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Sustainability in Architecture: Dynamic Buildings, "The Future of India"

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Abstract- *Taking cognisance of the growing need and importance of urban development in India, we must focus on the suitable infrastructure plans which will meet not the present expectations but also the future one. The Indian Economic Survey 2017-18 estimated that the country will require $4.5 trillion infrastructure investment by 2040. The need of infrastructure will increase the demand of electrification so the power consumption will be much higher. To avoid such failures in smooth development we need to adopt the plan of dynamic buildings. In this paper we have discussed the relevant ideas how the infrastructure itself can help to generate the needed power consumption. This research presents different definitions of sustainability and dynamic architecture, along with the elements of sustainability and their application on the dynamic buildings whether static or partially or fully dynamic. Global interest in environmental issues was the reason for the outcome of a thought of interactive buildings friendly with the environment called "sustainable dynamic buildings".*

Keywords: Architecture, Dynamic buildings, infrastructure, sustainability, sustainable dynamic buildings.

1. INTRODUCTION

Sustainability is now being considered essential in the design of building and urban environment. Its real aim is to build simpler buildings spaces or components along with avoiding work genera-tion and have multiplicity and replicability in design that will also give longer adaptability and workability for users. It is common to see that most of the contemporary buildings achieve comfort level through mechanical systems, use of technology with basic design approach will always help in making simple and economical design structures. The major focus in designing buildings is on making them sustainable by reducing energy consumption without compromising on user's comfort. Sustainable architecture is architecture that seeks to minim-ize the negative environmental impact of buildings by efficiency and moderation in the use of materials, energy, and development space and the ecosystem at large. Sustainable architecture uses a conscious approach to energy and ecological conservation in the design of the built environment to continue in future or next generation. The idea of sustainability, or ecolo-gical design, is to ensure that our use of presently available resources does not end up having detrimental effects to our collective well-being or making it impossible to obtain resources for other applications in the long run. One of the most important thing in temporary architecture is sustainable architecture [2][3]. In fact, sustainable in architecture is pervasive. We can say that sustainable architecture is the maximum use of nature talents and environment for users also minimize the adverse conditions of the construction. Actually, sustainable building is an building which has a least adverse effect on the natural environment during the life of the building. But it has to be understood that the architecture is based on human thinking and is for consumer comfort and sustainability in architecture is trying for the maximum of human comfort and least damage and create less pollution to the environment

2. OBJECTIVE OF THE WORK

1. Find a clear definition of dynamic buildings
2. Describing sustainability as a dynamic concept of design approach and discuss it through relevant examples
3. Role of renewable resources without neglecting the applications of modern technology.
4. Study of different models based on sustainable dynamic design and access to different ways to apply dynamic architecture.
5. Combine dynamic construction and sustainable architecture by achieving sustainability factors to achieve the standards that allow for the assessment of dynamic integration of projects that are still under design and implement-tation in the country.
6. Access to a comprehensive guide for the design criteria that help the future architect and the student to design a sustainable dynamic buildings for our nation.

3. DYNAMIC BUILDINGS

The Dynamic buildings are the one, which will be constantly in motion changing its shape. Italian experimental architecture company Dynamic Architecture [1] has proposed a revolving sustain-able

skyscraper for Dubai powered by wind turbines placed between each floor as shown in figure 1. Each floor rotates separately, meaning the building's profile will constantly change. This building will be able to generate electric energy for itself as well as for other buildings. Forty-eight wind turbines fitted between each rotating floors as well as the solar panels positioned on the roof of the building will produce energy from wind and the sunlight, with no risk of pollution.

Figure 1: Designing concept of dynamic tower

3.1 Examples of Dynamic Architecture

In the world there are some structures that change their configuration. Some floors in the top of landmark buildings rotate but this is done within the structure of the building, no movement can be seen from the exterior of the structure. This has been done mainly as tourist attractions in which rotating restaurants that have a 360 degree view of a city gather a lot of attention examples of these are the rotating restaurant in the top of the CN Tower in Canada (figure 2), or the one in the top cylinder of the World Trade Center Building in Mexico City(figure 3).

Figure 2: CN Tower in Toronto, Canada

Figure 3: WTC Mexico City

4. NEED OF SUSTAINABILITY IN INDIA

There are many environmental issues in India and depletion of natural resources and the pollution are the major challenges for the country. Construction involves activities like use of building materials from various sources, use of machineries, demolition of existing structures, use of green fields, cutting down of tress etc. which can impact environment in one or more ways. Civil engineering field being the major part of the Indian economy, it is very essential that sustainable construction practice dominate the past followed conventional practice and methods.

