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High- Rise Buildings – Needs & Impacts

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ABSTRACT

High-rise Buildings are product of our time and temporary solutions for the problems they create. In recent years, developed countries have emerged as centres for new high-rise buildings. Land is scarce and expensive particularly in big cities like Japan , where tall buildings represents the best solution for solving the problem , as a product of need , while in Egypt the situation differs, only 4 % of Egypt terrain, where nearly the entire population has chosen to live, where tall buildings used as a tool to achieve high density development.

The paper aims at clarifying the needs and impacts of high-rise buildings and the criteria for using them as an efficient urban development tool, calling on the government to issue more stringent planning guide lines to local authorities to control the ad hoc building of tall buildings to provide successful integration into their urban context.

Keywords: High-rise – Development- Context.

1. INTRODUCTION

Architecture is a discipline, a profession and a state of mind, which must conveniently serve the purpose for which it was built. The role of architecture is to satisfy the physical, social, and aesthetic needs of society, where architects play a crucial role in effecting change responsible for the social and environmental imports of their professional activities. Since ancient times it has been believed that architecture carries discernible meanings which are consciously or unconsciously built into them by their designers ,and as Richard Rogers mentioned "The twentieth century is a period dominated by innovation and the spirit of science it has had revolutionizing effects on all fields of man's endeavours-art, economics

and politics". Through the unprecedented scale of scientific change, the world is becoming an artefact, an industrial village. The need for growth and increased density in urban centres persists and has been growing exponentially. Everywhere, people are moving from villages to cities, and with rapid population growth, land is scarce and expensive, particularly in big cities, leaving developers and builders nowhere to go but up, where tall buildings beginning to dot the sky, and their resulting consequences, are products of our time and solutions for problems they create.

The 20th-century city was largely the unselfconscious result of the competition between individuals and groups of people striving to maximize their own benefits as they perceive them, but there has also been much cooperative action to shape the public realm.

There is also a competition between individuals and architects designer's specific buildings for particular clients and needing to display their own dexterities in order to capture a market for their services (Kurata, 2001). In the past the natural world was the guiding design principle all over the Arab countries. Examples survive of comfortable living environments answering human, social, cultural and climatic needs. Decorative and design features were concerned with privacy, security and temperature control. Now the world is witnessing great changes that have affected aspects of life, economically, technologically, socially and culturally, these changes are normally referred to as construction for development, a new phenomenon gradually encroaching on all countries, including Egypt.

2. HIGH-RISE BUILDINGS

What is a High-rise building? A High-rise building is essentially a building with a small footprint, small roof area, and very tall facades. And what differentiates it from the conventional low rise and medium rise buildings is that it needs special engineering systems due to its height (Scott, 1998)...Later, a better definition was coined: "A high-rise is any structure where the height can have a significant impact on evacuation."

As the inevitable result of growing population and intensifying urbanization, high-rise residential towers have become more prevalent in many cities, replacing vast areas of vernacular houses. During the building of these towers, the housing process has been radically, thinking about the long history of human dwelling. Today, the building of large numbers of dwellings in high-rise residential towers is controlled by a few parties (architects and developers), which is a dramatic change from tradition.

Essentially, the early High-rise building was an economic phenomenon in which business was the engine that drove innovation. Design was tied to the business equation, and style was secondary to the primary factors of investment and use. The priorities of the men who put

these buildings were economy, efficiency, size and speed (Huxtable, A. and Ada, L., 1992).

The reasons for adopting high-rise buildings could be solutions for density problems and lack of available land for development, sometimes tall buildings more about power, prestige status, where they play an important role in meeting occupier demand for large prestigious headquarters, and aesthetics than efficient development.

A historic race to the sky and the marking of a city resulting in a battle between tradition and modernity affects the form of the city, as well as the culture and political landscape (Sorkin, M.,2001).The high-rise buildings have now replaced grand mosque minarets as one of the typical phenomenon of high-intensity development.

A new era is dawning for High-Rise Buildings, the destruction of the World Trade Centre's 110-story twin towers on Sept.11, 2001, sent a chilling message to the world. Since that time, a battle has been ranging in engineering code making, fire protection and political circles over whether tall buildings are safe, and the role of public officials in the process, moving towards an increasingly significant technical sophistication.

