

## Using of natural patterns in urban design & planning (Case study: Mashhad meddle area)

Mohammad rahim Rahnama, Samaneh Sherkat, Mohammad Homaeefar

Assistant Professor Geography & Urban Planning department, Ferdowsi University, Mashhad, Iran

PhD Scholar Department of Geography & Urban Planning, Ferdowsi University, Mashhad, Iran

PhD Scholar Department of Geography and Urban Planning, Ferdowsi University, Mashhad, Iran

**Abstract:** - Meddle area of Mashhad is important area due to gardens, macro land uses and open & green spaces. Using of natural adaptable patterns in order to promoting urban environmental quality. Also have been done comprehensive and master plans in order to improving quality. The purpose of research is improving urban environmental quality and creating relation between natural structure and spatial –physical structures. Research method is "descriptive- analyzed". The process of research is analyzing of some patterns such as: mosaic pattern, branch pattern and etc. on the other hand, has been tried, determination better factor for approaching sustainable city. Analyzing natural pattern is important for strengthening urban factors. The findings show, using from forms, physical structure, and natural shape create appropriate urban environment.

**Keywords:** *natural models, branch pattern, background pattern, mosaic pattern, native city, west central area*

### I. INTRODUCTION

Natural environment has been concluded from all of elements, natural process in every aspects such as landscape and viewpoint, shape of earth, plant cover and etc. also , it could be analyzed as value models such as basic models , earth shape model , landscape model , ecosystem model and etc ( bell , 1999: 26) . These models and process have value factors, such as sustainability, various, beautifully and etc. so, they are as the best models. Indeed, natural environment, viewpoints create peaceful spaces (Lang, 2003: 87).

Cites growth inharmonious, due to developing and physical changes. So, there aren't physical environment quality in our cites. This process has been resulted physical and spatial models. Today, physical models don't support quantity and quality condition for residents. Thus, physical changes, decrease environment quality and create many problems (mehdizadeh, 2004:105). Cities haven't value spaces due to don't applicability with needs of residents, requests and behaviors models, also don't applicability with environmental and natural conditions. Also don't use from natural factors such as viewpoint, sun and etc.

The main problem is mentioned criteria and values in design models and urban planning, don't provide needs of residents both quality and quantity aspects. On the other hand, it decreases quality of natural environment (special in large cities). There are reduction of quality in many cites. They are:

Don't use from values and opportunity of natural environment such as winter ray, don't appropriate urban infrastructure especial in transportation , don't exist urban security system in crisis condition such as sail , earthquake , don't responsibility functional spaces and etc . They are begging new problems in cites now.

In this research, have been studied better models in design and urban planning that adapt with natural models in city. There are many gardens and land uses in Middle area in Mashhad. So this district has appropriate potential for creating open and green spaces that adapt by natural condition.

#### Research purpose

Total purpose in this research is, adapting physical condition of middle district with natural models in urban planning and urban design. So subdivided are:

- introducing various natural models in urban planning and urban design
- Measuring, compatibility of middle area by mentioned models.

- Proposing appropriate model for middle area in Mashhad.

### Research method

This research is "descriptive –analytical". So, has been analyzed physical structure of studied area. Also, research method includes seven parts. They are:

- documental and liberality studies in order to introducing natural models in urban planning
- evaluation studied area with mentioned patterns
- creating plan and geography information (GIS) in order to update information

So, at first was considered proposed natural models in order to using from natural factors and approaching development models. Then, was analyzed mentioned area in several aspects. At finally, was compared studied area by considered model and finding challenges.

