

Study of Physical-Spatial Effects of High-Rise Building

Mohammad Rahim Rahnama, Mohammad Hossein, Heravi Torbati,

(Case Study: Sajad Blvd. and N.-S. Janbaz Blvd. Trading Corridors, Mashhad)

Associate Professor, Geography and Urban Planning Department, Ferdowsi University of Mashhad

Student of Ph.D. in Geography and Urban Planning, Ferdowsi University of Mashhad

Abstract: - The process of high rise building in Mashhad has been considerably increased during the last years. Despite of solving the problem of shortage of land and housing, this caused many problems in different environmental, physical-spatial, functional, social, and demographic aspects. In fact, loading of land-use intensity (plot ratio) affects different aspects of urban environment. In the present study, the aim is to discuss plot ratio and high rise building policies in Mashhad, and its physical-spatial effects. This study is conducted on Sajad Blvd. and North-South Janbaz Blvd. trading corridors, as a sample of tall buildings erected on the trading corridor in Mashhad, in which the growth of high rise building during the recent years in these two corridors has been strictly increased. Then, it analyzes plot ratio indices through documentary and library studies and field approach. Finally, SWOT method is used in order to evaluate advantages and disadvantages of high rise building in both corridors. The results from the studies conducted show that current plot ratio and high rise building policies, in terms of physical-spatial effects, have caused damages to access network and aesthetics, and only has a considerable financial contribution economically.

Keywords: -Plot ratio, High Rise Building, Physical-Spatial System, Sajad and N.-S. Janbaz Trading Corridor.

I. INTRODUCTION

Today, most of the cities in the world, especially metropolises, encounter the phenomenon of high rise building. The idea of high rise building was first developed in order to use the estates of the downtown, following paying attention to the city economy, because, on one hand, tendency to plot ratio and concentration of firms, had increased the demand for land in the downtown and, on the other hand, land supply was limited at this area of the city. As a result, increase in land-use intensity (plot ratio) was provided as a solution for increasing built area under use. In fact, the phenomenon of high rise building was a response to living and activity in cities with high rise building, and today in most of the world cities, high rise buildings are an integral part of urban life.

Erecting tall buildings in the modern way stated first in American metropolises and then in the Europe. After some decades, it emerged in developing countries as well. In Iran also, it is nearly half a century that we witness the presence of tall buildings. In fact, in addition to the human's responding to shortage of space, mentioned first, this phenomenon is a tool by which states are able to boast about their economic powers. However, towers began to take on residential role in addition to trading one, so that in the next decades, residential towers have had a more percentage of trading-office towers.

There are three viewpoints on the issue of high rise building; the advocates know tall building construction as a type of realism, and always emphasize its advantages. Indeed, they consider tall building construction as a response against shortage of urban lands, control of urban development, need for housing, and the available demand. On the contrary, the opponents of tall building construction believe that construction of such buildings reduces quality of urban life, and causes disadvantages for living in cities through trampling on the values and traditions. But, the third viewpoint on this issue is a middle position. The owners of this viewpoint accept high rise building under certain conditions (adapted from Golabchi, 2010).

Although construction of tall buildings in Iran is not the result of functional, cultural, social and even developmental need, and this has been in imitation of the world's metropolises, today, given certain conditions and the existing needs in some cities, one witnesses increasing extension of high rise buildings. This

phenomenon is extended in the western countries as more quickly as possible; but, in the West, while using high rise buildings, certain regulations and standards are applied, causing less negative effects. In Iran, however, in spite of responding to high demand for housing and, due to violating the necessary regulations and rules in the performance of high rise building phenomenon, this causes important problems in urban spaces. The fact is that the phenomenon of high rise building is not problematic, in itself, as we see in the western countries, there are less problems than Iran, in spite of more extension of this phenomenon over there. These problems in Iran are caused by the weakness of regulations (Azizi, 1999).

II. STATEMENT OF THE PROBLEM

Following physical extension of cities and the subsequent problems, addressing the phenomenon of plot ratio is high on the agenda of urban planning, as the most important solution of the problems of urban development. Here, plot ratio control is considered as an effective device for controlling the problems due to urban developments. Generally, the goals of plot ratio control can include establishing a logical balance between the activity produced by buildings and the surrounding spaces outside, as well as creating an environment with better quality. Increased plot ratio or vertical urban development in the recent years has become one of the most important strategies and urban plannings. However, this phenomenon, with several advantages, will have negative effects on qualitative indices of urban environment, in case of weak planning. Today, the indiscriminate and unplanned process of high rise building in Mashhad, has resulted in excess consequences and effects on different aspects of the urban environments. The aim of the present study is to identify physical-spatial aspects and components of urban environments influenced by high rise building. By identifying negative effects and examining positive effects of high rise building in terms of physical-spatial effects, this study takes step towards knowing this category as best as possible and assisting optimal use of this problem and, as a result, creating a high-quality environment.

1. Theoretical Fundamentals

1.1 Concept of Tall Building and Its Types

According to the definition of Ministry of Housing and Urban Development, high rise buildings refer to those with 6 stories or more. High rise buildings emerged in Tehran after the 1340s, and multiplied following the 1360s (Karimi, 2004).

