

An Investigation into the Urban Square's Layout in Turkman Era to Develop the Sustainable Pattern in Northwest Iran

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ABSTRACT: The appearance of Square in Northwest Iran, as a traditional element of the city, did not have a certain definition in the urban planning due to its structural disruption in the spatial fabric as well as its chaotic present in the manifestation of its identity. On the other hand, since the concept of the square in this area does not match to the similar models existing in the central plateau of Iran including the characteristics of being enclosed and architectural integrity, most researchers have assumed that the irregularity of the form in the squares of northwest Iran is because of gradual growth, lack of spatial desirability, and performance without a pre-designed plan. This descriptive-analytic research studies the effect of climate on the formation of the structural layout of "Saheb Abad" Square as a case study. In this way, a specified framework would be suggested, and a fixed sustainable urban pattern would be achieved regarding the form of a square in modern urbanism in this region. According to the findings of this study, the disintegrated layout of the square in Northwest Iran is not only because of its structural weakness, but it was in certain parallels with environmental and natural conditions. It is obvious that the investigation of this innovation could lead to sustainable development in modern urban constructions.

Keywords: Turkman era, Square, Sustainable Development, Cold Climate, Northwest Iran.

INTRODUCTION

The theory of sustainable development, which usually follow by sustainable architecture, is one of the most controversial issues in contemporary architecture. In fact, "sustainable architecture" is an inclusive issue, but does not result in architectural style like the previous inclinations. Although its major concern has something to do with the environment, it enjoys all previous inclinations, which paid attention to a decrease in the use of materials and energy. It is noted that sustainable design is a kind of architecture that enjoys the most environmental talents for consumer welfare, employing smart tools and strategies while minimizing the unpleasant conditions resulting from construction. In other words, buildings should respond to the circumstances and situations desirably from the very stage of design and construction, while minimizing the confrontation with nature (Ahmadi, 2003). The reason is to review past solutions, concerning adapting harsh climatic conditions and

the architecture of past generation is the result of the process of vernacular architecture, which transferred from one generation to another in a way that its position and continuity have been tested through trial and error process during hundreds of years. Then, sudden discontinuance of this process made possible as a result of modern architecture, which made us forget all the environmental methods based on climatic design.¹ Although urban designers are well aware of the importance of the climatic impact on the design, execution details, and attention to economic factors, they have hardly paid attention to the climatic information and its impacts on the design (Oliver, 2005, 56).

Regular researches concerning the effect of urban physical planning on the climate and the use of energy in the cities have just begun for a few years, and most research is limited to studying and recording climatic changes between the city and the surrounding areas, without considering the effects of

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the physical form of the city (Pourdeihimi, 2011, 232). Today the sensitivities around the issue of using energy in urban engineering necessitate a return to urban planning based on climate (Oke, 2012). Climate compatibility can help realize the talents hidden in any climate and use them as a positive force. Urbanism is currently increasing, and studying the states and historical grounds of the cities are essential, attempting to achieve a sustainable pattern of the city, as the excessive growth of the cities, these days have destroyed the spatial identity in public places. In this regard, the square has been affected by the performance of the buildings and creating "beauty". However, based on the climate and environmental conditions, any region of the world has its unique techniques of providing architectural patterns. Architecture is deeply ingrained in climate (Brebbia, 2011). Therefore, environmental, and urban planning have to be carried out regarding environmental geography (Thornthwaite, 1948), and the relationship between urban space and natural environment has to be determined, predicted, and analyzed before any action. Such areas that have been designed according to the regional climate lead to a decrease in the mechanical cooling and heating equipment, as they are affected by the natural energy of the environment. In this regard, the design and construction of the "Saheb Abad" Square in Tabriz has been one of the first challenges regarding urban design during Turkman Aq-Qoyunlu, which aimed at joining urban environment with climate, for its spatial form is an indication of a special kind of human relationship with the natural environment as well as geographical groundwork, which was unprecedented until that time (Omran & Aminian, 2006).

MATERIALS AND METHODS

This paper rests on architectural materials to justify the Saheb-Abad square's layout and its unique architectural features as the center of this research. In this way, the limited amount of archaeological resource, literary pieces of evidence, and epigraphic records at the disposal of the architectural historians appears as the main ticket. Filling up this lacuna based on these scantily documented and apparently inconspicuous resources is the main research problem that exists. Here, the research method is structured to cater to two levels. In the first level, it started from much broader aspects of urban details and architectural arrangement by emphasizing on the architectural approach to study the minute characteristics of this square in detail. The second level of the study is that of typological comparison, which basically focused on the taxonomic classification of physical characteristics commonly found in contemporary squares. In conclusion, it combined these two at the end to make a proposition regarding the formal attitude towards the Saheb-Abad square.