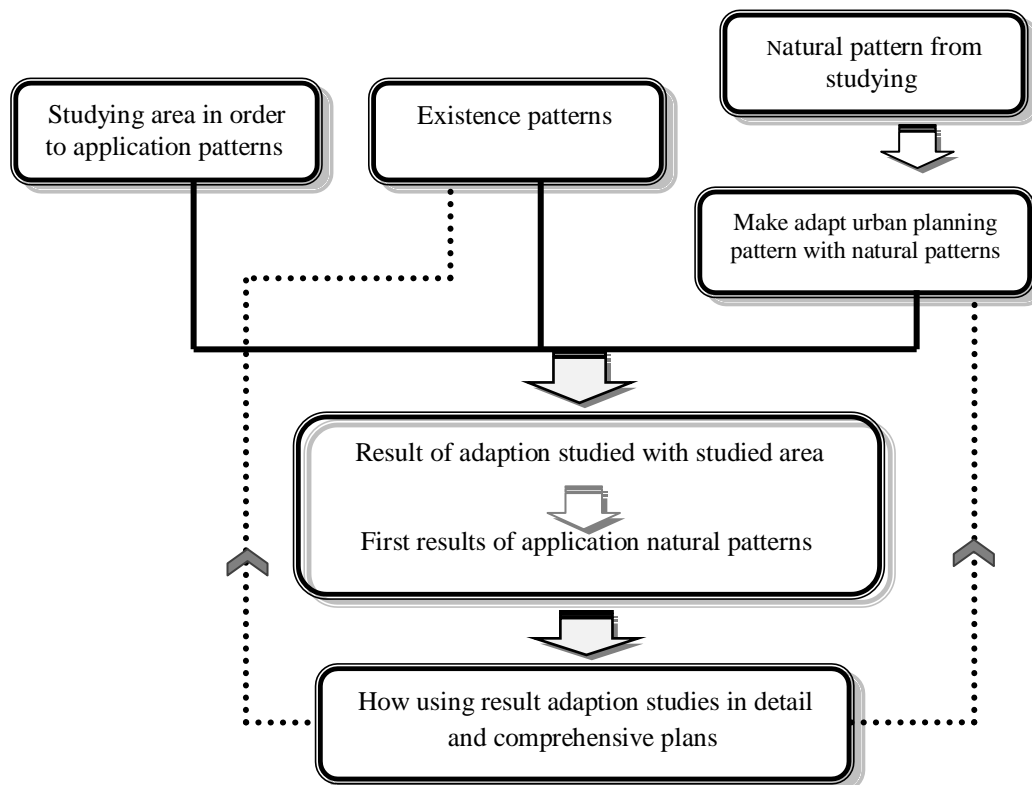


Figure (1): method research

## II. THEORETICAL BASIS

### 1.1. Adaptability natural models

The world isn't random. There are models in every place. Indeed, we use from them every day. Models has been seen in wide scale, also many options has been used from natural. One of the basic challenges is, understanding these processes and relation between them. Indeed, there are complex relations between processes that understanding is difficult (bell, 1999: 22).

Models could be defined by some worlds such as: orient, shape, fabric, density, and color, view forces, continuous, repetition, similarity, cohesion and etc. Analyzing of patterns was done through studying of place and classification of natural phenomenon that they have as like as patterns.

Therefore have been analyzed natural pattern in four parts (main parts). They are:

1. **Basic natural pattern:** pitter Stevens has proposed patterns and relevance between processes in patterns in natural book (Patterns in nature, 1974). Also, he has divided patterns and natural element in various scales in four parts. They are: 1- spiral pattern, 2- curve pattern, 3- junction pattern, 4- mosaic pattern. Each pattern has special factors (bell, 1999: 38).
2. **Earth shape patterns:** these patterns emphasis on hemisphere by using natural factors such as: repetition, coherence and etc (bell, 1999: 38).

3. **Aesthetic of natural environment (landscape):** this pattern consider identity of natural places, also it define space. Indeed, it is several sensitive between human and natural environment. These relations are, various and complex, coherence, several scales and forces (Mak hark, 2008: 30).
4. **landscape synthetic patterns :** landscape include several patterns , such as : shape , structure , elements and etc . All of the landscape consists of them (Matluk, 2001:24). Landscape patterns have been consisted of concept of landscape language, means, landscape conversation (between details and residents), processes and natural forms, networks (Aspyrn, 1998:19).

The first finding that has been concluded from considering and analyzing of natural patterns and quality factors has been shown in table 1.

**Table1: adaptive results of natural pattern in manufacture environment**

Using in artifact environment ( urban planning and urban design patterns )	Natural environment patterns	
	Using of pattern	Basic patterns in natural environment
Approaching to maximum capacity in limit spaces and completing urban spaces	Using of needle plants in order to utilization from light of sun	spiral pattern
Adapting urban edge from flexible curve patterns and curve line	continuous flow by inharmonic cover plants	curve pattern
Creating balance in terrific flows (v/c)	There is junction traits and hierarchy traits	junction pattern
Composition functional element in several scales , mosaic patterns	There is understandable framework according to understandable mosaic	mosaic pattern
- Creating density structure - Creating physical building in order to identity	Earth shape is according to natural pattern Also , determining land uses	Earth shape patterns
Using from water element	There is identity of natural places , also there is coherence between natural elements	Aesthetic of natural environment
Using from natural structure in order to developing physical form	Appropriate form of landscape elements such as : mosaic , tunnels , path , background	Landscape patterns
Creating various physical in relation wind , sun , temperature	Landscape language is special words such as water, soil. indeed it is as alive element for creating various condition in natural environment ( Bahraini , 1996:22)	
Creating harmonic spaces ( shape , construction , density )	There is structure and shape in landscape (structure were led to understanding environment) (Biken, 1998, 35).	

