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Studying the Vulnerability Reduction and Physical-Spatial Organization of Bojnurd City through the Urban Land Use Planning (Case Study: Flood)

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Abstract- Natural hazards are considered as a part of inevitable realities, the occurrence of which is largely beyond the control of human beings. Natural disaster management, especially floods, is a set of measures to reduce before, during and after the occurrence of disasters and their effects and side effects. Meanwhile, the flood phenomenon is one of the unforeseen and devastating events in the country.BojnurdCity has not been safe from the threat of floods by being located in the direction of rivers that cross the city transversely and longitudinally. Accordingly, the present study was conducted to identify the vulnerable areas of Bojnurd against the dangers of floods.The research method in this research is descriptive-analytical. First, the indices' weights were determined by 15 experts of Bojnurd Municipality and related specialists and were determined using Expert Choice and GIS software and using AHP models and fuzzy operator.Delphi method has been used to explain the indices for assessing the vulnerability of Bojnurd city in the face of floods.The results showed that Bojnurd City is in relatively high risk in terms of flood vulnerability.In general, the areas in the south, the western part and the outskirts of city are less vulnerable than the rest of city. Moving from the south to the north of city increases the vulnerability.

Keywords: **Urban Land Use, Vulnerability, Flood, Bojnurd, Sustainable Urban Development**

I. INTRODUCTION :

Today, due to the obvious changes in the structure and organization of cities, it has made them very vulnerable to unexpected events. Many scientists argue that the world is more dangerous than it used to be.We live in a world where the dangers we create are as much or more than those imposed on us from the outside world (Anbari, 2004).

Natural disasters cause great human and financial damage to human societies every year, so that the 90s was declared by the United Nations and the World Meteorological Department as the decade of natural disaster reduction and invited all countries of the world to cooperate with global institutions and organizations to pay more attention for reducing the effects of such disasters.It had many goals, the most important of which was to change behavior in response to natural disasters, but now the main goal of most countries in the world is to take precautionary measures before the disaster and try to change the public mind to preparedness. Before it happens, this important issue requires special management, training and joint efforts of all.The phenomenon of flood has found a new face due to the expansion of large cities and has opened a new place in urban studies under the title of urban flood (Ghahroudy, 2009, 1).

Flood is considered as one of the natural hazards and limiting development, especially in riverside lands. Therefore, studies related to flooding and flood control is one of the important goals in watershed management plans and water resources management.In addition, awareness of the situation and knowledge of flood areas, help planning to optimize the use of natural resources and reduce financial losses to various sectors (MajidiHeravi et al., 2015: 100).The results of study can be effective in reducing the financial and human losses due to the lack of improper location of Bojnurd City and the occurrence of natural disasters such as floods (Askarizadeh, 2010).

II. THEORETICAL FOUNDATIONS AND LITERATURE REVIEW:

Natural disasters are usually associated with the destruction of income sources and biological facilities, as well as the health of residents and are always a serious threat to development, especially in developing

countries (Badri et al, 2013: 38).According to the Sigma study in 2017, there were 301 catastrophic events, 183 of which were natural disasters. Natural disasters are mainly due to severe storms, rain and earthquakes.Economic losses in 2017 have almost doubled compared to the previous year, 2016, and 180 $ billion to 337$ billion in 2017 (Jazayeri et al., 2019: 52).

Floods occur in most environments, especially in coastal, mountainous, and lowland floodplains, and are more common in arid and semi-arid climates. Heavy rainfall, rapid snowmelt, sea level rise, steep slopes, infiltration rate, vegetation, dam failure (natural and artificial), urbanization, land use change and deforestation are some of the effective factors in the occurrence of floods (Karami, 2015, 5).To control the floods, it is necessary to first know the causes and factors affecting flooding. The most important of these factors is theclimatic factors. Among the elements and climatic factors, rainfall plays the most important role in the occurrence of floods. In this regard, the amount of rainfall and the type of rainfall and the other characteristics of rainfall are noteworthy.It is obvious that due to heavy and prolonged rainfall, the soil is saturated and surface runoff increases. However, we should know that convection rains do not have the opportunity to penetrate the ground due to their high intensity and coarseness, and instead of flowing deep into the ground, they flow and increase the Vol. and intensity of runoff.As a result, huge and destructive floods are caused by this type of rainfall. This type of precipitation is more specific to the climate of arid and desert areas (which lacks sufficient vegetation and the soil is also fine-grained and poorly permeable), (Taghvaei and Soleimani, 2008, 3).