Urban Characteristics of Tabriz City in Turkman Era According to the Archeological Evidence

Heavy snowfall throughout long winters has affected the relative moisture of the soil as well as the whole climate of northwest Iran. Therefore, coldness is the most serious problem in this region (Hooper, 1975, 113). Furthermore, like a dam, Azerbaijan's high mountain range does not let the wet Mediterranean weather penetrate Iran's plateau, keeping the humidity in its feet (Mofidi, 2008, 56). Similarly, the cold, humidity and freezing caused by that have led urban

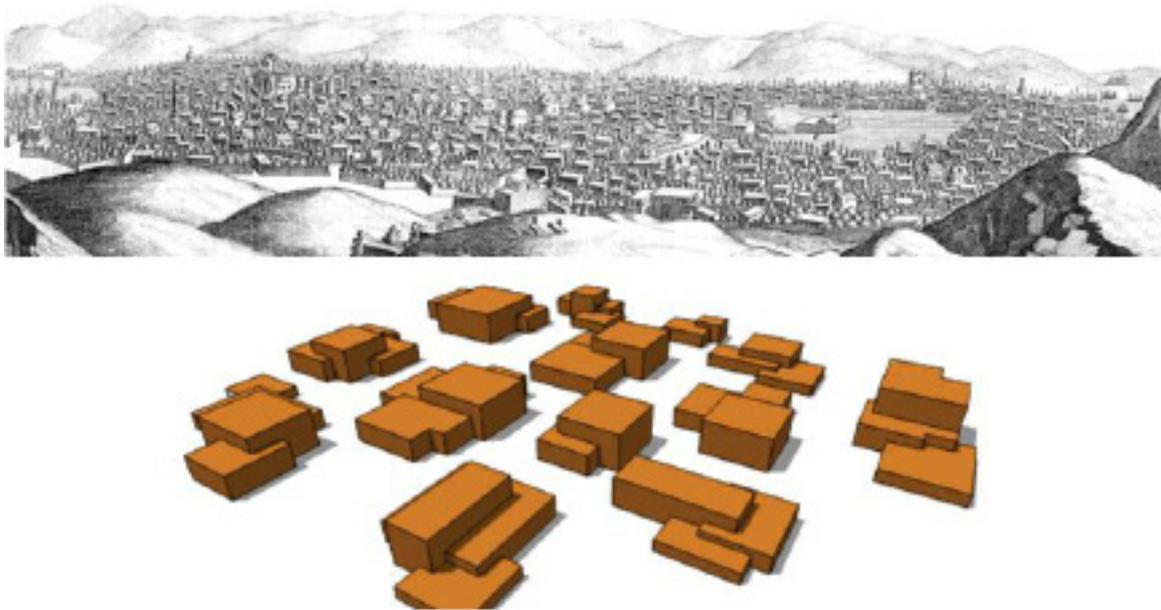


Fig. 1: Up: Historic fabric of Tabriz as Chardin observed (Chardin, 2000, 112); Down: Schematic of Tabriz in 17th century representing detachment urban design with the aim of air circulation.

neighborhoods to be placed side by side in a way that they limit the penetration of undesirable cold air while confining urban spaces, and hence the cold air is adjusted as the heat is cast from the exterior surfaces of warm building walls to small open spaces. However, in order to remove the problem of humidity caused by precipitation, the issue of finding a solution for the air currents has, to a great extent, led to the disruption of urban elements in the local architecture of the region (Chang, 1959). (Fig. 1)

Previously done researches indicated that there is a significant relationship between the concept of a sustainable city and the concepts of "density and compactness" because providing climate comfort and energy saving can be analyzed by defining the highest levels of contact, which is due to increased levels of buildings surfaces and urban texture relative to solar radiation (Brebbia, 2011).²

The need to vacate the peripheral architectural spaces as far as possible for wind circulation around the building has been one of the factors affecting the division of urban texture into separate neighborhoods and single buildings; the location of Tabriz in a cold mountainous climate as well as extroversion and the least common physics with the neighboring cities, with the purpose of maximum use of air current, has resulted in the formation of distinct urban blocks; thus, such a strategy leads to a decrease in the potential evapotranspiration, having direct effects on a decrease in moisture penetration into the physics of the architectural site.³ Dividing the city into several different neighborhoods typically facilitates running the cities (Hanachi & Pourserajian, 2012, 151). On the other hand, the above-mentioned policy towards the superficial expansion of

the urban context to lower the skyline and the construction of blocks at a height closer to the ground surface in order to lower the center of gravity has not only taken into account the destructive effects resulting from the earthquake debris (Mourieh, 2007, 51) but prevents shadowing on adjacent context, which is very desirable.