3. NEEDS & CONSEQUENCES

Tall buildings are built out of necessity as one of a wide range of tools to achieve high density development. They provide the opportunity to control urban sprawl with their relatively small foot print. Identifying what unique characteristics a tall building brings could be represented in the need for a particular built form- the concentration of activity-the proximity to important facilities for large numbers of people which is more than "image" and being a more sustainable form of development .Some appear to be opposed to tall buildings wherever they are located or whatever they look like .The positive and negative influences through development by high-rise towers and tall building could be evaluated within certain factors including (Social –Environmental –Economics-Emotional-Safety (Fire-Earthquakes).

Tall buildings have been blamed for crime, mental breakdowns, the generation of urban pathologies-they deform the quality, the function, by overloading the infrastructure and the public realm of the streets that contain them .Criticizing the building of High-rise building as being about power prestige than efficient development, some critics say super-tall buildings are too hard and expensive to build. Addressing the kind of risks that a tall structure is likely to encounter in its, life time, risks of safety problems are usually associated with unknown disasters like for example blocking fire escape (NFPA, 2006).

High-rise buildings bring impacts at strategic and local levels. The huge people load of a high building, particularly at peak times, may overload the cities infrastructure-its public transport, roads and utilities. The size of a building has important direct influences on our emotional

response. More and more planners are being asked to consider streetscape in addressing a community's quality of life; streetscapes play a central role in place making and providing spaces for social interaction. Understanding their proper design and the impact of that design is essential in planning healthy and vibrant communities. (Bekkering, H., et al, 1997).

Shadow restrictions are designed to limit the height of buildings so as to ensure sufficient sunlight in the city. Buildings that reach new heights pose numerous engineering and technological problems relating to such issues as building a sufficiently strong foundation, ventilation, heating, cooling, lighting, transportation (elevators, stairs, parking), communication, electrical power, plumbing, wind resistance, structural integrity, fire protection and building security (Glaeser, L. and Jesse, S. 2001). There also is a host of public issues connected with the increases in employment density brought about by tall structures, such as transportation congestion and environmental concerns (Sukkoo, K. 2002).

There is rising concern for the safety from fires, and in order to develop appropriate plans for combating high-rise incidents, there needs to be an understanding of the whole process. Basic concept behind fire safety measures: The standards relating to fire safety in buildings broadly consist of two major parts, namely, those relating to fire protection and those relating to fire evacuation. England has such a requirement supported by a British Standard (BS 5588 Part 5) requiring fire-fighter lifts in buildings exceeding 18m (60 ft) in height. Fire-fighter lifts are also provided in the Petronas Towers, one of the world's tallest buildings in Kuala Lumpur, Malaysia. Fire fighter lifts, required in tall buildings, are being discussed to improve both the safety and efficiency of fire fighting operations.

4. URBAN CONTEXT & SUSTAINABILITY

The urban fabric of a city is a reflection of the events that took place, growth, transition and change, where buildings conveys messages about the way in which they were put together in the architectural sense. A key design policy consideration is that development should respond appropriately to its context, but that context should be defined to include the visual, social, functional and environmental dimensions. Architecture is concerned with culture, society and economics as well as the surrounding environment. The interaction of all these aspects is vital in defining the characteristics of a place. The built environment of a city is thus a product of its socio cultural and political context, which in turn impacts both architecture and planning disciplines. Tall buildings can be equally appropriate grouped in clusters or located alone. The suitability of a particular site for a tall building development will, however, depend on site specific circumstances and the proposal in question.

The approach to the design of tall buildings has changed rapidly; nowadays the building design has become an integral part of a complex process. In many American and Canadian cities, almost arctic conditions have been created by thoughtless placement and detailing of tall buildings. In *Sun, Wind and Comfort*, Peter Bosselmann, apart from pointing to the undesirable shadow effect, gives examples of climate deterioration due to wind around free-standing high-rise buildings, among them the channel effect, the corner effect and the gap effect. William H. Whyte, writing about conditions in New York, points to the consequences by mentioning that "It is now well established that very tall free-standing towers can generate tremendous drafts down their sides.

Problems were results of the dark caverns by shadows of tall buildings: depressed workers due to lack of sun, an increase in, winter diseases "congestion" in the streets, and the possibility of fires. Tall buildings always cast shadows, and change the patterns of air movements around them, affecting their cleansing qualities.

Many major cities, requires every proposal for a new High-rise building to include a "Sunlight Access and Shadow Impact Study". The study guidelines state that new buildings should not cast significant shadows on public parks, plazas, waterways, beaches or playgrounds. Each building is evaluated on its shape, height and orientation, focusing on environmental factors, by creating better relationships and harmony between buildings and their urban and environmental contexts.