The issue of urban safety against natural hazards is one of the main goals of urban planning; it is very important to educate about the vulnerability of urban issues and to know the extent of their vulnerability to natural hazards.Paying attention to these risks and crises is an undeniable necessity of the crisis management system and the structure of crisis management. Natural hazards in many cases have destructive effects on human societies.The consequences of these phenomena are changes in environmental conditions, which in turn leads to the disruption of normal life and destructive effects on the settlement and imposes extensive economic and social damage in communities (Memarzadeh&Sarfarazi, 2010, 8).

In recent decades, the vulnerability of cities to natural disasters has received special attention. Vulnerability is a special internal and dynamic feature in any system that is usually considered as a hazard. Earthquake susceptibility is a basic concept in this research and a fundamental name in planning, prevention and reduction of damages (Meshkini et al., 2014: 845).Due to the issues that have occurred in recent years in the field of natural disasters, much attention has been paid to studies in this field, some examples of which are mentioned below:

MawdudiArkhodi et al. (2015) did a study entitled “Explaining the Resilience of Rural Areas Against Natural Hazards with Emphasis on Floods”. In this study, their statistical population includes 13 villages in the central basin of Ghaem city where are at high risk of floods; the statistical sample of the study consisted of 10 natural hazard specialists and 335 residents of the study village, which was done using the AHP technique.They concluded that the resilience of study villages was moderate, however the resilience of the villages has been different.

Rajabi et al. (2015),did a study entitled "Vulnerability Zoning of Natural and Geomorphological Hazards of Saqez Settlements (Case Study: Flood and Earthquake)".The results show that out of the total number of villages in Saqez city, 145 villages are in relatively high-risk zone and 135 villages are in relatively moderate risk zone.

- IsmailiAlavijeh et al. (2017),did a study entitled "Vulnerability Assessment of Urban Areas Against Floods with Fuzzy Logic (Case Study: District 22 Of Tehran City)".The results show that according to the final map and the percentage of population density in the northeast of area, near the Kan River (more than 1.07%), the probability of vulnerability in this area is high.Also, due to unauthorized constructions in the area of Kan and Vardavard rivers, it causes water to accumulate and release it in the region at once.

- Mousavi et al. (2016),did a study entitled "Evaluation and Zoning of Flood Risk Using Fuzzy Logic Topsis In GIS Environment (Case Study: Baghmalek Watershed)". The results show that 17.86% of the area is in the very high-risk category and 24.15% is in the high-risk zone.

- Schmidt et al. (2012), have modeled the risk of multiple disasters, including earthquakes, volcanoes, floods, winds and tsunamis, and have developed software called RiskScape that is able to take multiple risk risks. Of course, this software is written in JAVA language and has some limitations. In this study, the risk outcomes were not considered and were determined independently.

- Hansen et al. (2008) did a study entitled “Risk Management and Climate Change” has examined the effects and results of crisis management in reducing the damage caused by climate change on agriculture and rural livelihood.

-Javanberg et al. (2009) examined multiple hazards in the Vital Arterial Network at the University of Tokyo. In this analysis, the network of vital arteries is considered in the form of nodes and links and it is considered the failure in each of them and its simultaneous effect on the link and the other nodes and finally the risk of failure is obtained.

-Barake et al., (2006), have studied and determined the risk of multiple hazards according to the probabilities and finally have quantified the risk of hazards (assets and arterial network). In this study, failure in systems such as vital arteries, which are in the form of links and nodes, has been considered.

