

## High-Rise Buildings Aspects and Significant Impacts in Urban Areas

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### ABSTRACT

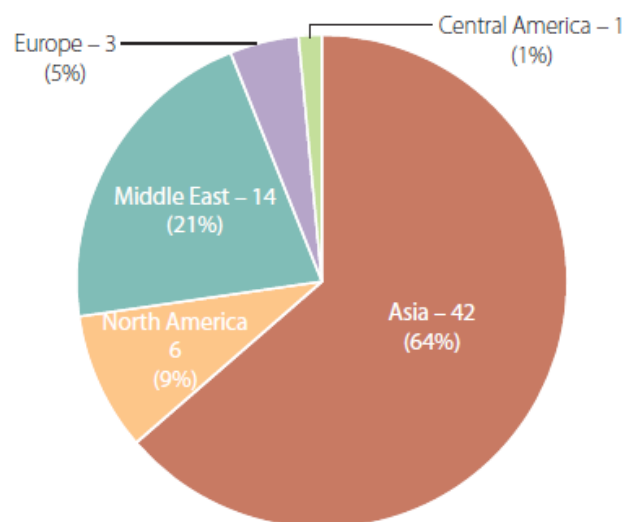
Planning and design urban area with its specialty has significant improvement role in the history of architecture. Many factors and rules are considered in this design and improvement such as environment, culture and region. Nowadays, technology and its process also have the role in architecture and urban planning. Tall buildings with this height that seen today is one of the outcomes of technology impacts. It is measured as one of the trends that drive tall buildings to develop. There is no debate that urban area having a skyscraper is not like those areas that majority of the buildings are in low rise buildings. In the research, those impacts of the tall buildings in urban areas are explained. The paper starts with the history and background of tall buildings then showing the ration of them around the world. After that, number of aspects had shown that related to the existing tall buildings in the urban. Those aspects are conclude in number of points such as environment, views and culture that explained by the number of figures. Finally, a conclusion summed up main points in this research.

**Keywords:** tall building, urban, suburban, context, development, solar gain, and society.

### I. INTRODUCTION

Using tall and tallest buildings go back to the very early civilization. In ancient Egypt, this word used to describe their pyramids that related to about 2700 before Christ. After that used for showing the height of the churches, castles and cathedrals. Fore example, cathedra of Lincoln was

the tallest cathedra for more than 200 years (WcP. Story. Teller, 2008). Tall for buildings as a tall building Historically goes back to 19 century in Chicago then moved across The New York after that separated around the world (H. Hayati, M.H. Sayadi, 2012). In the last three decades, it is improved very quickly (Figure 1).



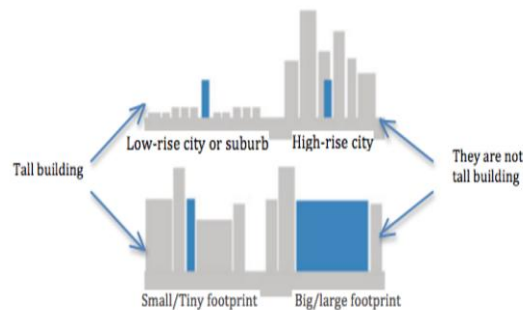
**Figure (1):** ratio of tall buildings in the world with 200m height or more that completed in 2010. Source: Aminmansour, A. (2013).

Tall buildings are a phenomenon of the city now and dose not going individually with out effecting on the urban planning. Studying and researching tall towers usually come beside the urban context. In another word when measuring the high of tall building should be look at the surrounding context. Then it can be decided are

they high raise building or skyscraper. Tall buildings or sky scrapers is not simply about the high. There are a number sides should calculate. The Council on Tall Buildings and Urban Habitat (CTBUH) defined the number of aspects that should look at them while calculating the tall of buildings. These aspects are proportions,

technologies and urban contexts. As clear that one of the aspects relate to the urban context. It means that the urban and tall building have the strong connect between them and there is not separate between them. Each of them has affects on others. To illustrate, any towers with fourteen stories in

Shanghai or any other cities that known as a high rise city can not be measure as a tall building or skyscraper. It will be the high-rise building. On the other hand, the same tower with the same tall can be known as a tall building in many of the cities in Europe (Figure 2).



**Figure (2):** relation between tall buildings and urban context. Analysed by authors.  
Source: [online]. Available at:

<http://www.ctbuh.org/HighRiseInfo/TallestDatabase/Criteria/tabid/446/language/en-GB/Default.aspx/>  
[Accessed 23 August 2016].