Despite differences in definitions, perspectives and priorities, sustainability remains a critical challenge, sustainability and the aim that development should constitute an environmental benefit, is a new objective, concerning drawing "design" into issues of landscape quality, ecological, soundness, environmental capacity, pollution control and public transport viability (Punter, J. and Carmona, M. 1997). Sustainability is about improving the quality of human life while living within the supporting ecosystems. Sustainable design, dealing with efficient use of energy, while utilizing the latest smart construction techniques, is now an essential ingredient of any development. Construction as a whole uses more of the world's energy and material resources than any other activity, from the perspective of environmental sustainability, the discussion of indoor environment quality must be among the most important topics to be addressed. John Gummer, environmentalist and former British Secretary of state for the Environment emphasized that "buildings of low quality cannot provide the ingredients of sustainability". In addition to technology other mechanisms need to be found to use energy efficiently (Ellis, C.1998).

Ecological sustainability could be classified into three basic sets of strategies. The first strategy is one we call design for efficient operations costs. That means efficient energy, materials, efficiency by design configuration by passive means with low environmental impact. Second level is design for efficient fire costs. That means the energy equipment and assembly that gives you efficient first costs with low environmental

impact. And eventually if we have sufficient data to do this, we should design for efficient end cost and end use.

If you are working in different climatic zones, then you have the hot seasons and the cold seasons to deal with, and you have the two mid-seasons. So you have to design the enclosure, the skin as a responsive environmental filter for energy efficiency.

5. DEVELOPING COUNTRIES-EGYPT

In most of the developing countries, the planning policy has been concentrating on the development of capital cities. Desert regions are given little attention. Capitals are suffering from the overloaded density of population, transportation, lack of housing for those creeping over the city looking for job opportunities and better services. On the other hand, desert communities do not practice the part they should play in the national development scale. Egypt's terrain is largely composed of desert, which constitutes approximately 96% of the total area. The remaining 4% make up the Nile river valley and delta where nearly the entire population has chosen to live. Egypt pressing urban problems prompted concerned state officials to consider new comprehensive strategies for the urban development by establishing new communities. Egypt's major centres have experienced huge population increases, the situation resulted in a number of problems, the most important being the high density. A rise number of high density buildings in Cairo increased pressure on an already congested transport system.

The current character of the city with its phalanx of high-rises straining for a view of the river is the hypertrophied result, the familiar Chicago and syndrome. The completion of the Aswan dam in 1902 stabilized the banks of the Nile, allowing development close to the river on land that had previously been a flood plain. Today high-rises hug the water .One conspicuous distortion is the insane valuation of prime riverfront sites, which fetch prices at the Tokyo or New York standard. Cairo is busy blowing a speculative real-estate of great and frightening dimension. Indeed, one of the abiding fascinations is its extremely successful import of global models of urban development and the integration of these foreign prototypes into the city against staggering demographic and economics odds (Sorkin, M., 2001).The dark side of the equation is the way in which cutting and pasting' has been used in the Arab world imposing Western building types without considering their impact on the context.



Figure 6.1 High-rise example from Egypt

Comparison between countries like Japan in which the land suitable for development is limited and very expensive, and Egypt in which the land is available and development is also through implementing high-rise buildings in spite of the relative cheap land availability, shows the contradiction in the needs and opportunities represented in the land availability, and the similarity in solving the development problems.

6. DEVELOPED COUNTRIES-JAPAN

Japan is an island nation off the East Coast of Asia, comprising four major islands, mountain ranges distributed in the central parts of the islands, Limit arable land to only $\frac{1}{4}$ of the entire land area of Japan. As the country becomes progressively urbanized, the geographical limitation to urban growth has become a serious issue in Japan (Basic Information About Japanese Cities, 1996). The total area of Japan is about 377,780 km². Of this, 376,250 km² is land, most of which is mountainous; much of Japan consists of high mountains with narrow valleys in between. As a result, population density on habitable land area in Japan is extremely high compared to Egypt. Only 4% of the land is occupied by houses, factories, offices buildings, stores and other facilities.

Although it is a small country by land area, Japan has a very high population; this makes Japan one of the most densely populated countries in the world on average. But since much of the land is not flat enough for houses and roads, same areas are actually even denser (Views of Japan, 2000). Since the late 1970s, architecture in Japan has been influenced increasingly by information and media technologies (Harvard Design, 2000). As Vittorio Gregotti mentioned, "Japan is probably still the world's most productive nation of formidable economic power with an outstanding capacity for work organization, investment, and research, combined with a sense of accuracy and precision in manufacturing (Gregotti, V., 1994).