III. METHOD :

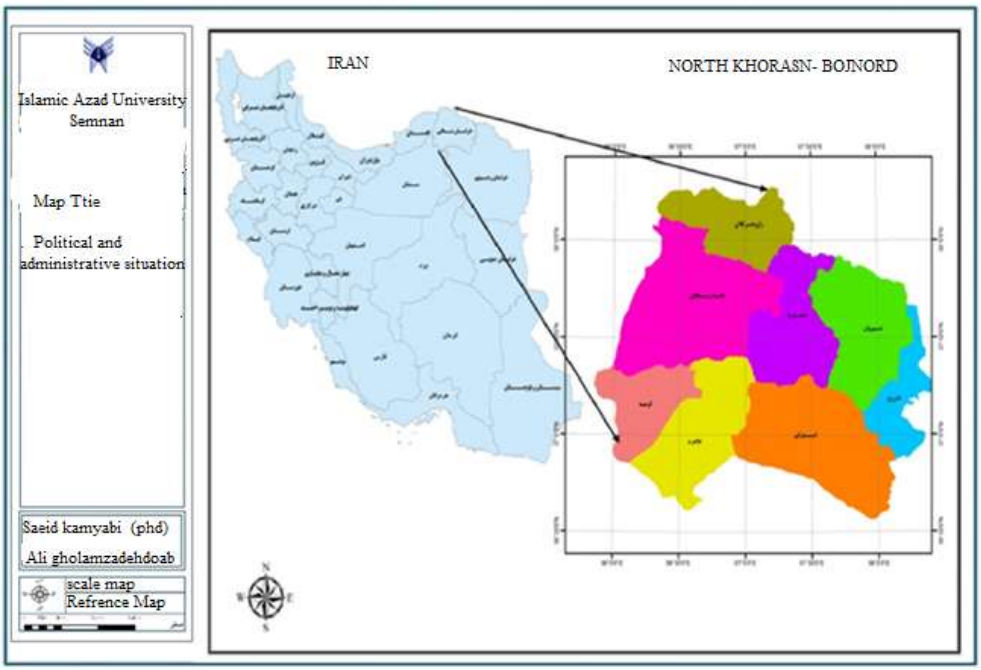
The present study has been done in two descriptive and analysis sections. In the descriptive section, descriptive data were collected using library-documentary studies appropriate to the purpose of the research. In the analytical section, the model used to determine the vulnerability of Bojnurdagainst the floods, is the AHP model and the Fuzzy operator.The statistical population of the present study is experts related to the fields of urban planning, crisis management and water resources of Bojnurd.In this regard, due to the specialization of the research subject, questionnaires were distributed and completed for 15 managers and senior experts of Bojnurd Municipality and specialists related to crisis management by purposeful sampling method and using software Expert Choice and GIS and the vulnerability of Bojnurd city was determined using multi-criteria decision-making models.Delphi method has been used to explain the indicesfor assessing the vulnerability of Bojnurd city in the face of floods.

The fuzzy function has been used in order to measure the vulnerability in terms of flood,so that, based on the results of Delphi method for each of the criteria mentioned above, the weight and the importance were determined and alsothe vulnerability of city was determinedbased on the weights obtained in fuzzy model for effective use of assessing flood.After that, the weights obtained in GIS were entered and using the Weighted Overlay function, the vulnerability zones of Bojnurd city were prepared and determined.

Research Area:

Bojnurdcity is located in the North Khorasan province, in latitude19 56 to 43 57 and longitude 37 37 to 17 38. This city with a total area of 3215 square kilometers, is located in the center and continues in the north and northwest. From the north and the northeast is co-border with Turkmenistan, and from the northwest withRaz and Jargalan County, from the west withManeh and Samalqan County, from the southwestwithJajrom County, from the southwithEsfarayen County and from the southeast and east withShirvanCounty.BojnurdCity isextendedbetween 37 degrees and 27 minutes and 27 seconds to 37 degrees, 29 minutes and 31 seconds of northern latitude and 57 degrees, 17 minutes and 4 seconds to 57 degrees, 21 minutes and 36 seconds to eastern longitude, and its height from sea level is 1070 meters.Bojnurdis located in 30 kilometers northeast of Saluk Mountains and 13 kilometers south of Atrak River and is located 270 kilometers northwest of Mashhad and 695 kilometers east of Tehran.The city is 55 kilometersfrom the border with Iran and Turkmenistan. The area covered 1900 hectares of Bojnurdplain lands (Statistics Center of Iran, 2011).

According to the latest divisions of a country approved by the Ministry of the Interior, Bojnordconsisted of two districts and five villages.