Now a day, skyline is one of the issues that the cities recognized by and a symbole for modern life which can be seen the growth of tall buildings very quickly. (Pandya, S. V., and Brotas, L., 2014). . It is clear that there are number of factors tall building drivers as population, land price, global icon and sustainability (CTBUH, 2008). Having the tall buildings is not just solve those problems that have been mentioned above, impacts on the urban context on the other hand such as environments. Which create many problems such as sun light- shade and shadow- environmental pollution and fresh air (H. Hayati, M.H. Sayadi, 2012). The effects of tall buildings in high-rise surrounding context are different from the low rising urban. Design tall buildings are not easy and not simply about the height and floor above the other floor, it is complex in architecture, structure and environment.

**There are a number of issues arose because of the tall buildings:**

• **Air pollution:**

There are many sources of the air pollution in the city such as cars that produce CO. With increasing the height the density of the CO will be increasing. If there is a tower, this increasing can be happening till around 6-9 floors after that this increasing will be decrease irregularly (H. Hayati, M.H. Sayadi, 2012). As known that, the wind load increase with increasing the height (Fad, M., S. and Karadelis, J., 2013). So, if the tower has a wind flow from above to down, the CO will be

separate around and make the volume of the pollution bigger.

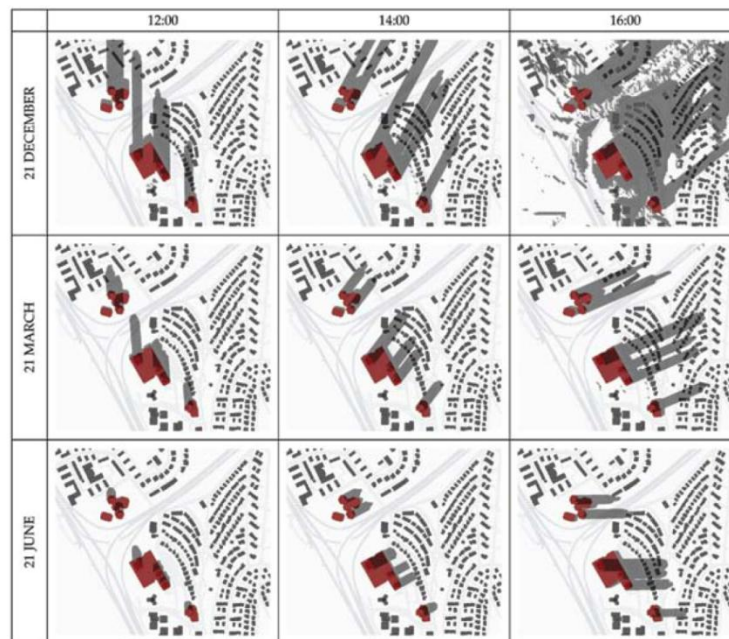
• **Sunshine**

Skyscraper can get a sun solar easily especially the upper floors because its height. What about the impacts of the building on the surroundings area, making shadow and avoiding getting sun solar directly from the sun are the appear points that many researchers conecer about it (H. Hayati, M.H. Sayadi, 2012). The affects of this shadow and shading are change in different climate and block the sun with change the access, sun light and solar sun (Sakinç, E. and Sözen, M. Ş., 2012)..For instance, in hot climate zone, shading the many urban space in long period time is good and helpful for daily activity. On the other hand in designing the Passivhous buildings in cold climate, it will be avoid solar gain for the buildings especially low raise buildings around the tall buildings. Also it has impacts on vegetation and green area. In agriculture, having the over shading area, it is not easy and not suitable for planting many of vegetation.as known that direct sun is very important for growing plants and green architecture. Green area and plants inside the urban is vital important case for social activities (Sakinç, E. and Sözen, M. Ş., 2012). As clear that this shading go back to a number of factors as (figure 3): (Sakinç, E. and Sözen, M. Ş. (2012)

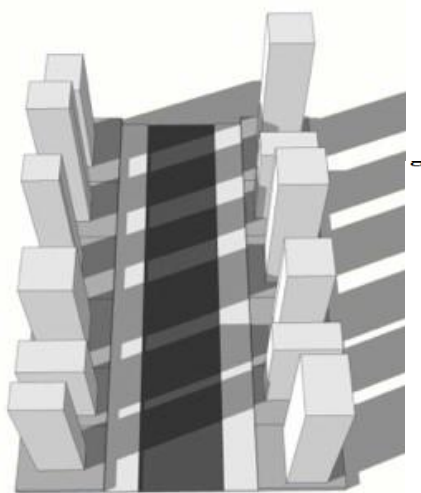
- Differences in height of buildings (sky line)
- Tall buildings direction and location according to surrounding neighborhoods( with sun path and time)