Although high rise buildings in Iran refer to the buildings with more than 6 stories, on the strength of the regulations and codes of Iran Supreme Council for Architecture and Urban Planning, approved in 1998, this definition is used for the buildings having more than 12 stories, in accordance with Detailed Plan of Tehran, approved in 2007 (the original document of Detailed Plan of Tehran, approved in 2007).

Urban planners often know buildings with ten or more stories as tall buildings, and believe that a high rise building is characterized by a designed facing indicating number of its stories. In other words, an exhibition, factory and or any building with a high height is excluded from this definition. In Iran's domestic regulations, according to the executive guideline for building protection against fire (Journal 112 issued by the State Plan and Budget Organization), the minimum stories of a high rise building is known to be 8, although this figure can be increased to 12, given the advance in facilities (Shakeri, 2010).

The main problem of defining high rise buildings from urban perspective is that this definition is not adequately flexible, because "tall buildings" have a relative concept, which in addition to its heights, other things should be considered as well. For this reason, defining tall buildings with respect to urban problems can be a combination of qualitative and quantitative variables. For example, in some parts of the UK, tall buildings are defined depending on the height, their effect on the surrounding environment or major impact on the sky line. If a building has one of these conditions, it constitutes a high rise building. With these conditions, for example, a building with a middle height can be considered as a high rise building on condition that it has impact on the sky line or the surrounding environment (KarimiMoshaver, 2010).

The following criteria can define a tall building regardless of its height or stories:

1. Special land-use intensity (plot ratio): The ratio of total built area to area of the land on which building erected, is high relative to the neighbouring properties.
2. Mechanical systems (usually lift) are used for vertical movements.
3. Use of special construction and management systems and methods differs from the systems used in low rise constructions (Farhoodi, 2001).

High rise buildings have different types, which can be categorized based on different occupancies (residential, trading, office and ...), size and scale (narrow, high, massive, elongated and ...), distribution (single, cluster) and plot ratio (low rise, high rise and ...) (Golabchi, 2010).

1.2 History of High Rise Building in the World

High rise building in the world is a phenomenon which has emerged since the late 19th century and in the early 20th century, when the first steps were taken towards producing skyscrapers about 1880-1900 in Chicago (Sadoughian, 1992). At the turn of the nineteenth century, steel structure began to substitute for heavy masonry structures in construction of multi-storey buildings. Coincided with the Industrial Revolution (accompanied by urbanization and rapid population growth), mass building was common.

Chicago School: Chicago School is a term used in the framework of evolutions made in the city of Chicago after the big fire occurred in this city in 1871. This school moved in line with modernism movement of the 19th and 20th centuries (Sadoughianm 1992). This school was among the first viewpoints encouraging high rise building and the use of tall buildings for residential purposes, and in its development process, it made International School of Modernism emerged (Poormohammadi, 2004).

Table 1. Theories of Chicago School (Adapted from Poormohammadi, 2004)

Theories of Chicago School	Use technical developments of construction
	Reject the old traditions in decorating buildings
	Use simple and pure forms and make the structure prominent

School of Modernism or Functionalism: This school which was emerged between the World War I and the World War II, and reached full flowering one decade after the World War II, played more role in vertical growth of cities during the 20th century than other intellectual movements, but was criticized. Aspirations of the followers of this school are manifested in the Athens Charter. It can be said that in the Modernism, high rise building and separation of performances are the main base of urban planning (Poormohammadi, 2004).

Table 2. Theories of School of Modernism (Adapted from Poormohammadi, 2004)

Theories of School of Modernism	Generalities in urban planning
	Spatial separation of urban functions
	Economic saving in construction, mass building, and low land use
	Emphasize high rise building to achieve sunlight, fresh air and green space
	Use tall buildings for different occupancies (trading, office, residential)

School of Human Spatial Planning or Humanism: As urban planning experiences of Modernism were developed and criticized, the necessity of considering the human and his/her social relations in the process of planning was taken into account, thus making emerged an approach known as Humanism or School of Human Spatial Planning. The followers of this school believe that urban planning is a thing beyond architecture and an interdisciplinary activity.

Mumford and Jacobs are two followers of this school, whose studies indicate that desired plot ratio from the viewpoints of humanists is a condition between suburb-oriented status and excessive concentration of urban centers, so that it can meet the needs of balanced and organic human. This approach is derived from culture-oriented thinking about city, as seen in the works of Cit, Havard, and Geddes as well (Poormohammadi, 2004).

Table 3. Theories of School of Humanism (Adapted from Poormohammadi, 2004)

Theories of School of Humanism	Limit city size and population density to improve social relations
	Organize distributed suburbs into a balanced community
	Decreased plot ratio of metropolis through vacating part of population and use its place for service occupancy
	Create a compressed urban texture to provide diversity and improve urban performance

Postmodernism: Extended criticism of the modernists' performance in different cultural, social and environmental aspects resulted in the movement of Postmodernism in different sciences including urban planning. This movement attempts to review the principles of modernism to improve environmental quality of cities. In fact, in postmodernism, two historic culture-oriented and future-oriented approaches, which, with criticism of industrial city emerged and sought to solve urban problems from two different perspectives, approached each other and reached a relative equilibrium (Poormohammadi, 2004).