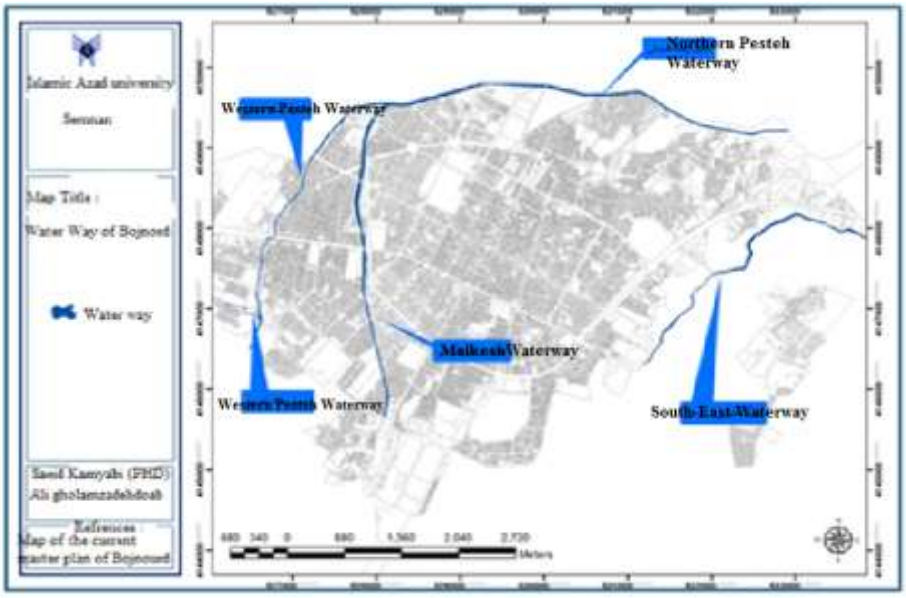


Map 3-1. Political and administrative situation ofBojnurdCity

IV. ANALYSIS OF RESEARCH FINDINGS:

Waterway s of BojnurdCity

Three major waterway s in BojnordCityare the subject of this study and, based on an overview of the status and characteristics of thesewaterway s, are as follows:



Map 4-1.Waterways of Bojnord

South-East Waterway (FiruzehWaterway)

It flows from the southeast and east of the city to the northeast, with a length of about 4.5 kilometers, and an average width of 22 meters, with an average distance of 300 meters to the western residential context. The percentage of slope to the north is reduced, therefore the lands around are subject to the flood.

Thereis gardens and agricultural lands in two sides. The waterway is borderline and bounded to the east of the city. The vacant lands around the road with regard to the ring road and the announcement of residential reserve are highly exposed to plotting and unplanned construction and are considered a future threat. However, nowadays vacant land around the residential context is an exceptional opportunity for the city. The main axis of the city continues as the road of the Farhangiyan town through the waterway and immediately passes through the hill. Thewaterway in the plan is protected by green area and any construction is prohibited. The area is 30 meters from the west of pit and the total area is about 50 hectares. Due to the relative possibility of providing water and the surrounding environment, this waterway can be a very valuable natural park for the city, with a slight shiftof ring road.

The eastern and southeastern pit remain relatively clean due to the relative distance from the habitat, and seasonally there is little water flowing there. Thispit is the only natural landscape in the natural space of the city, and is surrounded by cultivated fields and gardens, and the construction in this area is smaller than in the western area. It has a good quality as a city landscape.

An Overview of the Most Important Role of South-Southeast Waterway (Firuzeh) at the Present and Future

Obviously, the main role of waterway is the disposal of urban floods and surface water, however, it plays a role in the structure and organization of the city (the interaction of artifact organizers and natural organizers).In this regard, the south and south-eastern pit studied in Bojnurdcan play a role in macro look (A) and along the path (B), and create different and meaningful urban sequences.

Identify and Introduce Inappropriate Uses based on the Plan Area

In objective observations, it has been found that the inadequate use has not been established in the area of the study. Thereare residential, administrative, educational and cultural space residential, far away from the area of the project, which is currently the only improper use of the warehouse, as well as themacaroni factory, located outside the area of the project and at a distance of about 400 meters.

Physical Features of Buildings and Passages

Investigation of the Fragmentation and Full and Empty Status of Buildings

There are the agricultural lands and gardens around the southeast and south pit. A few residential complexes have been built on this route, all new and small which are outside the area of the plan. The history of floods and construction failures is less in this area, due to the flooding feature. It was also found that, besides the residential spaces, the rest of the pieces were coarse grains.

Studying the Height and Floors of the Building of the Area

Bojnurdis generally a horizontal city with two to four-floor buildings. The skyline of the city is entirely horizontal and almost uniform. High-rise buildings, especially in the center of it, are rarely observed. In the area of pit, there is no construction, and there are only a few two or three-floor complexes that are new. There are most the garden and agricultural lands within the pit area, with only about 2 hectares of one-floor buildings and about 5882 square meters of two-story buildings.

According to the observations, it was found that in the adjacent area of the pit, most of the buildings have a brick, stone and glass view, which reflects the development of the city towards modernism. Most new buildings are constructed after Bojnurdbecame the center of the province. Most of the residents want to have villa houses, but they have stated that they would prefer to build multi-floor buildings, given the high cost of land and the economic benefits that landlords and housing owners receive.

Qualitative Study of the Passages of the Area

Not nay passage ends to the pit, due to the fact that it is surrounded by the agricultural lands and gardens. Most passages close to it, are also sandy with low width, about 8 meters. In the mental images of the citizens, the only important and paved passage that interrupts it, is the Farhangiyan Boulevard, which passes through this waterway to the Farhangiyan town.

As mentioned, 89% of the residents have assumed the street, the main spaces around the waterway. Even some citizens have described the street as the most interesting place they know.