The allies being wider provided the appropriate conditions for people in cold seasons of the year. Enclosure, hierarchies, privacy, and social arenas in the neighborhoods have been observed through vegetation as long as the sunlight surfaces are not reduced, which has considerably contributed to the social sustainability of the city (Omrani & Aminian, 2006). Although different buildings have diverse uses, they exhibit a harmonious, consistent, and very beautiful image, as a result of the specific climate, materials used, and the particular culture of architecture. The countenance of the texture reflects the integration of congestion in the residential neighborhood, building height, and façade making. Building gardens play a major role in reducing the penetration of cold into the urban context, as the use of tall trees such as poplar trees as a windbreak⁴ will reduce the significant amount of energy that the unfavorable cold winds have. Therefore, the effort to prevent shadowing while maintaining the airflow to evaporate descending moisture and to prevent its ascending penetration into the building's physics is considered as one of the most important structural factors in this climate (Brebbia, 2011). (Fig. 2)

As the level of groundwater in Northwest Iran is high, building construction over stone wainscots seems necessary (Arens, 1981). (Fig. 3) It is proven that the use of materials with high



Fig. 2: Historic fabric of Tabriz by Matrakci in the 10th century (Sattarzadeh & Balilan, 2013).



Fig.3 : The installation of stone blocks in the lower construction level to prevent the increasing humidity in the Blue Mosque (c. 1491) (Moradi & Houseinpour, 2018, 101).

thermal capacity, such as stone, not only prevents humidity from penetrating the physical structure, but also results in heat storage and returning it to the building at night.⁵ Regarding the climate, the problem is the excessive cold, and that day heat should be stored for the night. On the other hand, unlike the central plateau of Iran, living on the roofs at night is not common due to special type of climate in Tabriz; and things like roof clothing storage, easy access to the roof, walls separating the privacy of neighbors, etc. are not seen.

The Role of Climatic Factors in the Development of Square Layout in Northwest Iran

In any area with population density, whether in the village or in the city or metropolis, collective human life requires specific social functions, which inevitably necessitates the gathering of a large number of inhabitants. Since a long time ago, the presence of a central gathering place has been the easiest and most reasonable solution to meet the needs of businesses and gatherings (Ebrahimi, 2009). Square meaning a vast open space, which often had important urban functions such as religious, governmental, and market elements in its vicinity, has existed in most of the established human settlements in a land, whose domain of cultural influence is known as Iran (Omrani & Aminian, 2006). Square can be a place for displaying the cultures, a symbol of ideology, a transcendent aspirations of a city, a place for demonstrating the community power or the authority of the political-economic and technical system, a place for displaying the creative power and artistic taste of city residents and a place to crystallize and consolidate myths and national beliefs (Ebrahimi, 2009). In other words, a square is a form of public space where the representation of social life is exposed to the public (Hanachi & Pourserajian, 2012, 164). However, defining a form has never been easy, which is why the type of application is always determined (Seif al-Dini, 2012). The general definition of square expresses it as the

spatial distribution pattern of human activities over a specific time (Anderson, 1996, 8). Another researcher called Handy defines an urban form as a combination of features associated with land use patterns, transportation systems, and urban design (Handy, 1996). Kevin Lynch also defines urban form as a spatial pattern with spacious, permanent, and physical elements in the city. In general, it can be concluded that urban form is the result of an assembly of many concepts and features of urban structure (Seif al-Dini, 2012).