- Mass and form (geometry)
  - Urban space between the buildings (distance)
- There are many experiments and case study have done for showing the case. The diagram figure

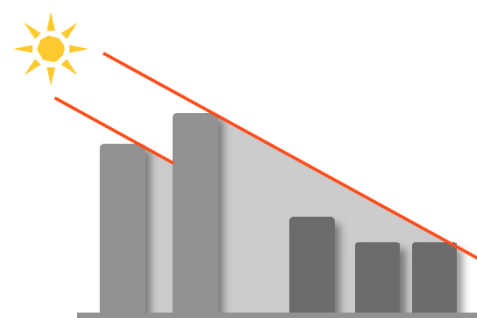
shows the model analysis of İSTANBUL LEVENT REGION in different time and date and natural lighting.



A.istanbullevent region shadow diagram in



B. Urban Geometry.



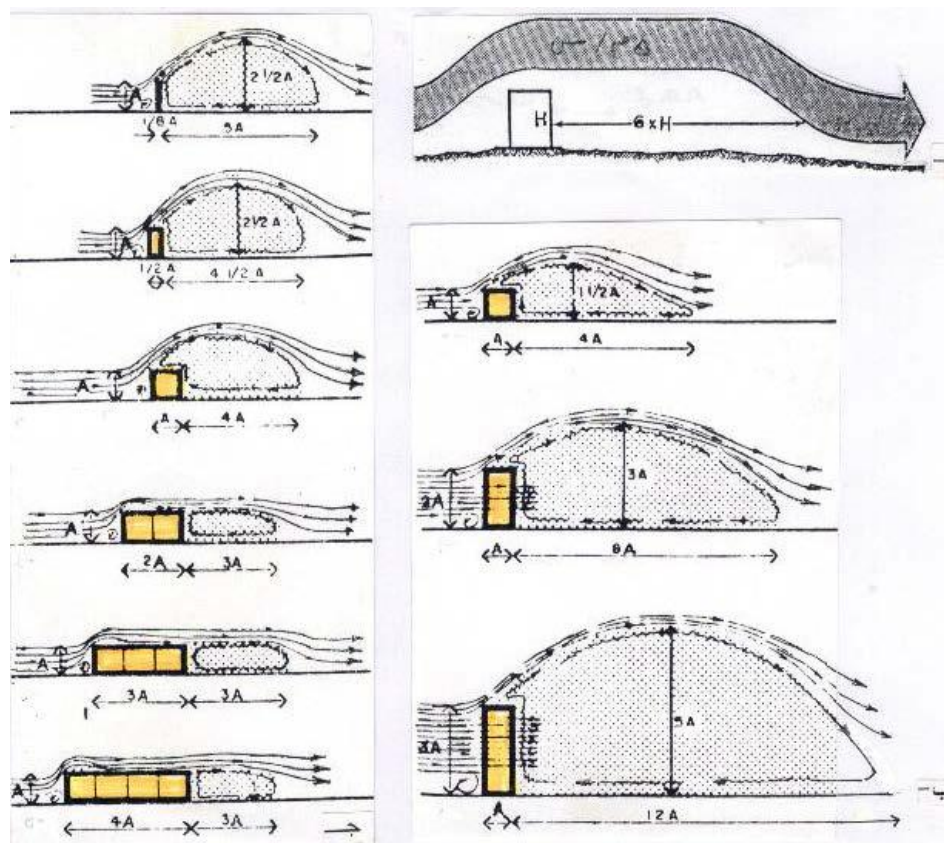
C. Orientation and overshadowing

**Figure (3):** Source: (Pandya, S. V., and Brotas, L., 2014).

- **Wind flow**

For the Wind flow, as the sunshine there are two different sides. The tall building can create the wind flow past the urban buildings or can avoid the airflow inside the urban planning. If the buildings are not near to each other, these impacts will be minimizing to very low level. Tall buildings can change the direction of the wind in urban planning (H. Hayati, M.H. Sayadi, 2012). On the