**1.2. Research history & functional samples of natural patterns**

Generally, there is regard to natural in previous years in urban systems (Magtif, 2009, 53). In this research, was considered some concepts such as: green city, ecology city, sustainable city and etc (Bahraini, 2004: 65). Indeed, green city approach or native city have used functional samples and natural patterns in urban environment. These patterns emerge in green space networks patterns, native city, and sustainable city. On the other hand, there is one paper that has been done natural patterns and has changed to applied model. Other paper has been studied natural and objective concepts.

**1.2.1. Mosaic patterns ( new strategies in urban design )**

Mosaic patterns have been seen in every where in all of the earth. Also, this patterns understandable for every one. These patterns have been seen in various scales.

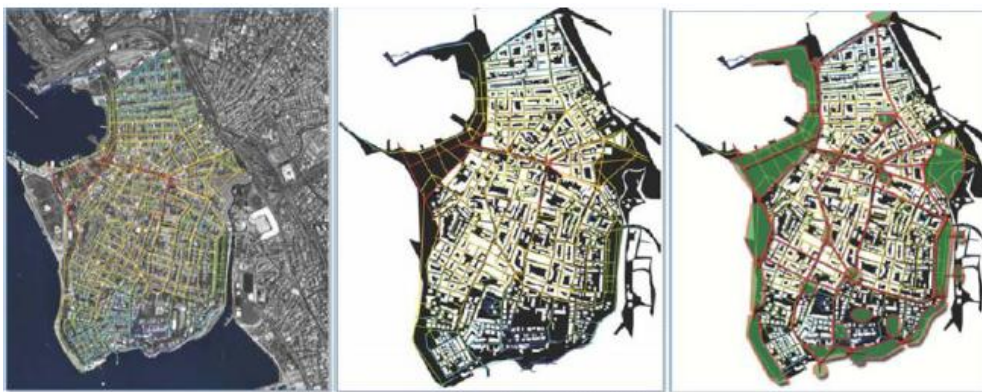
Figure (1): natural earth mosaic



Re: Başer & Kubat 2007, A New Landscape Design Strategy, Kadıköy – Istanbul

Conceptual framework of natural environment in inside and outside ecosystems. Always, one same conceptual framework could be used in urban environment or could be created sustainable urban viewpoint. So, designer should be explored structure in natural environment and creating sustainable city. Kadıköy is one the city in Istanbul that conceptual framework of urban environment is based on mosaic pattern for approaching urban sustainable viewpoint. These patterns are used relation open spaces networks, shape of path. Also, this pattern is defined as continues components (Baser&kubat, 2007).

Figure 2: proposed green and open spaces according to mosaic pattern

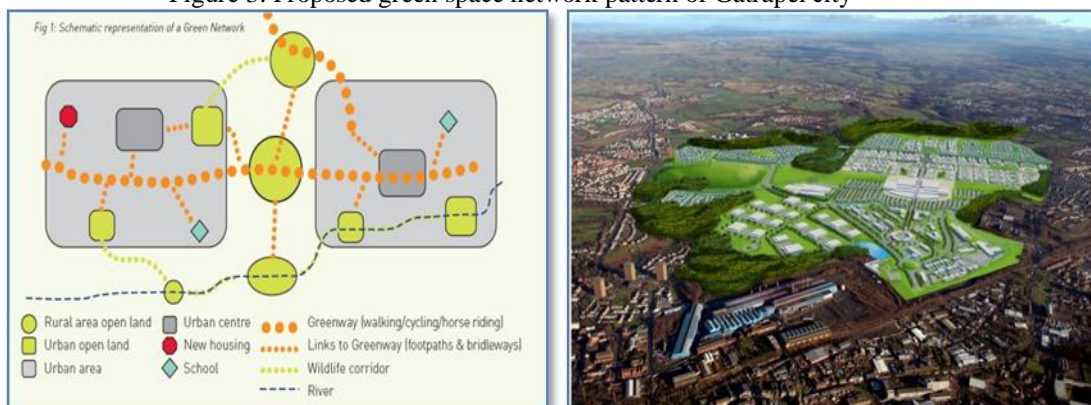


Re: Başer & Kubat 2007, A New Landscape Design Strategy, Kadıköy – İstanbul

**1.2.2. Green space and networks pattern**

Gatraple project (green network project) (2008), was done trough hierarchy of green networks in order to improving environmental quality (landscape pattern & natural environment elements).