Appropriate climate and sufficient precipitation make it possible to have access to permanent water flows, and proper political-economic conditions of Tabriz from the Ilkhanid era to the early Safavid period has transformed the city into an ideal "city garden". From this point of view, most buildings were located in the middle of a very green yard as individual mansions or the form of a central mass. However, in the interior plateau, due to the lack of precipitation, volatile air humidity, and radiation, this yard was surrounded by structures. Therefore, the moisture resulting from evaporation of the pools in the yard would be maintained to regulate human-environmental conditions and the green space of the garden as well. Moreover, with this kind of construction around the four sides of the yard in the given times, the spaces enjoying proper sunlight were used. This difference can be seen in the overall arrangement of the 'square' as much as the distinction is seen in the kind of architectural plan of the Azerbaijan region and interior plateau in this period. Although concerning the theories of Camillo Sitte, Geddes, Mumford, and other culturists and proponents of human preparedness, the concept of the square as an urban space relies on the notion that urban space is a part of the city structure that has had a consistent harmonious totality, and has an enclosed body in terms of physics (Hanachi & Pourserajian, 2012, 164), the square in Azerbaijan is referred to a vast open space where the buildings were located around or in the center of it, and this did not mean that the buildings around the square

must be necessarily attached forming four sides of a square or a rectangle similar to the architecture of the area before the mid-Safavid period - after which most of the constructions were built around central courtyard - they were mostly separated, with either a courtyard wall or only parts of them attached. New construction inside the old squares of Azarbaijan, which delete the totality of the concept of the square. Some of these include the old square of Tabriz, the square in front of Tasouj Jame Mosque, and Saheb Abad Mosque in Aq-Qoyunlu period. However, considering the specific surrounding edges (usually four sides), restoring and identifying the form of the square is easy, especially in the squares constructed in the interior plateau or following it, even if the interior space is occupied. Nagsh-e Jahan Square in Isfahan, Ganjali Khan Square in Kerman, Saheb ol-Amr Square in Tabriz (following the earthquake of 1780 in a part of Saheb ol-Amr Square), and Sar Gabr-e Agha Square are among the examples of such squares. Thus, most of the second types of squares remain or the shape of their plan can be restored (Omrani & Aminian, 2006). (Table 1)

As figure 4 suggests, like the abovementioned squares in Northwest Iran, the Saheb-Abad square is shaped based on outright disintegrated units where the Hassan Padishah mosque and a palace from the 16th century introduced its axial buildings. (Fig. 4)

Geographical Location and Historical Background of the Saheb Abad Square

The initial formation of the Saheb Abad Square is attributed

to Khaje Sheikh Mohammad Juwayni, the Grand Minister of Hulagu Khan (1218-1265 CE) (Hanachi & Nejad Ebrahimi, 2006). Based on the introduction of Jahangoshaie Juwayni, he made a large beautiful garden on the North Coast of Mehran River in Tabriz, building a royal mansion in the middle of the garden, later known as Saheb Abad Garden (Karang, 1997, 160). After the reign of Aq Qoyunlu kings (1378-1502), and choosing Tabriz as the capital, the Saheb Abad mansion attracted the attention of these kings, and after developing this place by the head of the Aq Qoyunlus, Uzun Hasan, the garden complex and Saheb Abad Square are used as the headquarters of Aq Qoyunlu kings. The most important travelogue, which gives an accurate description of this complex, is a travel story of an anonymous Venetian tourist, who comes to Iran during the reign of Uzun Hasan, the founder of Aq Qoyunlu and King Tahmasb. "...and the other one on the east, there is a large square, which opens to a garden...anytime a ceremony was held in this square (Saheb Abad), Hasan Beig came to this mansion accompanied by many of his commanders...he had sent a message that he had to go to the square and entertain himself...there were about three thousand onlookers gathering together in Saheb Abad Square, and more than twice as many people walking...it is a spritted place, and a beautiful mosque has been built in that square, where a rich and useful hospital depends on it" (Kontarini, 1970, 391).

It is evident that the large dimensions of the Saheb Abad Square not only represent political applications, but they were also the grounds for the entertainment of the king and the courtiers:

Table 1: Two different arrangement of square in central Iran (A) and Northwest Iran (B).