As Arata Isozaki mentioned, Japan has tremendous wealth, technological powers, extensive investment great research capabilities, highly skilled and dedicated workers and a tremendous need and appetite

for construction market, accounting for more than 20% of the country's GNP and employing about 10 % of its labour force (Kurata, 2001). No wonder, then, that entire cities particularly Tokyo, seem constantly to be under construction, urban skylines are crowded with forests of cranes and rising structures. Land is a scarce resource and particularly restricted in central city areas. This necessitates greater density of development often leading to demand for tall buildings (Harvard Design, 2000).

Land prices and the myth of land are so clear; the continuous increase in land prices affected the development of physical infrastructure, selecting advantages locations in city centres, and the transaction of residential units. Because land is scarce, especially in cities, houses are often expensive and fairly small. In Japan land is scarce and notoriously expensive; in Tokyo land prices are skyrocketing. To cope with the inner-city problems, it promotes high utilization of land.



Figure 8, 1 High-rise example from Japan

7. CONCLUSION

From the previous demonstration of the case studies from developed and developing countries, we should admit that high-rise building is a phenomenon encroaching all over the world.

In case of Egypt desert land is available and new communities are acting as new growth poles in solving the high density problems. Importing models of urban development and their integration into the city, without considering their impact should be taken into consideration. These foreign prototypes contribute negatively in solving urban problems.

While in Japan the case differs, the land is a scarce resource and the need for growth and increased density, leaving developers nowhere to go but up, and the high-rise prototype is the only solution to cope with the high population density and the scarcity of land suitable for construction, where these prototypes are solutions for density developments and land scarcity.

We will never stop building tall buildings; it makes sense both economically and functionally. Demands for housing have resulted in rapidly built tower blocks, providing maximum profits per unit area, which in turn makes the building more desirable and therefore more valuable, to their cities, so now our responsibilities and burdens are increasing.

Simplified, the cost of land creates an effect that raises the per-floor cost of a building of a given height and creates the incentive to build taller buildings to spread the land cost over a larger number of floors. Lower rates of interest also reduce the cost of capital which facilitates the desire to build taller. Higher land cost leads to taller buildings.

Since September 11, 2001, building codes, architectural and industrial design parameters and educational courses are changing and being developed internationally focusing on human safety, prevention of disasters, anti-terrorist attacks, and biometric warfare (Nichols, P. 2000). The tall building is a fundamental component of dealing with density, and it will continue to be -"William Pedersen, FAIA Partner, and Kohn Pedersen Fox ". Unquestionably there will be a (short-term) stop [in plans for tall buildings]. This is inevitable. [But] the desire to build very high and slender buildings is so ingrained in the way we are. Tall buildings will be built with great care and consideration. Cesar Pelli, FAIA. (Punter, J. and Carmona, M. 1997). And so like it or not, the high rise isn't going to go away. It's going to be with us, and somebody's got to do it; and do it well which is an important challenge for both current and future generations.

8. RECOMMENDATIONS

High-rise buildings are sometimes solutions for urban problems, but if we have to do them we should agree that we are facing a great challenge to minimize the risks due to the impacts and consequences of design if not well taken into consideration. Each country should select the best method for development (construction relevant to the region), not just importing new techniques, in order to produce architecture suitable for the place and circumstances it will be built in.

There are some recommendations, which, if taken to their fullest extent, could have substantial ramifications for tall-building design.

An adequate knowledge of physical problems and technologies and the function of buildings so as to provide them with comfort and protection against the climate. A measure of the quality of a building must include its interplay with its context, and must also encompass urban and environmental concerns. An extensive planning and environmental policy framework to ensure that the visual impact of a tall building is thoroughly assessed as part of the planning decision making process. For a large building to integrate well with its environment, its form needs to be responsive to the natural, urban, economic, and political forces that affect

this environment. The reciprocity that exists between building and their contexts must be respected in the design process.

Sustainability should set a context for all design policies at all scales, so that tall buildings can be related to the skyline and to wider planning concerns of infrastructure and land use so that high-rise buildings should be made very responsive to its environment.

Development plans and guidance for particular areas or sites should provide applicants with clear indications of planning authorities design expectations. Such advice should avoid excessive prescription and detail and should concentrate on broad matters of scale, density, height, massing, layout, landscape and access. In the planning context we need new proactive planning frameworks, which define much more strongly the rules of the game, and clearly set out administrative responsibility.

Finally, the research recommends calling on the government to issue planning guidance for local authorities considering applications for high-rise schemes to avoid the ad hoc development of poorly planned buildings.

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