Table 4. Theories of School of Postmodernism (Adapted from Poormohammadi, 2004)

Theories of School of Postmodernism	Value the historic continuity of urban space and finally emphasize street, square, and short buildings
	Emphasize partial organizing cities rather than fully designing them
	Underline the importance of mixing land uses
	Encourage pedestrian movement and relatively control vehicles in urban space

After postmodernism, when sustainable development approach was posed in the late 20th century, theories of the postmodernists continue in the framework of sustainable urban development theory, with highlighting the role of environmental issues (Poormohammadi, 2004). The discussions about sustainable urban development made more coherent the viewpoints on evolution and improvement of modern city, resulting in new ideas appeared in urban planning. Among these ideas, the idea focusing on increased urban plot ratio and using it in urban planning is the idea of "compressed city", attempting to provide more sustainability through developing the components of physical form of the city (Ghorbani, 2004).

Although, the idea of compressing urban spaces in the framework of urban planning thinkings dates back to more than a century, what is posed in the process of compressing has two essential differences with the first theories:

1. Economic-social and environmental results of energy generation and consumption for development, were not properly understood in the first approaches of the followers of compressed city.
2. Global effects and effects of globalization of environmental issues were not posed.

Therefore, it can be said that compressing in the last decade is a response to going to extremes of high rise buildings and suburb-oriented low rise buildings, to achieve an equilibrium based on social and environmental values in urban planning (Poormohammadi, 2004).

1.3 History of High Rise Building In Iran

The phenomenon of high rise building in Iran commenced from the middle current century in Tehran and then, became practical in metropolises, and gradually spread to other parts of the country. The history of modern high rise building in Iran dates back to about the 1330s. During these years (1949-1951), the first 10-storey high rise building was constructed in western style in Jomhuri St. (the former Nader St.), Tehran. The structure of this building was made of reinforced concrete. The building was equipped with two lifts, still being used (HosseinzadehDalir, 2011). During the years of the 1350s, construction of high-rise residential buildings, mostly in the north and north west of Tehran flourished. Location and type of these buildings show that the policy on encouragement of high rise building resulted in increased price of high-rise residential buildings for low-income or middle-income classes. With the outbreak of the Islamic Revolution, high rise building stopped for more than ten years. There was a new wave of high rise building during the late 1360s, due to increased price of land and when Tehran Municipality began to sell land-use intensity (plot ratio), coverings all parts of Tehran (Safavi, 2001).

1.4 Positive and Negative Effects of High Rise Building

Like other human-made artifacts, high rise buildings have both positive effects and advantages and negative effects and disadvantages obtained from their construction in urban environments. Negative effects of high rise building can be studied in different environmental, traffic, social, aesthetical and ... categories. In addition, positive effects of tall buildings can be known as such things as reduced cost, visual aspects and ... In the following tables, positive and negative effects of high rise buildings are classified and provided:

Table 5. Negative effects of high rise building (adapted from HosseinzadehDalir, 2011)

Negative Effects of High Rise Building	
Environmental	- Destroy nature and environment in case of incorrect location - Environmental pollutions due to vehicle congestion - Tall buildings block fresh air circulation and sunlight
Traffic	- Increased traffic volume due to increased plot ratio of tall buildings - Increased distance between place of occupants, because of erected tall residential complexes as mass building projects
Social	- Decreased health social relations among occupants of tall buildings due to their scale and nature - Social degeneration, social isolation and alienation in tall residential complexes
Cultural	- Incompatibility of ideology and culture of occupants of tall buildings with their spaces - Spatial limitation of tall buildings prevents activities rooted in Iranian Islamic culture from accomplishing - Priority of high rise buildings over low rise ones

Safety	<ul style="list-style-type: none"> - Vulnerability of tall buildings relative to low rise buildings against accidents such as earthquake - In cases where such accidents as fire occur, the fire will spread - Possibility of accidents including falling down the stairs and falls from height
Health	<ul style="list-style-type: none"> - Pressure from weight of tall building breaks soil layers and interferes sewage networks with groundwater supplies - Existence of car parking lots in a closed space in tall buildings makes pollution stable.
Aesthetical	<ul style="list-style-type: none"> - Erection of tall buildings near each other prevents natural perspectives such as sunrise and sunset, from being seen from low rise buildings - Mass building of tall blocks causes the environment to be drab

Table 6. Positive effects of high rise building (adapted from HosseinzadehDalir, 2011)

Negative Effects of High Rise Building	
Reduced Cost	<ul style="list-style-type: none"> - Save costs of construction and reduced cost of residential units - Use tall buildings decreases land price per capita, street cost per capita, and cost of underlying facilities - Compressed cities decrease volume of infrastructures of cities and reduce costs
Perspective	<ul style="list-style-type: none"> - Due to visual highlight, high rise buildings can help orientation of cities - Possible creation of cozy and relaxed atmosphere far from crowdedness; urban perspective
Prevention of Horizontal Extension	<ul style="list-style-type: none"> - Decreased suburban development and decreased damage to environment - A suitable model for housing in cities facing limited physical horizontal extension
Social	<ul style="list-style-type: none"> - Possible creation of suitable space for improving social facilities and urban services