A			
	The square of Sar-e-qabre Aqa; Tehran; Qajarid Period	The square of Ganj-Ali-Khan; Kerman	The square of Imam; Isfahan
	B		
The main square of Tasuj; Northwest Iran		The square of Registan; Samarkand	The square of Kalian; Uzbekistan

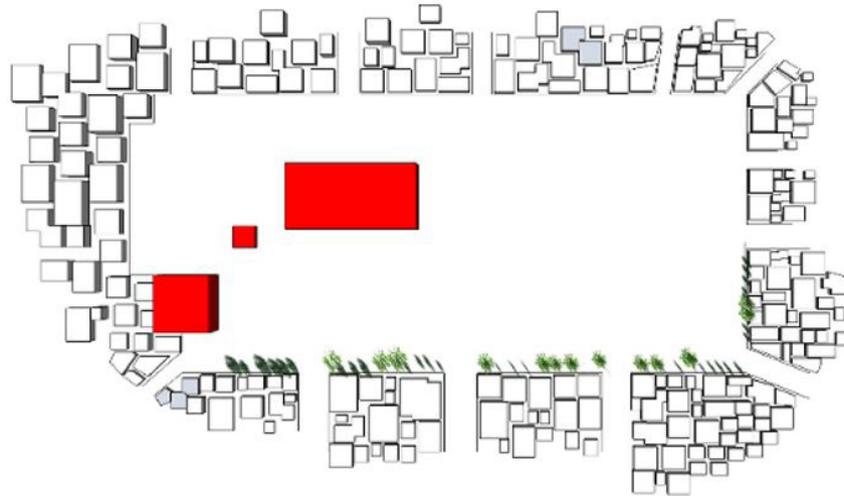


Fig. 4: Spatial arrangement of the Saheb Abad Square in Tabriz in a way that pivotal elements of the square like Jame Mosque and governmental centers are not located at the edges.

“...after settling in the Hasht Behesht palace and establishing Shiite religion, King Ismail played polo with his commanders in Saheb Abad Square.” (Büyükcivelek, 2012).

“...his majesty played polo as well as various games and stunts, which are the custom and traditions of Tabriz people, and his majesty was overjoyed, and then he left Tabriz to pay a visit to the great Sheikhs of Safavid in Darolershad, Ardabil” (Navayi, 1971, 109).

Besides, it can be said that the punishment of the disobedient was performed in this square. “King Ismail Amir Dibaj, the ruler of Gilan was hanged and burned in an iron cage between the two minarets, for being rebellious.” (Ibid).

Chardin describes the Saheb Abad Square and its applications as:

“The Saheb Abad Square is the largest square in the world I have seen so far, and it is much larger than Isfahan Square. The Turks have arranged thirty thousand soldiers for wars at this square. Every evening, this square abounds with ordinary people who gather together to have entertainments and watch the shows exposed to everyone. The entertainments of this square include shows of magicians, acrobats, trading, wrestling, rams and bulls’ fight, saying poems, reading stories, and wolf dance. This large square is not empty during the day either, in fact, is considered as a bazaar, where different kinds of groceries and cheap stuff are the merchandise.” (Chardin, 2000, 407).

Structural Arrangement of the Square in Saheb Abad District

All the studies and researches in the field of sustainability followed by sustainable public spaces mainly present three

environmental, economic, and social components, among which the environmental component has physical incidence more than the other two in the city. Although before the ninth century AH, the term “square” in Iranian literature was synonymous with the battlefield, front, battleground, etc., it should be noted that with the formation of the Saheb Abad Square, the square has entered the political-social arena as a powerful element (Hanachi & Nejad Ebrahimi, 2006). This is because politically the transfer of government from the Timurid government to the Turkmans, not only altered the structure of the medieval Ilkhanid-Timurid city, but also Iran’s proximity to Tabriz and the Ottoman Empire had direct effects on renaissance urbanism (Bach, 1972, 88). On the one hand, in addition to the Ottoman Empire’s access to superior military technology, it was thinking about creating a well-organized military to attack the target countries, among which Iran was the closest accessible one. In this regard, “square” was created as a major element of the city for organizing military groups in the northwest of the country. From this viewpoint, it seems that the proximity of Iran’s northwest with the Ottoman Empire, the conveyor of the European urbanism heritage in the renaissance, has introduced the modern concept of the square into Iran’s urbanism (Büyükcivelek, 2012, 342).