Pesteh (Doberar)Waterway

This is one of the longest waterway s in the city (about 9 kilometers), continuing from southwest to northwest, after the annexation of Malkeshpit to the north of the city; it is divided into two parts by feature.

Western PestehWaterway

It is located in the west of the city and the current developmental boundary of the city and flows from the north to south, as an urban pit with a length of about 4 kilometers and an average width of 10 meters and a distance of 8 to 12 meters in the middle of the bed. The green area proposed in adjacent empty contexts is 15 meters from each side (about 15 hectares). In the northwest, there is floodingproblems, in principle, the disposal of surface water. This urban waterway is becoming a garbage dump and is extremely polluted due to its bad habitation, border uses and lack of belonging sense.

The western pit (Pesteh) is northern-southern, which goes on to the north after connecting to Malkheshpit. Many parts of this pit is partitioned. Currently, it is a sewage disposal site for the workshops, repair shops and pastoralism. In the past, it was the western border of the city, but at the present time, in the western part of the construction, it passes through the border of pit and has formed the new development of the city along Mashhad-Tehran road.

Studying the Main Role of the Western Waterway (Pesteh) At the Present and the Future

Obviously, the main role of waterway s is the disposal of urban flood and surface water, however, depending on their circumstances, and their presence area, play a role in the structure and spatial organization of the city (the interaction of artifact organizers and organizers); they can have positive and effective roles, despite their separating status and edges. In this regard, the studied pit s in Bojnurdcan play the role in some modes: in macro look (A) and in their path (B), and create different and meaningful urban sequences.

Land Use and Functions

Studying the Land Use and Its Quality In Relation To the Users' Classes

The land use of the surrounding area is now more residential. A huge part of Pestehpit has been resettled in the current state.

In general, the waterway does not have a desirable quality and, according to a survey of people, 90% of them consider the waterway as a waste dump and have asked to cover them.

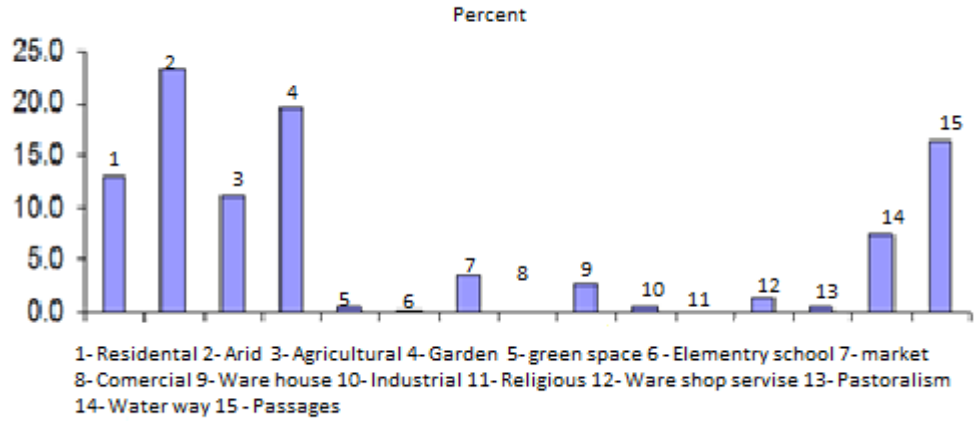


Chart 1- AvailableStatusUsein the Western Border of Western Pit (Pesteh)

Identifying and Introducing Inappropriate Uses Based On the Western Pit (Pesteh)

According to the above, the most important inappropriate uses on the western pit (Pesteh)are the workshops and livestock where are the most important environmental and visual pollutant factors. The transfer of these functional units to the out of city should be one of the main factors on the agenda. Also, defining the airport's entrance and arranging the surrounding housing context will cause the visual enhancement of the area.

Physical Features of Buildings and Passages

Studying the Fragmentation and Full and Empty Status of Buildings

The quality of the buildings is also somewhat appropriate, due to the approximate location of the waterway in the new parts of the city. The Pestehpit is a western border and actually surrounds the west of the city. Most of the buildings around this pit are new. The largest part of the plain is located between the Golestan Boulevard towards the south. Compressed and fine-grained context is located on the eastern side of the pit, and the buildings in this part are older than the west. Most of the empty spaces are on the west side of pit.

Qualitative Study of the Passages of the Area

Regarding to the location of the western pit (Pesteh) inside the city, most of the passages end to asphalt, although not suitable. It is observed that the maximum number of passages is 8 to 2 meters. This indicates the traffic importance of the pit and also the importance of it as a part of the city center.