1.5 Criteria for High Rise Buildings

Although designing a tall building is the final result of a complicated process whose elements interact with each other, and multiple factors including cultural, social and economic features affect it, by compliance with the principles and criteria obtained from fundamental and applied studies on architectural design, structure and urban planning (if accompanied by formulating and implementing the policies needed in other areas), the possibility of properly using tall buildings is provided. In general, given special conditions of the current century, proper and conditional use of tall buildings can be considered a realistic and desired solution for accommodating people and meeting other needs related to social and economic activities in metropolises (Golabchi, 2001). In fact, tall buildings can properly satisfy, under appropriate conditions, the needs and necessities of the environment, if some main criteria are considered when planning and designing them. General criteria with respect to erecting tall buildings can be classified as shown in the following table:

Table 7. Criteria for Tall Buildings (adapted from English Heritage, 2007)

Relationship between building and location conditions	Includes natural topography, scale, height, urban texture, its facing in street, and quality of construction, open space, river and waterway, important facings, perspective and view, and its effect on the horizon line. Tall buildings must have a correct relationship with the factors associated with topography and other buildings.
Effect on historic texture of city	Historic buildings, sites, urban facings, and horizon line should be preserved. Design of tall buildings do not must affect historic buildings.
How to access to vehicles	Includes limitations of air transportation, particularly public transportation capacity, quality of site routes and possible improvement of conditions. Existence of vehicles due to continuous and excess use, specially with respect to tall buildings is very important.
Quality of building in terms of architecture	Includes scale, frame, size, proportion, design, materials, and its relationship with other structures. High rise building, due to its effect on the horizon line, is very important. Basic design of a tall building also influences the appearance of the street and the surrounding perspectives.
Role of building in space and public services	This means internal and external development of a tall building including the multi-purpose nature of the building particularly in ground floor and its capacity as a part of public domain. This development should interact with other buildings of the street, and help safety, diversity, life, social interaction and its sense.
Effect on the surrounding environment	Includes micro climate, its effect on other buildings, facing of the building at night, vehicles and environment and welfare of the neighbors.
Effect on permeability	A site and a more extensive area, an opportunity for availability and in a suitable place will improve the situation and more extensive perspective of the city.

III. METHODOLOGY OF RESEARCH

The present study is of analytic-descriptive type, and given the descriptive objectives, a documentary method is used. The documents and evidence in local organizations including urban development plans, satellite images, books, and specialized journals have been the most important sources used by this study. SWOT method, as one of the most suitable techniques of planning and data analysis, is used in order to evaluate physical-spatial effects of high rise building. SWOT method includes environmental examinations (both internal and external environments), formulating a strategy (long-term or strategic planning), implementing the strategy, evaluating and control (Chase, 2001). This model is one of the strategic tools for comparing in-house strengths and weaknesses with opportunities and threats outside the organization, as an abbreviation for the words of Strength (S), Weakness (W), Opportunity (O), and Threat (T) (Earabi, 1384: 12). By investigating the principles and criteria of urban planning in high rise building, the factors affecting determination urban plot ratio and the regulations and codes of tall buildings, and by overlapping their components, the main determinants of the study approach were obtained, each having some sub-criteria, as shown in Table 8.

Table 8. Determinants of Physical-Spatial Effects of High Rise Building (Author)

Determinants under Survey		
Physical-Functionals	Aesthetical	Access
Human Scale	Sky Line	Relation with occupancies and service activities
Mixed Occupancies	Proportion	Access to parking
Number of Stories		Traffic Volume
		Passage Width

The area study is Sajad Blvd. and N. Janbaz Blvd. corridors, located at the western middle area of Mashhad. Physical-spatial effects of high rise building in these two corridors will be discussed in detail in the framework of the above criteria.

Introduction to the Area Study:

In terms of antiquity and history, Mashhad is a 1200-year-old city, whose special religious place and spiritual richness of the Holy Shrine of Imam Reza (peace be upon him) in the Islamic world and national and international applications cause Mashhad to annually receive millions of pilgrims and tourists. The dominant economic role of Mashhad is tourism, by which about 15 to 20 millions of pilgrims and travelers per annum come to Mashhad, playing an important role in economic, social, cultural, and physical life of this metropolis. High rise building in Mashhad, during the recent decade, has grown increasingly, influencing the tendencies for construction in the city. Currently, the average stories of a building in Mashhad ranges from 2 to 3. High complexes in the form of tall buildings with more than 7 stories and or more than 20 meters are considered high rise buildings, which are located sometimes in cluster (e.g., Alton Trading Tower and Baran Residential Tower) and or in localized form in an axes (trading towers located in Sajad Blvd.).