Figure 3: Proposed green space network pattern of Gatrapel city



Re: Farrar, Gowkthraple regeneration, Greenspace & Green Network 2008

Also, other city such as Kirkols has been used nodes and green corridors and has been used from opportunities.

### 1.2.3. Urban sustainable form

Done studied for sustainability (Urban design for sustainability 2008) is, appropriate method for having sustainable cities. Therefore, was studied design theory and urban sustainable models in order to development of compact green city. In this research has been done, coherence between natural and manufacture environment by using functional coherence, improving green nodes (Helsinki& Schulz, 2006), strengthening appropriate density ,appropriate green structure ,making integrated structure , developing neighborhoods centers , designing green structures & urban viewpoint , creating identity , improving design and management of structures and green nodes as continues elements between old and new structures (Land use consultant , 2008) .



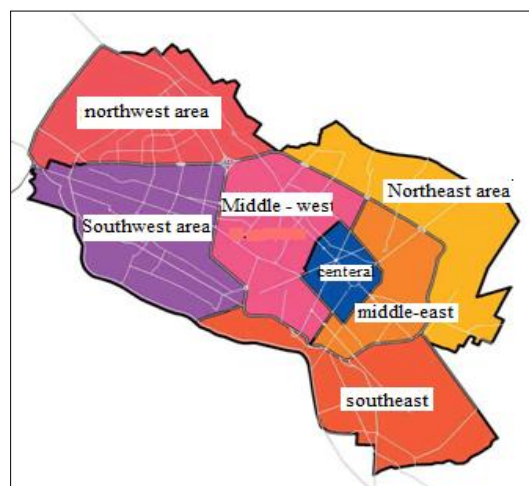
Figure 4 : detail of urban green structure (Green network in Kirklees)  
Re: Başer & Kubat 2007, A New Landscape Design Strategy, Kadıköy – İstanbul

### III. STUDIED AREA

Mashhad has been located between Hezar Masjed & Binaloud Mountains. The city is located at 36.20° North latitude and 59.35° East longitude, in the valley of the Kashaf River near Turkmenistan, between the two mountain ranges of Binalood and Hezar-masjed. Mashhad divided 7 parts in planning based on environmental, physical, economical, social indicators (Farnahad consultant, 2008). This area consists of natural and physical opportunities. Thus, middle area is one of the main economical and physical areas in Mashhad. This area has some factors. Such as:

- appropriate place in urban spatial space
- appropriate relation between with natural area such as Binalood mountain
- consisting of structure and various physical fabrics
- centralization of activities in urban scale
- there is value environmental such as : gardens , canals
- there is the most network in this area due to holly shrine
- there is problems about urban spaces and physical structure , so it is necessary urban planning

Figure 5: proposed planning area in Mashhad metropolitan



**2.1. Studied area in urban natural structure**

The area is 3207 hectare (11%).also; it located a side Binalood Mountain and Kohsangi (natural element). According to, there is channel structure in this area (Prsomash consultant, 2008:67). So, studied area has appropriate position in Mashhad metropolitan. South mountains create value landscape in this area. Also, there is appropriate slope in studied area (90 meter difference of height). There are various temperatures due to different weather. They effect on urban environment quality.