There are many passages on the path or intersection with this waterway , the most important of which is the Golestan Boulevard with a width of 44 meters and Taleghani Boulevard with a width of 36 meters (the table below shows the number and width of the passages along the path of the western Pestehpit and the north).

passage width	6 meters	8meters	10meters	16meters	30meters	36meters	44meters	sum
numbers	15	4	4	2	2	1	1	29

It is observed that many numbers of connected or adjacent passages with the west and north Pestehpit is 6 meters. At present, the traffic importance of this pit is less than Malkeshpit,but can be planned as a future capacity. The most important problems were the traffic jams and the lack of pedestrian routes, which accounted for 65% of the traffic jams in passages ending to the Pestehwaterway and toMalkesh passage. Nearly 100% of the residents had a lack of equipped spaces for pedestrians.

Northern Pesteh Waterway

It is located in the northwest after joining Malkeshpit to the northeast and on the northern border of the city about 5 kilometers in length, with an average width of 15 meters, and a distance of 12 meters (this area is not enough); in a detailed plan, protective green area is considered from 15 to 40 meters on each side of pit. There are the agricultural lands and sometimes gardens on this part of the pit; it has thecondition for creation of linear protective green space. The vacant land on the south side of pit (within the area) has a very good potential for improving the condition and improving the living conditions of the northern contexts (the region with a general border feature) and setting upthe macrouses of urban scale. Continuing the main north-eastern axis of the city, is a good place to use the vacant lands in connection with the pit and its privacy to provide a kind of service between the city and the surrounding villages. The creation of green zone in this area usually does not have a significant effect on the northern view of the city. In general, a clear strategy has to be developed regarding the existence or appearance of tangible green spaces in BojnurdCity. The main challenge is that a kind of spread and vegetation is imagined in mind, and make the condition of the city acceptable in terms of green space, due to the presence of gardens and even agricultural lands in urban context, as well as the specific nature of the environment surrounding the city of Bojnord.Therefore, addressing the development and maintenance of public green spaces in BojnurdCity should be considered as one of the most basic and priority urban management strategies.Under these conditions, green conservation areas that are appropriately linked to the surrounding area and the city, have the fundamental importance. The green landscapes caused the negligence and the city, in the unpardonable invasion of the unsustainable constructions of Mashhad city,

was rapidly losing its green landscapes.BojnurdCity, on a much larger scale, may be the victim of this neglected image.

Studying the Main Role of the NorthernPestehWaterway at the Present and Future

Obviously, the main role of waterway s is the disposal of urban flood and surface water, however, depending on their circumstances, and their presence area, play a role in the structure and spatial organization of the city (the interaction of artifact organizers and organizers); they can have positive and effective roles, despite their separating status and edges. In this regard, the studied pit s in Bojnurdcan play the role in some modes: in macro look (A) and in their path (B), and create different and meaningful urban sequences.

Land Use and Functions

Studying the Land Use and Its Quality In Relation To the Users' Classes

The land use of the surrounding area is now more residential. There are the agricultural and arid lands in the west part. The only large-scaleuse on the west side is BojnurdAirport.In general, the waterway does not have a desirable quality and, according to a survey of people, 90% of them consider the waterway as a waste dump and have asked to cover them.

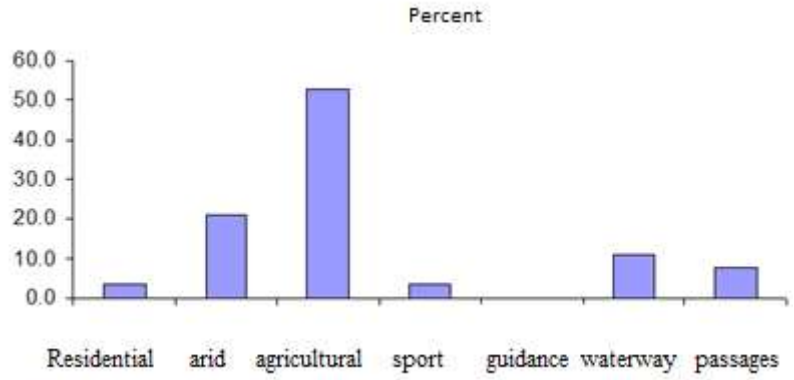


Chart 2- The current status use on the border of North Pestehpit

Identifying and Introducing Inappropriate Uses Based on the NorthernPestehPit

The only inappropriate use, which may be considered as an advantage, is the establishment of Bojnurdairport in the area of this pit; it is also an obstacle to the city progress.The presence of the airport is one of the issues that most people in the area regard it inappropriate.Also, the presence of self-contained and unplanned residential complexes have created an inappropriate visual landscape around this area, which should be one of the first principles to be taken into account.