IV. INTRODUCTION TO THE CORRIDORS UNDER SURVEY (Sajad Blvd., N. and S. Janbaz Blvd. Trading Corridors)

Sajad corridor and N. and S. Janbaz one locate at districts 1 and 2, Mashhad, respectively. These two corridors are connected each other through Janbaz square. The area study in this research is Sajad-Janbaz corridor, as one of the most important trading corridors in Mashhad, on which characteristic elements such as Proma Trading Complex and Caspian Mode Trading Complex locate, that serving in urban scale. The first core of tower making on north Janbaz corridor begins from Proma Trading Complex (around Janvas Sq.). This process, during the recent years, is growing increasingly, so that construction policies in this area move towards construction of tall trading and office towers. New constructions have been made in the form of high rise buildings, especially on the edge of these corridors, because of shortage of undeveloped land and expensive land, as the most important reasons. On the other hand, increased economic role and performance of the area in Mashhad decrease residential construction and increase construction of new occupancies (office and business use).

Most of the area study has a checked regularly texture. Grading plots in this areas is middle, mass and space have a linear order, and networking the passages is also regular and in checkerboard shape. Occupation surface of the plots in trading towers in Sajad Blvd., sometimes reach to 80% even. In the area study (Sajad-Janbaz corridor), powerful presence of Azadi Blvd., as one of the important accesses of Mashhad, with a high traffic load, is obviously seen. Janbad and SajadBlvds., as two main corridors of Mashhad, play the main collecting and distributing role, that connect with Azadi and Ferdowsi streets. The role of Janbaz and Sajad streets is their social availability, which is implemented due to business uses.

V. ANALYSIS OF FINDINGS

Explain and analyze the determinants discussed in the study:

4.1 Physical-Functional:

4.1.1 Human Scale: Scale is a combination of the ratio of height to street width, relative distance of human from building, permeability in texture and sense of glory or glandeuror personal intimacy with the space. Therefore, this scale depends on intensity of plot ratio because high rise spaces have usually taller buildings (Seddigh, 2010).

The area study (Sajad corridor and Janbaz corridor), due to proper width of both corridors, high rise buildings do not prevent human scale from being observed and even, the same high rise buildings in summer and the heat from it cause shading and climatic welfare alongside both corridors, and increase individuals' feeling of being present, strengthening pedestrian-orientation.

4.1.2 Mixed Occupancy: In the area study, most of high rise buildings have business uses, including banks, trading complexes, shopping centers and ... It can be said that, currently, in these complexes and high rise buildings, there is no mixed occupancy, and indeed, they all are single-purpose.



Fig. 1 Pasargad Bank, Sajad Blvd.



Fig. 2 Proma Trading Complex, Janbaz Blvd.

4.1.3 Number of Stories: Status of number of stories in the corridors under survey is shown in the following diagram. The studies show that in Sajad Blvd., buildings with 4 to 8 stories have 37% of total buildings in this area, while in Janbaz Blvd., high rise buildings are formed as spot, and most of high rise buildings are being constructed.



Fig. 3 High Rise Buildings Being Constructed in Janbaz Blvd



Fig. 4 High Rise Buildings Already Constructed in Sajad Blvd.

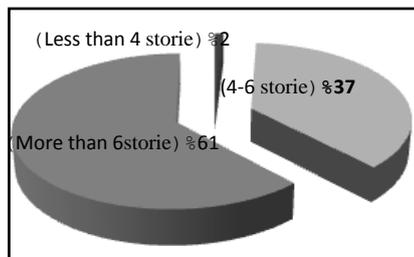


Diagram 1. Percentage of Number of Stories of Janbaz's Buildings

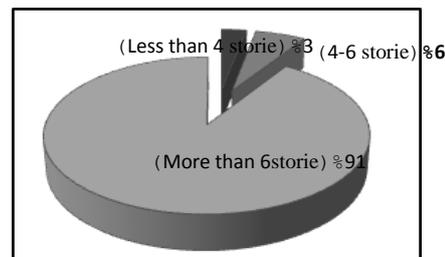


Diagram 2. Percentage of Number of Stories of Sajad's Buildings

4.2 Aesthetics:

4.2.1 Sky Line: Sky line, which constitutes one of the basic and important elements of a street landscape, refers to separation limit of physical wall of the street from the sky. This physical element includes total volumes existing in combined roofs of buildings and or is visible in combination with taller buildings located behind the wall. Physical element of the sky line manifests form combination in street body and presents order or diversity in street landscape (Armanshahr Consulting Engineers, 2007).



Fig. 5 Sajad's Wall

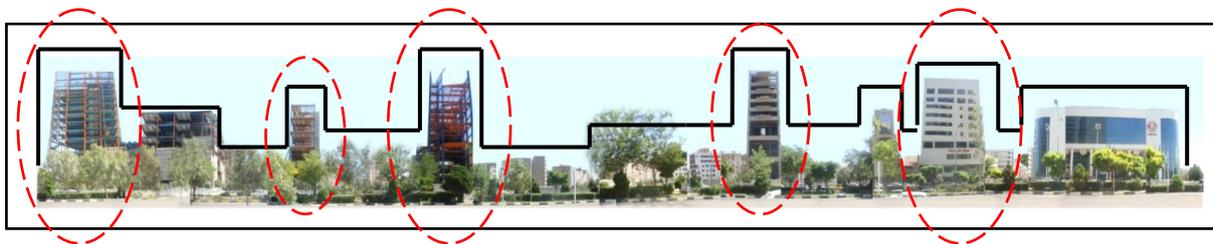


Fig. 6 Janbaz's Wall

As shown by the panoramic images provided, in Sajad Blvd. most of buildings have 2 to 3 stories, and the existence of tall buildings in this corridor causes fractures in sky line of the walls. For example, however, in Fig. 6, the symmetry among high rise buildings is evaluated to be positive in examining sky line of the wall. In the panoramic image of Janbaz's wall, it is also seen that the existence of high rise buildings already constructed and or being constructed beside low rise buildings has caused a sky line with many fractures, which have been decreased in some parts through planting trees.