5. ROLE OF RENEWABLE RESOURCES

Energy is the golden thread that connects economic growth, increases social equity and an environment that allows the world to thrive. Development is not possible without energy and sustainable development is not possible without sustainable energy[5]. Environmental sustain-ability means that it doesn't do harm to the environment. That means that we need a positive energy balance to start with. Production of renewable energy costs more energy than it produces during its lifetime, it's not sustainable because we're a net consumer of energy. But there's a material side to it as well. Let's not close our eyes for what's happening: anything that's mined destroys complete ecosystems. When looking at sustainable electricity resources, we commonly identify four: solar, wind, hydro and biomass. Each of them is renewable, but that doesn't necessarily make them sustainable. Sustainability is determined by three different parameters: environmental sustainability, social sustainability and economic sustainability. What we can do, is use the full matrix of available renewable electricity technologies and use them in the most sustainable way. Just by using logic.

6. RELATIONSHIP OF DYNAMIC BUILDIN-GS WITH SUSTAINABILITY

Dynamic Architecture reveals three major innovations: changing shapes, industrial production of units and self-

production of clean energy. Dynamic Architecture buildings follow the sun and move to the wind, making modern architecture design more efficient and environment friendly. Dynamic Architecture buildings keep modifying their shape. The construction method and the ability to produce energy on its own are two of the most outstanding features of Dynamic Architecture buildings. These buildings are made of prefabricated units, custom-made in a workshop, to fit very high quality standards, resulting in fast construction, cost savings and fewer people on site. The main elements of sustainability are: use of renewable energy resources, the system must of energy efficient, user reliability and sustainable building material. The Italian architect David Fisher is building his first skyscraper, the ambitious construction plans since the Pyramid of Khufu. Every floor of the 80-story self-powered building rotates according to voice command, and nearly the entire structure of the $700 million building is pre-fabbed. The rotation takes up to 3 hours (so you're not always Dynamic Tower, and it happens to be one of the most spilling your coffee), and gets power from photovoltaic solar cells and 79 wind turbines, one located between each floor as shown in fugure 5. The system is meant to create enough energy to power to the entire tower and still have juice to spare for some surrounding buildings. According to Fisher[1], two of these $700 million futuristic scrapers are planned so far, one each in Dubai and Moscow. They will be built using a truly radical technique. Construction on the Dynamic Tower will be unlike anything that preceded it (figure 4).

Figure 4. Structural view of dynamic tower

The only part of the tower built on site will be the skinny center core. It is strong enough to hold the floors in place, and will contain the building's elevators, which transport people *and cars* right to their door. Each floor will be made piece by piece in a factory in Italy—a throwback to Fisher's previous life in prefabricated bathroom design—and placed onto the core using a lift system.

Figure 5: Concept of dynamic tower

With this method, each story is completed in about six days. By comparison, traditional ground-up methods can take six weeks per floor[3]. The speed of wind in Dubai is 16mt/sec. considering per year2300 hr of 16mt/sec of wind in Dubai, we expect to have 460000KwH of energy produced by one turbine in one year, as each family consumes 24000KwH per year, therefore one turbine should supply energy for 19 apartments. If we apply this idea in high storey buildings in India then the shortage of electricity in our country could be overcome and we can also supply it to the nearby rural areas where it is difficult to build a power station we can also supply this electricity to the nearby commercial area at low cost. Also the maintenance of these buildings is low.

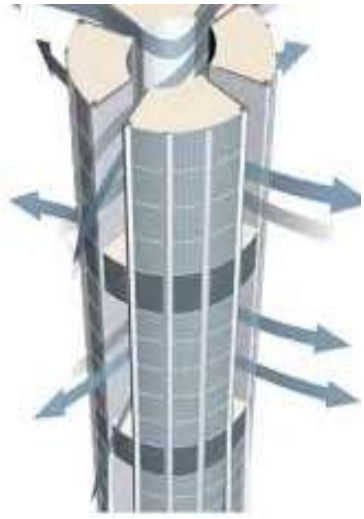

Figure 6. Wind turbine concept in dynamic tower

The use of carbon fibre wings will take care the acoustic issues. This energy will have a positive impact on the environment and economy. These building can be prove as a green power plant for our country. And its dynamic shape may finally help us to enjoy nature.

7. CONCLUSIONS

The advantage of future building technology (dynamic buildings) are broad and revealing:

Industrialization: enable more reliable quality control.

Fast construction:

At the height of the property boom, developers in India competed to outdo each other with increasingly grand designs. But no rivalry was as interesting as the race to build buildings that rotate, giving home owners 360-degree views of the world. No project, however, was to receive as much attention as the Rotating Tower. For an industry obsessed with views, it was the ultimate prize that would translate into large premiums and healthy profits. While builders in Brazil and the US had built smaller rotating buildings, three developers in Dubai announced buildings that would have put the UAE in the architectural vanguard, so in India we must also adopt this idea. But after the global financial crisis, these projects have come under pressure and it is unclear when, or if, Dubai will see one of these wonders. Many of the most ambitious architectural projects in Dubai have been scaled back or slowed down but we can also grow with this concept at low levels, we can built low storey buildings with this idea in our country to compete not with in the country but also in the market at world level.

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