Located in the northern side of Tabriz, being far from the residential context and surrounded by two natural monuments of the mountain and the Mehran River, Saheb Abad Square had segregated the political elements from the urban context, gathering governmental elements in itself. Saheb Abad Square is located along the most important intercity trading route and city’s street market, and since easy local access for people is required in the formation of a square (Carmona, 2010), its

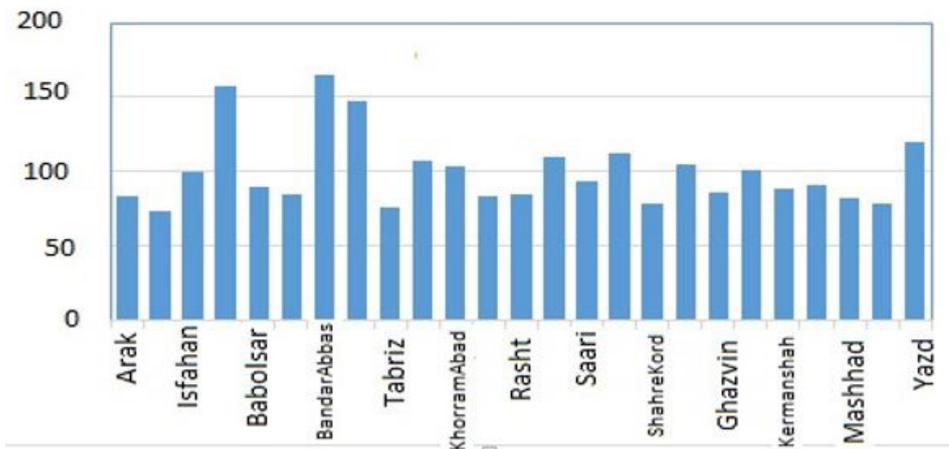


Fig. 5: The level of annual precipitation and evaporation potential in the cities of Iran (Pourdeihimi, 2011, 129)

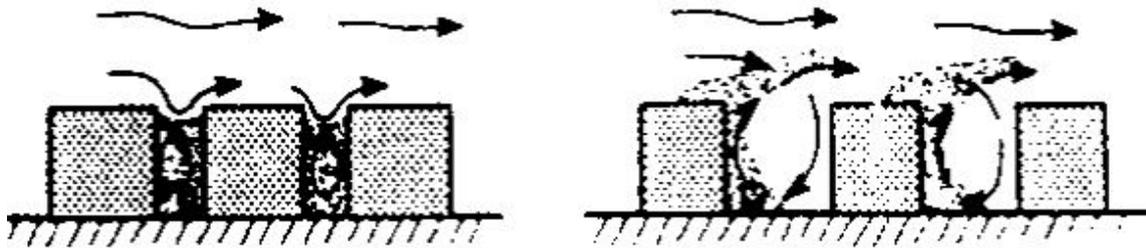


Fig. 6: Detached fabric of the city provides the air flows between the architectural elements to evaporate the existing moisture (Pourdeihimi, 2011, 129)

location is significant concerning the environment of trade centers. On the other hand, the spatial linkage with other urban scaffolding elements has expanded its access and availability to neighborhoods.

Climatically, the location of the Saheb Abad Square about the northern heights of the city had led to the formation of the cold air pool.⁶ Since the amount of precipitation in the northwestern climate is, statistically, higher than other parts of Iran, and the average temperature is lower than other regions due to its gigantic location (Pourdeihimi, 2011, 232), cold air prevented proper evaporation of precipitation. Thus, a decrease in evaporation and perspiration potential has been a destructive effect in the structure of buildings with very high amounts of moisture absorption, affecting the physics of urban elements.

(Fig. 5) As a result, the detachment of square elements has been considered as a practical solution for generating airflow to increase evaporation potential.⁷ (Fig. 6)

Many researchers have discussed the problems caused by the high speed of the wind in urban spaces (Arens, 1981; Aronin, 1956, 231; Bach, 1972, 112; Flash, 1981, 38). Aynsley has suggested that there are three major problems, those referring to the urban spaces themselves, those happening the environment around the city, and finally, the problems that would happen to the pedestrians (Aynsley, 2006). Meanwhile, the problems happening to the pedestrians have always been considered the most important regarding wind blowing, for the pedestrians feel uncomfortable when the wind speed is high and air turbulence. In addition to the effect of "clod air" factor, wind speed causes



Fig. 7: The position of poplar trees in the south and west of the Saheb Abad square to reduce the effect of undesirable wind flow. Right fig: Chardin drawing of Saheb Abad square (Zoka, 1989, 51).

some problems concerning walking, clothing mess, lifting of dust and trash into the air, etc. An issue, which has been promoted as the space-defining elements by considering urban green space at the edge of the square and the fact that it is in the direction of strong regional winds. (Fig. 7) Besides, the physical form of the city affects the range and wind movement (Camuffo, 1988, 386). From this point of view, the disturbance in the natural state of the wind is a major condition in areas with high wind speeds, but a difficult one to observe (Hooper, 1975, 112).