4.2.2 Visual Proportion: Body of each street forms the original part of the street body. In fact, this element specifies street space and gives it environmental concept. Facings can be admired in terms of visual richness, and in different distances from building, the eyes' need for seeing should be met. In various scales, the details should be taken into account. Design elements in the wall include theme, rhythm, similar row, continuity, street architecture, proportions, turn, and corner (Armanshahr Consulting Engineers, 2007).



Fig. 7 Disproportion of Extensions

Fig. 7, disproportion in billboards installed on the building and the disproportion between them in terms of color and dimensions also result in visual disturbance. It should be considered that in high rise buildings, due to their height, they usually have different activities in their stories. So, it should be noted that

any extension and billboard installed on them with respect to size, color and location, must be proportioned and create no sense of irregularity for pedestrians.

5.3 Access

Criterion of communication networks can be analyzed in the framework of different things such as spatial relation of the network with occupancies and activities as well as traffic issues. Effects of changed plot ratio and population density on communication network and access, due to high rise building construction can be studied in traffic volume, traffic jams and communication networks per capita. The relationship of any network with land uses and activities can also be of the essential issues of this criterion (Mashhoudi, 1996).

5.3.1 Traffic Volume: high rise buildings will result in population density. This population is the people living in or passing in a certain hour peak. If the tower is residential, the population is the occupants and, if it is trading or office, presence of the people in towers will be passing and at a certain time.

In the area study, most of the towers located at Sajad Blvd. and Janbaz Blvd. have some clients at a certain time peak. These clients themselves are the reason for increased traffic volume at certain times. In Sajad Blvd., traffic jam exists at Bozorgmehr-Sajad intersection, and the existence of tall buildings such as Caspian Mode, Tandis, and Bank Melli attract many persons from all parts of the city, which in turn are the main reasons for traffic in this area.

In S. Janbaz Blvd., there is no traffic jam, and traffic is flowing, while in N. Janbaz Blvd., there is traffic jam at peak hours (in the evening and at night) in front of Proma Trading Complex, because of high volume of vehicles of the users of Proma Trading Complex.



Fig. 9 High Volume of Traffic in Sajad Blvd. (Source: Author)

5.3.2 Access to Parking Lot: One of the important criteria for studying access is proper access to parking. In the area study (Sajad Blvd.), the existence of trading and office towers doubles this necessity, because the users of these towers often face difficulties with parking their cars. Because most of trading and office towers in Sajad Blvd., such as Bank Melli, Tandis Trading Tower, Bank Pasargad, Caspian Mode Shopping Center lack public parking lots, and their users have to use fringe parking (with No Parking sign or Prohibitory Traffic sign) or use Sajad's subsidiary streets for parking purpose.

In Janbaz Blvd., as the second area study, the existence of Proma public parking provides the possibility of access to public parking for the users. In the other parts of Janbaz Blvd. such as Kondoz and Poonak take-aways (fast food restaurants), there are public parking lots with a low capacity of vehicles. There are still fringe parking lots, often problematic.

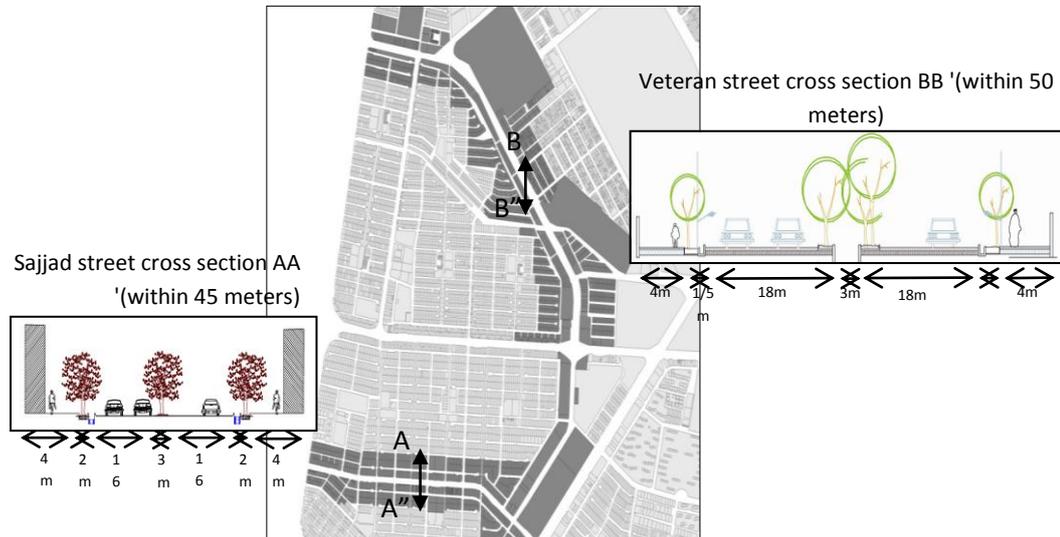


Fig. 10 Fringe Parking in Sajad Blvd. (Source: Author)