Physical Features of Buildings and Passages

Studying the Fragmentation and Full and Empty Status of Buildings

The quality of the buildings is somewhat appropriate, due to the approximate location of the waterway in the new part of the city. Pestehpit where is the northern border, has the highest percentage of empty spaces. Most of the residential complexes located within the area are fine-grained and newly built, which are almost entirely to the west of the airport. There are the agricultural lands and gardens in west side of pit from the airport to the end of the pit.

Qualitative Study of the Passages of the Area

There is only one passage in the length and parallel of this pit, which is sandy and has a width between 6 to 10 meters. Other passages leading to pit are also within the boundaries of the soil plan, with a maximum cross-section percent is between 6 to 10 meters, only passage ending to the asphalt airport and a cross-section of about 12 meters.

MalkeshWaterway

It extends from the south to the north with a length of about 4 kilometers and an average width of 10 meters and a 12 meter distance from the center of pit, almost from the center of Bojnord, and is considered as the most important urban waterway. A detailed plan in areas where the space has been provided, offers a free vegetation area of latitudes ranging from 15 to 35 meters, with an area of about 10 hectares. Malkesh waterway is aborderseparating the old urban context from the new development and the activity and movement axis of this waterway, introduce it as an opportunity to link two parts of the city to east and west on one hand, and connect the north and south of city to each other through a urban space with high social capacity, on the otherhand. The waterway area is occupied and constructed in some parts. The empty lands of surrounding area should be identified and quickly acquired due to the importance and also the relatively high value of the land on its path.Parts of this waterway have a high potential for creating active urban spaces, and in the intersection with the important inner city axis, eastern-western part of the city, can be one of the most significant urban spaces.

The empty lands from the beginning of waterway in the south of city to BeshQardashroad, several empty spaces along the route, and the presence of spaces and administrative buildings around the pit toAfarinesh Park, the vast open spaces available on the sides of the pit afterAfarinesh Park, (intersection of Tehran route) to the location of Pestehpit,have provided a very good condition for playing the role of urban scale and the role of linking in the adjacent regions.Action in this direction is more important than the other pit s, due to the density, importance and relative value of the surrounding areas, which are heavily influenced by the rapid development of Bojnord.Another major challenge for Bojnourd development is the creation of suitable urban spaces that are commensurate with the dignity of the province capital and at a relatively short time. As a matter of fact, such spaces are significant in the center of the city, and in the downtown area of Bojnourd, (which change is neither possible nor desirable), changes are gradual, costly and intangible. This look, reveals the importance and inescapable value of Malkeshpit in creating the urban spaces of the index and a new urban landscape and perspective in the downtown area in conjunction with the existing urban spaces.

The presence of spaces and administrative buildings adjacent to Malkeshpit and in line with the role of urban scale and the role of linking of this pit

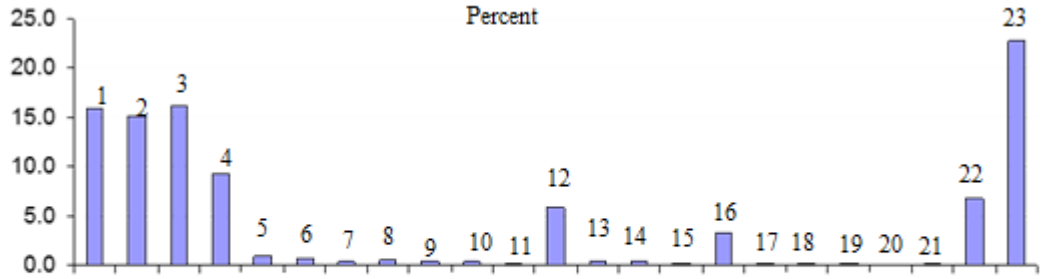
Studying the Main Role of Malkesh Waterway at the Present and the Future

Obviously, the main role of waterway s is the disposal of urban flood and surface water,however, depending on their circumstances, and their presence area, play a role in the structure and spatial organization of the city (the interaction of artifact organizers and organizers);they can have positive and effective roles, despite their separating status and edges. In this regard, the studied pit s in Bojnurdcan play the role in some modes: in macro look (A) and in their path (B), and create different and meaningful urban sequences.

Land Use and Functions

Studying the Land Use and Its Quality In Relation To the Users' Classes

The land use of the surrounding area is now more residential. Malkeshpit where goes through the city center, has a dense residential context, and in some parts of its center, the administrativeuses aremore located. In general, the waterway does not have a desirable quality and, according to a survey of people, 90% of them consider the waterway as a waste dump and have asked to cover them.