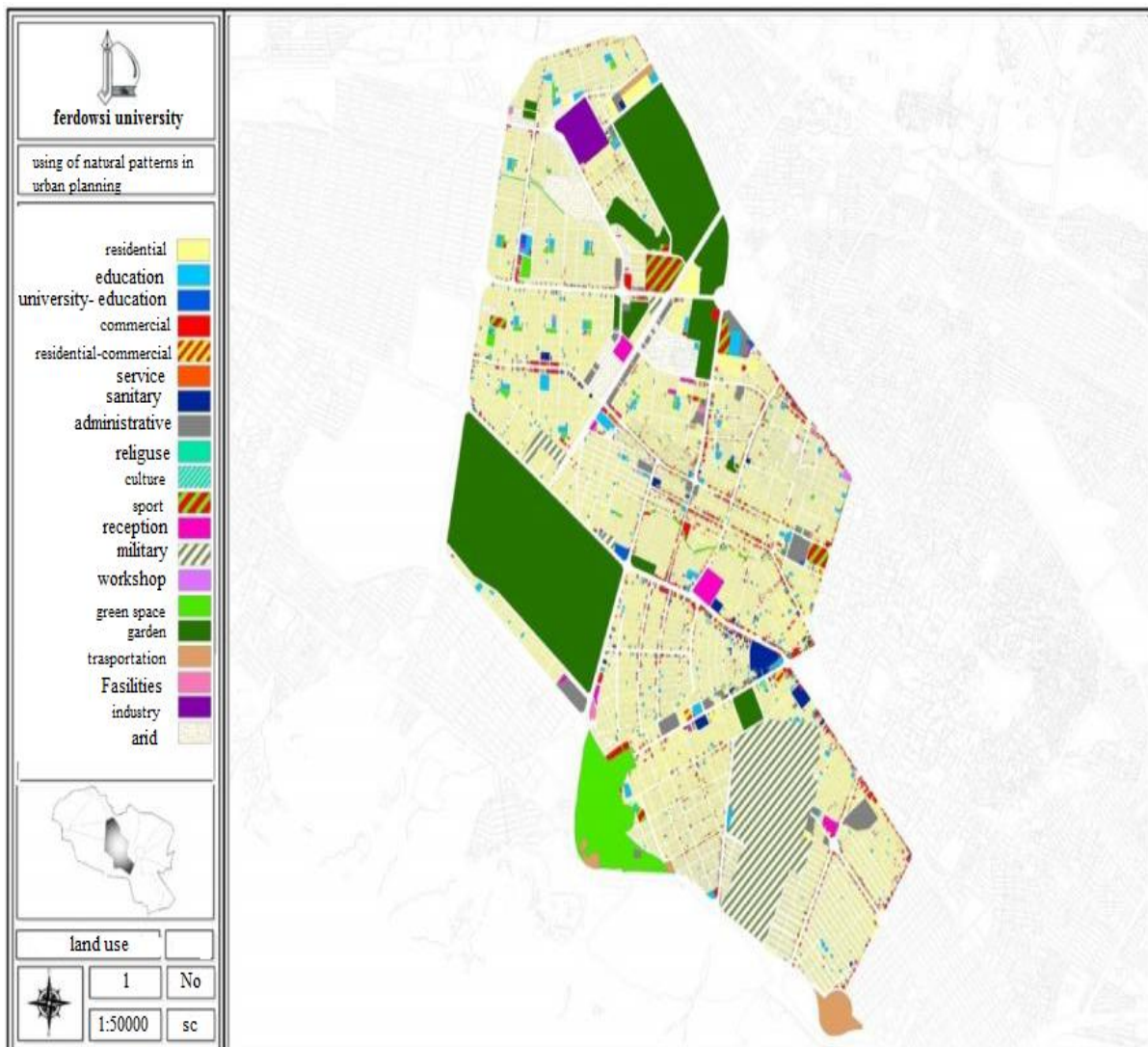
**2.2. Studied area in urban functional structure**

Studied area has spatial position in Mashhad city. There is a lot of land uses and services and populations in area. So, development of area is led to progressing that other area of Mashhad. Also, there is diversity construction due to western and central newly constructed. In this area, 37% of lands consist of residential zone and other parts consist of other land uses that have been dispersed in area. Due to the most land uses are non residential, so it show important of studied area as services zone in Mashhad city.

**2.3. Studied area in urban physical structure**

Studied area has been located in center of Mashhad .its developed fabric are related to after 1957 decade. There is corridor axis in south boundary of studied area. Studied area has been located between raster fabric of western area and central fabric. Totally, it have special place in metropolitan. Centralization of height building in this area, dispersion of land uses , centralization of macro physical lands are important factors for developing Mashhad city .

