iconicity. The core of the building is off-center, allowing for more flexible office spaces. The exterior cladding evokes the traditional Islamic "mashrabiyya", a popular form of wooden lattice screen found in vernacular Islamic architecture used to achieve privacy while reducing solar glare and heat gain. Placed along the building's façade, the "modernized mashrabiyya" uses a single geometric motif overlaid at several scales and densities to produce the desired effect. That is, the overlays correspond to the local solar dynamics with a 25% opacity at the north elevation, a 40% at the south elevation, and 60% at the east and west elevations. Overall, the building's façade is estimated to reduce cooling loads by 20%. Completed in 2012, Doha Tower has received the CTBUH Skyscraper Award for the Best Tall Building Worldwide that same year

Figure 3: Doha Tower, MIDDLE EAST

2.2. summary of applied sustainable design features: -

#	Building's Name	Height n/f	#of stores	Building's functions	Year Of Complete	City	Climate	Prime External Green Feature (Building's Envelop)
1	Shanghai Tower	632/2073	128	Hotel/office	2015	Shanghai	Humid	The tower's twisting and tampering from improves wind resistance and enhance structural efficiencies
2	Oasis Hotel Downtown	191/626	27	HOTEL/SOHO	2016	Singapore	Tropical	It boats a 750 percent replacement value by employing façade of aluminum mesh covered in 20 species of flowing and creeper plants that provides shade, absorb heat ,and cool, purifying air
3	Doha Tower, MIDDLE EAST	238/781	46	office	2012	Doha	Desert Hotel	Dynamic modernized masrabiyya system is designed to open and closed to optimism thermal performance of the building skin it is placed strategically in areas that need shades

The results obtained are as discussed below

II. DISCUSSION: -

The aforementioned case studies offer an extensive variety of green design approaches. To facilitate the discussion, this section first summarizes green design features of the examined case studies.The next section proposes a framework to classify the salient green design features, according to major topics, such as structural efficiencies, renewable energy, façade technology, bio-climatic, biomimicry-inspired, and greeneries. These categories also engage additional buildings, not included in the aforementioned case studies.

1) Structural efficiencies:-

- Aerodynamic Forms
- Triangular Configurations
- Braced, Diagrid Systems, and Exoskeleton

III. SOLAR SHADING DEVICES: -

Balconies and terraces offer multiple functions, including shading benefits, as discussed above. However, some buildings, such as office buildings, may not need balconies. As such, shading devices could be employed. Principally, the glare caused by glass is a significant problem for both the interior and exterior of a building. Glare occurs through an extreme contrast between bright areas that receive direct sunlight and adjacent areas of darkness. Inside a building, glare often occurs in areas close to windows that receive a large amount of sunlight, for "usually a single south-facing window can illuminate up to 20 to 100 times its unit area". Such a large amount of light may result in glare if concentrated on a small area. Additionally, unwanted heat gain occurs when sunlight enters the building on warm days, with local climate and facade orientation being the main determinants of sun control in regard to heat gain. In the last decades, the world has witnessed a significant high-rise development that embraces Western models of all-glass curtain walls, ignoring local climatic conditions. In this regard, solar shading devices play important functional roles. For example, cooling all-glass buildings is costly, both financially and environmentally, particularly in hot climates like that of Abu Dhabi, where intense sunlight causes temperatures to rise frequently above 38 °C (100 °F). In addition to functional roles, solar shading devices may offer interesting visual expressions, as follows.

IV. CONCLUSION

The 21st centuries city is increasingly vertical. Yet all this projects are widely recognized for design excellence and have received awards from major buildings recognitions. The examination has focused on identifying sustainable design feature that grant the building clearly identify and make it an iconic land mark. This paper shows "sustainable "design feature that many building have implemented. The design of the building should not be only green building point of view but it must be also aesthetically good which gives present feel.

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