RESULTS AND DISCUSSION

In the view of a wider audience, urban squares are general characteristics by enclosed borders. What makes the results of this paper is that this conclusion could not have been the only feature of square all around Iran. In other words, geographical factors should be considered as a vital factor in shaping urban squares. Since the Saheb Abad square is located in a position where the surface water's level is high and the ventilation is essential to remove the descendant humidity, unlike the typical form of squares in other parts of Iran, its units are detached to provide a scientific solution for this obligation. Hence, the form of the square in the Saheb Abad square is unique to reach a sustainable development factor in Iran.

CONCLUSION

The city and climate are two manmade and natural systems, which have a close effect on one another. Climate, as far as human comfort is concerned, is the result of factors like sunshine, temperature, humidity, wind blowing, and the amount of precipitation. On the other hand, the climate of any geographical location has special suitable conditions, which are still accompanied by some limitations with regard to urban planning. In addition to considering functional, visual and aesthetic qualities in designing various spaces of

the city, paying attention to the type of urban climate as well as observing the climatic design criteria seem necessary. As; nowadays, a lack of consideration to these issues has posed unusual problems to modern urbanism.

It seems that the construction of the Saheb Abad Square in Turkman period, which is due to a change from the medieval times to the Renaissance, the result of mutual interaction between the Northwest country, as the closest urban center of Iran, and Europe has terminated the absence of several-century-old open space in Iran's urban system, introducing a square space with a new form and shape into Iranian urbanism. There is a significant relationship between form and sustainability in a way that recognizing the form and explaining its growth pattern is considered an important step in achieving urban sustainability. Accordingly, the implementation of policies and strategies of urban planning and designing must achieve an optimal form. The spatial arrangement of the square in Saheb Abad in Tabriz is exactly in line with the environmental and climatic conditions, having a unique identity for its region. The inconsistency of this approach with the tradition of modern urban designing in Iran implies that although attention has been paid to the components of climatic design in creating urban spaces in most of the ancient urban contexts in several climatic regions of Iran, considering the process and products of urban designing in new cities of Iran reveals different and somewhat controversial content.

Attention to developing comfort conditions is significant not only inside, but also around, and outside urban spaces, so detached urban context should consider the most important pattern of square design in the northwest of the country. In this climate, urban neighborhoods keep a distance from one another to prevent shadowing each other. On the other hand, such a mentality will increase heat absorption and help control the dominant winds in the square space, because as the distance between the architectural elements increases, more radiation

will reach the ground and the building sheath as well, and this is linked to the concept of a sustainable city, which seeks to provide solutions against mortal patterns of the physical, social, and economic development that can prevent the destruction of natural resources, biological systems, and the decrease in the quality of life of the human beings living now or in future. Although fractures in the irregular spatial design of the square help reduce wind speed, considering the influence of climatic factors on the formation of such a square, the perspective of the crucial elements of the square and the lack of visual attraction of a dominant building creates a state of spatial attraction in the square, so the observer is not attracted by a specific building.

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ENDNOTES

- 1- A significant change in the mean of meteorological data during a given period of time is called climatic change. In fact, climate is the mean of the quantities determining the weather condition regardless of their time of occurrence (Chang, 1959); in other words, climate is a function of location, but does not depend on time (Kasmayi, 1995, 90).
- 2- Considering the role of the radiation, two basic factors should be taken into account, namely the intensity and duration of the radiation (Pourdeihimi, 2011, 141).
- 3- According to the definition, the precipitation and evaporation potential refer to the combination of evaporation of the surface of the soil and plants precipitation whenever water existing under the ground in infinite (Chang, 1959).
- 4- It should be mentioned that this very process is used to prevent fruits from freezing in the gardens of Azarbaijan.
- 5- In general, the implementation of stone waiscost in buildings is the characteristic of Iranian architecture in the northwest of the country, which the trend of this continuous trend was evident even in Qajar urbanization until the early revolution.
- 6- The accumulation of cold air in the limited basins between the highlands or valleys in the mountains on calm nights having a Clear sky is called the phenomenon of cold air lakes (Pourdeihimi, 2012, 75).
- 7- The lower the evaporation and precipitation, the less evaporation occurs in the building, which is absorbed by the building, and finally will cause problems as it is absorbed while ascending the physics of the building (Pourdeihimi, 2011, 237).

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