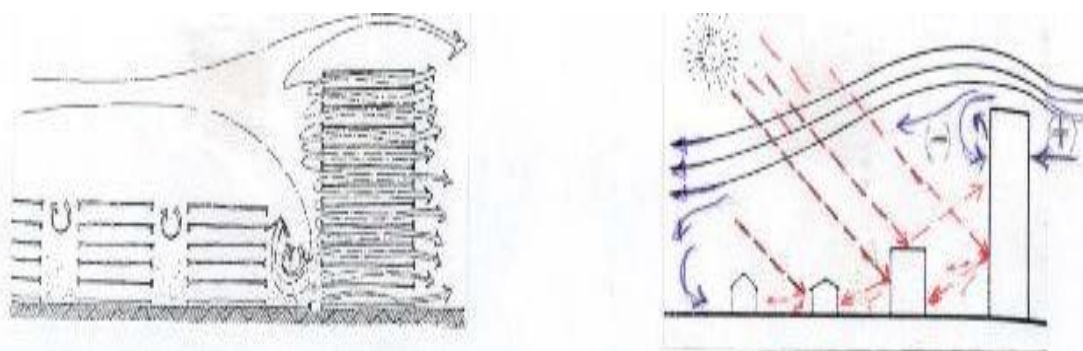
other hand, if there is quite high density with similar building height, the ventilation will be better (A.A. Aldeberky). For air shadow, tall buildings in urban planning increase the air shadow. This shadow increases with increasing height of buildings. About the depth of the buildings not very effect ablebuilding till more than four times of building height (figure 4 )(A.A. Aldeberky)



**Figure (4):** relation between wind shadow with building height and their depth.  
 Source: (Sleeper 1981).

In the (figure 5) it can be seen that the high rise buildings have a great impact on the their physical boundaries. There is a relation between the height and shadow distance that is greater than the building height about four times. To illustrate that, if the building has 20m elevations, the distance shadow will be 80m length. For the height of the shadow, it will be about one and half of the

building height. In another word, for the same building with 20m heights, the shadow elevation will be about 30 m. This wind shadow dose not change two much with change the building depth except for those depth that more than four times of the height of the buildings. For all cases the air velocity is a vital point for increasing and decreasing the shadow.



**A.** High-rise building enhances vortex and pollution around it  
**B.** High-rise building prevent wind and reflect solar radiation on low-rise buildings

**Figure (5):** Sources: (Givoni 1998).

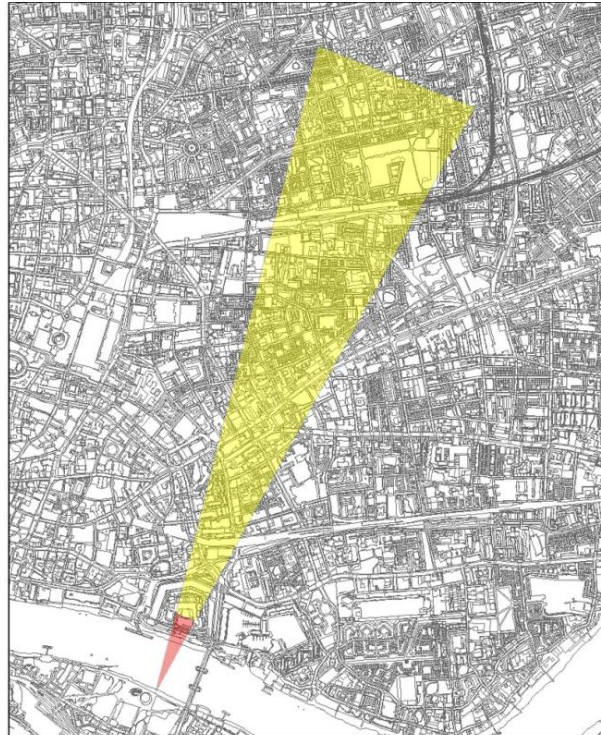
Plant vertical green area and roofs can solve the problem of air pollution. This green area also helpful for the building itself what help the

building to create the produce clean and fresh air and decrease the temperature in the hot climate zone.

- **Views:**

About the view, high-rise buildings, not like the low-rise, do block the view and visuals from other location of the city because their height. In many cities as London there is some

rules for avoiding block views. Protected view is an important issue in urban planning especially if there is a grate global icon or historical landmark in the city and existing high raise buildings (Figure 6).