Residential 2- arid 3- agricultural 4- garden 5- green space 6- elementary school 7- junior school 8- high school 9- commercial-residential 10-market 11- commercial 12- administrative 13- cultural 14- recreational tourism 15- Installations 16- oil company 17- remedial 18- industrial 19- military 20- workshop services 21- pastoralism 22- waterway 23- passages

Chart 3 - Use the status quo on the Water way of Malkesh

Identify and Introduce Inappropriate Uses on the Plan Area

Inappropriate uses around this waterway are the existence of workshop and industrial units, with most of the waste water flood into this area. Also, the existence of commercial units such as door and window workshop, engine and machine tools on the border of pit also caused pollution.

Physical Features of Buildings and Passages

Studying the Fragmentation and Full and Empty Status of the Buildings

The quality of buildings on the western side is somewhat appropriate due to the approximate location of the waterway in the new areas of the city.Malkeshpit separates the medial context from the border context and has an older context than two other pit s. The number of destructive complexes on the border of this pit, especially on the east and south side, is available. It has the greatest number of coarse-grained complexes in comparison to the other, the largest of these coarse-grained complexes are between Taleghani Street and Imam Reza Street. In the center of the city, almost empty contexts are rarely seen, except for the southern parts of this pit and also on the border of Golestan Boulevard.

Qualitative Study of the Passages of the Area

Regarding to the location of Pestehpit andMalkeshpit inside the city, most of the passages end to asphalt, although not suitable.

Width of passage	6meters	8meters	10meters	12meters	14meters	16meters	18meters	20meters	22meters	24meters	36meters	44meters	sum
numbers	5	12	8	4	1	3	1	4	1	2	1	1	43

It can be seen that the maximum number of passages is 8 to 20 meters. This indicates the traffic importance of this pit as a part of the city center.

The most important problems are the traffic jams and the lack of pedestrian routes leading; 65% of people stated the traffic jams in the passages leading to Malkesh waterway, as the problem. Approximately 100% of the residents expressed regret about the lack of equipped spaces for pedestrians. Some of the referrals to pit have mentioned the problem of passing through the pit.

V. CONCLUSION :

According to the studies and field survey, there are three main routes in Bojnurd city (Firuzehwaterway,Pestehwaterway (west and north), Malikshwaterway). due to its proximity to the old

gardens and the irrigation water, Firuzehwaterway has the characteristics of preserving and strengthening the natural characteristics of the land and enjoying the conditions of tourism and spending leisure time.Bojnurd city airport and also Mashhad-North-Tehran road is located on western Pestehwaterway.The airport is a barrier that has become the most important factor in preventing construction. Existence of this strong urban edge (airport) which is an obstacle to the continuation and progress of city and also by strengthening it and creating a protective green space in the western part of city will be one of the factors that make the northern border of city bolder. In the case of Malikwaterway, many offices are located on the outskirts of this waterway, and in fact, a huge administrative pole has been formed around this waterway.The most important roads of the city have passed through this waterway, and the proximity of thesewaterway shas caused major uses around the waterway as well as traffic around it.In the studies, the most important causes of pollution in the space of waterway were identified by the citizens themselves, which, of course, was also due to the lack of supervision on these urban spaces.Establishment of land uses in the immediate area, including warehouses, industrial workshops and macaroni factories, which may increase the risk of noise pollution due to the passage of residents' vehicles and the risk of environmental problems due to unsanitary disposal of industrial effluents, has been inadequately diagnosed.According to the study, the water in the waterway s is also polluted. Almost half of the citizens said that water pollution is caused by stagnation and stench, and as a result, causes unpleasant odors and the spread of various diseases in the region.

Therefore, according to the results of face-to-face interviews as well as the fuzzy function model, it was determined that the east of western Pestehwaterway, and the west of northern Pestehwaterway and around Malekshwaterway, the factors such as unauthorized constructions, non-observance and attention to the waterway area, high density, and the high height of buildings have increased the vulnerability of Bojnurd city to floods.

VI. SUGGESTIONS:

- Attempts to stabilize or change the uses of vulnerable sites to unbuilt uses such as green space, parks and sports spaces

- Efforts to acquire land in vulnerable areas for the construction of temporary accommodation camps, and medical stations

- Lack of population new loading and other uses within a radius of 500 meters to waterway s

- Efforts to create open spaces among residential masses in addition to selected sites due to the lack of these spaces within the city limits

- Preparation and construction of multi-purpose uses in vulnerable sites such as sports complexes, meeting halls and etc.

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