5.3.3 Width of Passages: Given type and function of the land uses around, width of passages should be in proportion with them to prevent such problems as traffic congestion. In Sajad Blvd., the land uses adjacent to the main street are often trading complexes and offices, as tall towers distributed all over Sajad Blvd., while the width of Sajad Blvd. is 45 m, with a middle island for separation round trips in the street. Width of Sajad Blvd. relative to type and scale of the adjacent land uses, often serving extra-local level and the city surface, is

proportional, and in cases where vehicles fail to stop unnecessarily and do not use fringe parking, it can be said that there will no traffic jam in the street, and the traffic from Khayyam Crossing to Azadi Blvd. will be flowing easily. Janbaz Blvd. also is 50 meter wide. The land uses adjacent to it are all trading complexes and offices, scale level of which is extra-local. Example is Prama Trading Complex. The studies suggest that the width of Janbaz Blvd. is proportional to the land uses adjacent to it.

Drawing 1. Width of Passages in the Area Study (Source: Author)



Summarizing

Given the above, it can be said that high rise building in the area study (Sajad and Janbaz) has many negative and positive effects. In order to achieve these effects, SWOT tables are used, so that indentifying strengths and weaknesses of high rise building in the area, ongoing opportunities and threats can be presented.

Table 2. Analysis of Strengths, Weaknesses, Opportunities and Threats (SWOT) in the Area Study (Source: Author)

	Strength	Weakness	Opportunity	Threat
Physical-Functional	<ol style="list-style-type: none"> 1. Follow human scale for the purpose of proportion of passage width 2. Desirable proportion (one by one) of main streets and high rise buildings 3. Mixed land uses alongside Janbaz Blvd. (existence of high rise buildings with business and office use) 4. Proportion of number of stories (high rise buildings) in Janbaz corridor 	<ol style="list-style-type: none"> 1. Visual disturbances due to disproportion of number of stories in Sajad Blvd. 2. Lack of mixed land use in high rise buildings and their sigle function 3. Lack of following human scale and improper capture in Sajad's subsidiary streets. 	<ol style="list-style-type: none"> 1. Possible use of furniture and accessories in order to adjust human scale in subsidiary streets of the area 2. Possible creation of mixed occupancies in high rise buildings 3. Possible adjustion of status of number of stories through adjusting plot ratio in the area studies 	<ol style="list-style-type: none"> 1. Increased single functional tall buildings 2. Increased captured in subsidiary streets due to non-systematic growth of high rise building in the area 3. Increased visual disturbances in cases where disproportion process continues in number of stories of Sajad Blvd.

Aesthetical	<ol style="list-style-type: none"> 1. Readable corridors because tall buildings are indicators 2. Tall buildings in both corridors are often of high quality, because they are new-built. 	<ol style="list-style-type: none"> 1. Fracture in sky line due to high rise buildings 2. Lack of visual continuity in walls because of disproportion between color and type of materials used in buildings 3. Lack of equilibrium and rhythm and joint row in the wall because of not neutral line moves 4. Existence of uncoordinated billboards on high rise buildings in Sajad 	<ol style="list-style-type: none"> 1. Possible decrease of sky line fractures through planting trees in Sajad Blvd. 2. Possible creation of visual continuity in the wall through proportion of materials used 3. Establish a unit system for installing accessories on tall buildings 	<ol style="list-style-type: none"> 1. Increased process of high rise building in Janbaz Blvd. to make a uniform and dull wall in this corridor 2. Create visual disturbance due to disproportion between extensions of tall buildings in Sajad Blvd.
Access	<ol style="list-style-type: none"> 1. Existence of multi-storey car parks in Proma Trading Complex in order to facilitate access to the services therein 2. Easy access to local and extra-local services due to access ways 3. Proportional width of main passages given the land uses adjacent to the same 4. Proportional width of passages given dominant role of trading corridors 	<ol style="list-style-type: none"> 1. Lack of public parking in Sajad Blvd. 2. High volume of traffic in the area studies and disturbing citizens' welfare 3. Existence of traffic jams in front of trading towers in Sajad and Janbaz 4. Existence of fringe parking lots in Sajad and disturbed traffic of vehicles 	<ol style="list-style-type: none"> 1. Possible erection of public parking lots in Sajad and Janbaz 2. Possible improvement of public transportation in main streets 3. Possible disturbance of occupancies in high rise buildings and decreased accesses 	<ol style="list-style-type: none"> 1. Increased traffic load due to lack of public parking 2. Increased fringe park due to lack of public parking lots

VI. CONCLUSION

Tendency to high rise building in metropolises of the country such as Mashhad is one of the consequences of urban development. This can have effective contributions to failure to uncontrolled expansion of metropolises. However, regardless of its positive effects, it can have negative and harmful impacts on urban space and the land uses, if not properly considered. By the studies conducted in the process of this research, bad effects of high rise building on urban environment are identified, which in addition to negative effects mentioned earlier, it has positive effects as well, including strengthening city landscape, prevention of uncontrolled horizontal growth, saving in land use and urban infrastructure, and solving some housing problems. By considering criteria of high rise building and its effects on urban environment, it can be concluded that tall buildings require a detailed design process and understanding its main principles with respect to homogeneous and integrated architectural design, urban planning and environmental management. Design by such a characteristic originated from general-oriented design see tall building as a part of a larger environment, which should be seen by a general view, so that its effects on the environment remain high on the agenda.