**Figure (6):**Example of protecting view of London

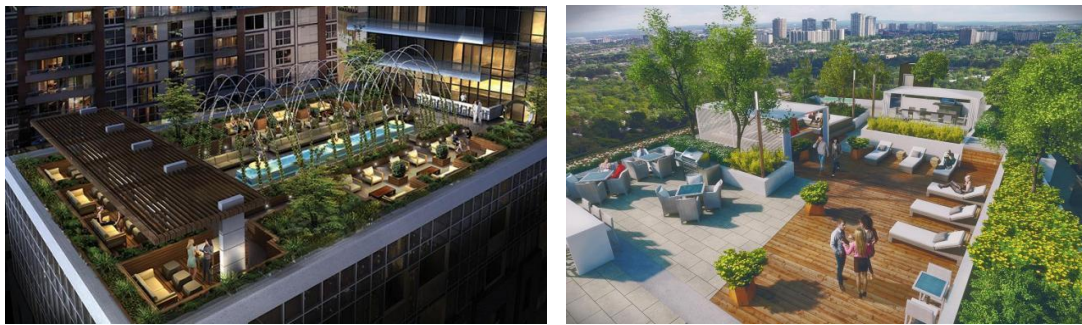
Source:[online]. Available at: <http://blog.findmaps.co.uk/2010/07/boris-new-protected-views-for-central.html>.  
[Accessed 22 August 2016].

## II. CULTURE AND SOCIETY

“Society and culture play a key role in accepting or rejecting tall building development. In societies where living in a high-rise is the norm, local culture will have no problem with adding new tall buildings” (Ali & Al-Kodmany, 2012). Many researchers illustrate that living in apartments has a socio-psychological impacts. Whilst, high-rise housing might be desirable for those were born there, single people, couples, and for those who wants to adjust with the new lifestyle. In contrast, it is undesirable for those from traditional societies were habited to live in low-rise buildings as (Ali & Al-Kodmany, 2012) stated that “Some sociologists argue that the environment of tall buildings can make inhabitants feel claustrophobic by creating a rat-cage mentality.” In addition (Doxiadis, 1966)summed up that “High-rise buildings work against man himself, because they isolate him from others, and this isolation is an important factor in the rising crime rate. Children suffer even more because they lose their direct contact with nature, and with other children. High-rise buildings work against society because they prevent the units of

social importance—the family, the neighborhood, etc., from functioning as naturally and as normally as before.”

In controversial, some scholars stated that the high-rise buildings become an important factor to make a social interaction, right treatment with the outdoor spaces design in details and elements of high-rise buildings will bring sympathetic living environments (Huang, 2006). Accordingly, “well-planned outdoor spaces of high-rise complexes can become effective activity nodes that facilitate residents’ daily informal contacts” (Bechtel, 1977). In addition, the rooftops design of high-rise complexes (figures 7) to attract a mix of people from different ages. They all will integrate and share the same area which enhances the social communication. The activities where not limited to the rooftops they contributes to enhance social communication between the residents of the block as they are all out in the open together, as well as to be used as a sitting area,. It also promotes a healthy lifestyle as it encourages residents to engage in some sort of fancy farming, even if it is not with the intention of growing their own vegetables.



A. Rooftop amenity area at King Blue, image courtesy of Condos, image courtesy of Chestnut Hill Homes  
Source: (Landau, 2014)

B. Rendering of outdoor rooftop amenity area at Lotus Easton's Group  
Source: (Landau, 2015)

Figures (7)

### III. CONCLUSION

The sudden growth of high-rise buildings in urban areas resulted in the rapid growth of population in cities, which demands more plots to habit there and the plots become more expensive with lots requirement. That is why the high-rise complex is the best solution for this context. "High-rise building has become a more common phenomenon, especially in metropolitan regions. The spatial pattern of high-rise buildings has significant implications for the function and the urban morphology of a city's built-up area." (Huang, 2006). The negative impact of high-rise buildings out-weighted of positive impact, the social relationship in high-rise buildings is more impersonal. High-rise buildings will make more crimes and fears in under-ground floors, as (Adedoyin, 2013) stated that "crime and fear of crime are greater, and that they may independently account for some suicides. Thus, skyscrapers destroy some form of social, public life". In general, (gregoletto& da luz reis, 1995) there are many alteration which is occurred by the high-rise buildings in urban areas such as decreasing landscape, excess in the urban infrastructure, amplified the density of population, traffic density and modification of the local microclimate, which displays that the impacts consider by users of the urban areas be likely to occur simultaneously with those mentioned in other studies (eg. gonçaves, 2010; scussel; sattler, 2010).

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