Suggestions:

Now, given the criteria obtained in this study, some solutions and suggestions are provided in order to decrease negative effects of high rise building on urban environment:

1. Any permit for plot ratio in result of high rise building should be issued only if urban transportations per capita are supplied, because in the area study, most of high rise buildings have business use, attracting excess urban trips.
2. To create more desirable and humanistic view for a tall building, it is more advisable that an open space around it (particularly around high rise buildings in Sajad Blvd.) are considered.

3. To prevent overlooking, tall buildings should not be erected in the proximity of each other or near low rise ones. Their distance from each other must be proportional in this regard.
4. The urban spaces existed or suggested should not be captured only by tall buildings. It is advisable that urban space is captured by buildings with human dimensions and scale, and tall buildings are taken farther.
5. Some standards can be formulated for painting tall buildings to be proportional to its occupancy, culture and etc., so that while creating a visual beauty, the building will become proportional to the surrounding buildings.
6. To prevent changed scale and disproportion of urban appearances, seen in Sajad Blvd., it is suggested that in combination of high rise buildings with low rise ones, middle scales and stages are used, or a separation space between both tall and short sizes are considered in the form of green and open space.
7. Erect public parking in the area study (Sajad and Janbaz) in order to facilitate access for the users and businessmen is a must.
8. Create an open public space and green space defined alongside trading towers in order to create soft space in Sajad Blvd.
9. Determine some criteria for protruded tall buildings along with margine of sidewalk in order to sunlight reach to the street and sidewalk is a must.
10. Diversity and mixing high rise buildings in order to render services will facilitate accesses.
11. Provide public transportation services in otder to facilitate accesses and decrease traffic jam, are all examples of suggestions for access system of the area study.

VII. REFERENCES

- [1] Approved original document of Tehran Detailed Plan, 2007.
- [2] Farhoodi, Rahmatollah; Mohammadi, Alireza, "Effect of Erecting High Rise Buildings on Urban Uses", Journal of Geographic Researches, Issue No. 41, March 2002, p. 75.
- [3] Ghorbani, Rassoul, "Plot Ratio and Organizing Urban Spaces (Case Study: Tabriz)", Doctoral Thesis, Supervisor: Mohammad Reza Poormohammadi, Geography and Urban Planning, Spring 2004.
- [4] KarimiMoshaver, Mehrdad; Mansouri, Amir; Adibi, Ali Asghar, "Relationship between Quality of High Rise Building Location and City Landscape", YaghNazar Journal, Issue No. 13, Spring 2010, 7th Year, p. 92.
- [5] Golabchi, Mahmoud, "Criteria for Design and Construction of Tall Buildings", Journal of Beautiful Arts, Issue No. 9, 2010.
- [6] Shakeri, Eghbal; SamadiVaghefi, Omid, "High Rise Building: A Response for Decreased Compressed and Old Urban Regions", 2010.
- [7] Sadoughian, Minoush, "High Rise Building and Urban Space", University of Tehran, 1992.
- [8] Seddigh, Morteza, "Basic Concepts of Urban Design", 2008.
- [9] Safavi, Yahya, "Guidance on High Rise Building in Tehran", Journal of Geography Education, 2001.
- [10] "Urban Design Plan in Ahmadabad Ave., Mashhad", Armanshahr Consulting Engineers, 2007.
- [11] Azizi, Mohammad Mahdi, "Plot Ratio in Urban Plans", Journal of Beautiful Arts, Issue No. 2, 2007.
- [12] Azizi, Mohammad Mahdi; Moeini, Marjaneh, "Analysis of Relationship between Environmental Quality and Plot Ratio", Journal of Beautiful Arts, Issue No. 45, Spring 2011.
- [13] Azizi, Mohammad Mahdi, "Evaluation of Physical-Spatial Effects of Tower Building in Tehran (Case Study: Farmanieh and Kamranieh Quarters)", Journal of Beautiful Arts, Issue Nos. 4 and 5, Winter 1999.
- [14] HosseinzadehDalir, Karim; Heidari, Mohammad Javad, "Analysis of High Rise Building and Its Disadvantages in Iran", Journal of Geography Education, Edition 25, Issue No. 4, Summer 2011.
- [15] CABE and English Heritage, "Guidance on Tall Buildings", July 2007.
- [16] Chase, M, "How SWOT Audits. Analysis and Action Planning Can Help Your Town", 2001.