**Figure 6: functional structure of Mashhad central area**



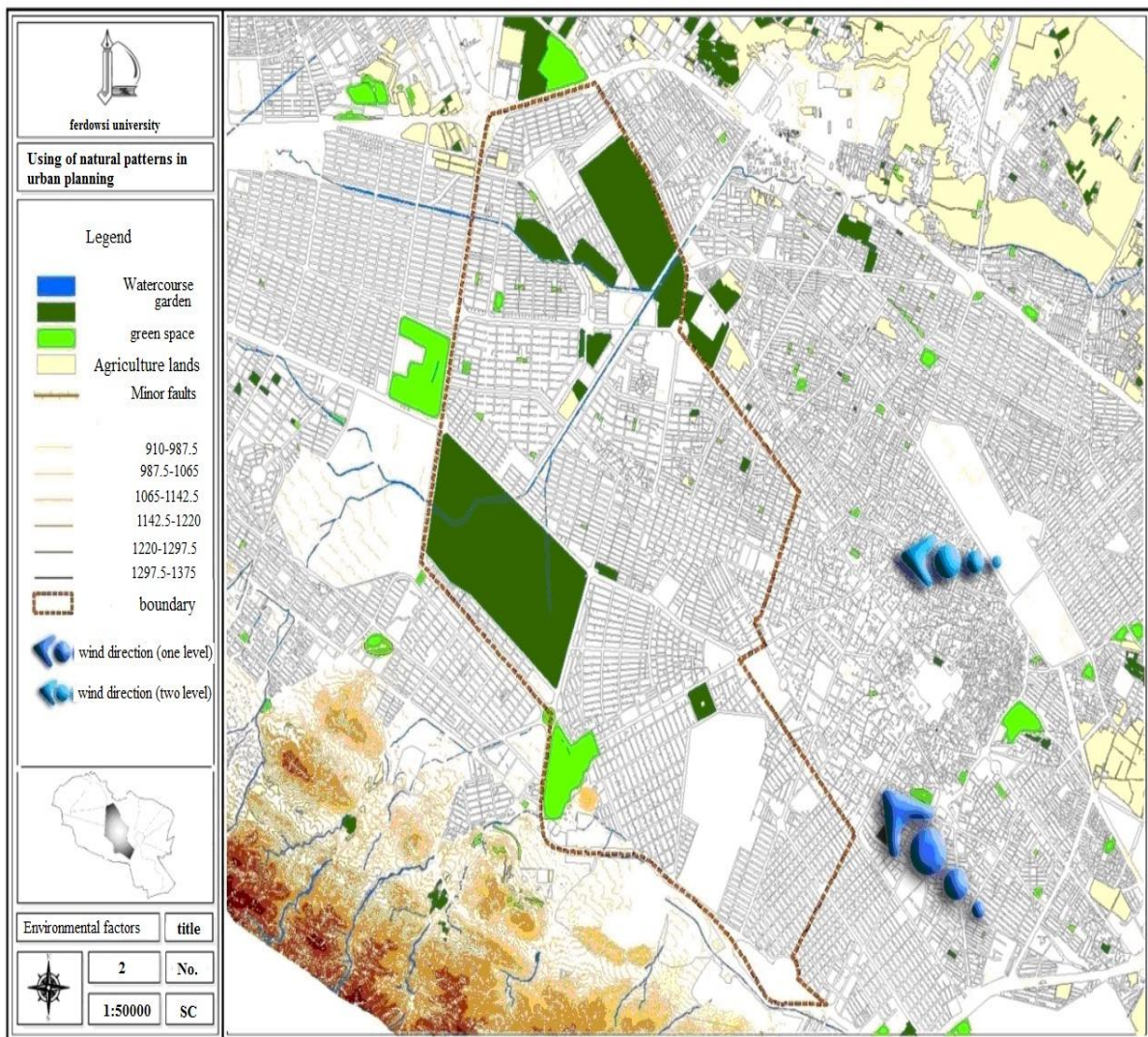


Figure 7: environmental structure of Mashhad central area

#### IV. CONCLUSION & DISCUSSION

According to research method, was considered structure of central area and was proposed as plans. Also, were proposed adaptable and functional models in urban and design planning. So, are proposed finding of analyzing natural models and influents of them.

##### 3.1. Natural structure in order to development of shape and physical form

Structure and natural form are led to shape and form. On the other hand create limitations. So, city as manufacture environment has relation with natural structure. Indeed, the city would be determined developing and evolution.

Mashhad consist of potential group that could be developed and create sustainable landscape for residents. So, adaptability of condition forms by natural environment is very important.

##### 3.2. Composition functional elements in some scales in mosaic networks

Totally, environment consists of some mosaic pattern in different scales. This pattern consists of hierarchy structure (Bell, 1999: 38). According to models , the structure of studied area are :

- green mosaic
- functional mosaic in neighborhood and district scale
- urban functional mosaic

These areas provide services and functional and uses that, are led to developing urban spaces. On the other hand mosaic pattern have ability to complete vacant land use.

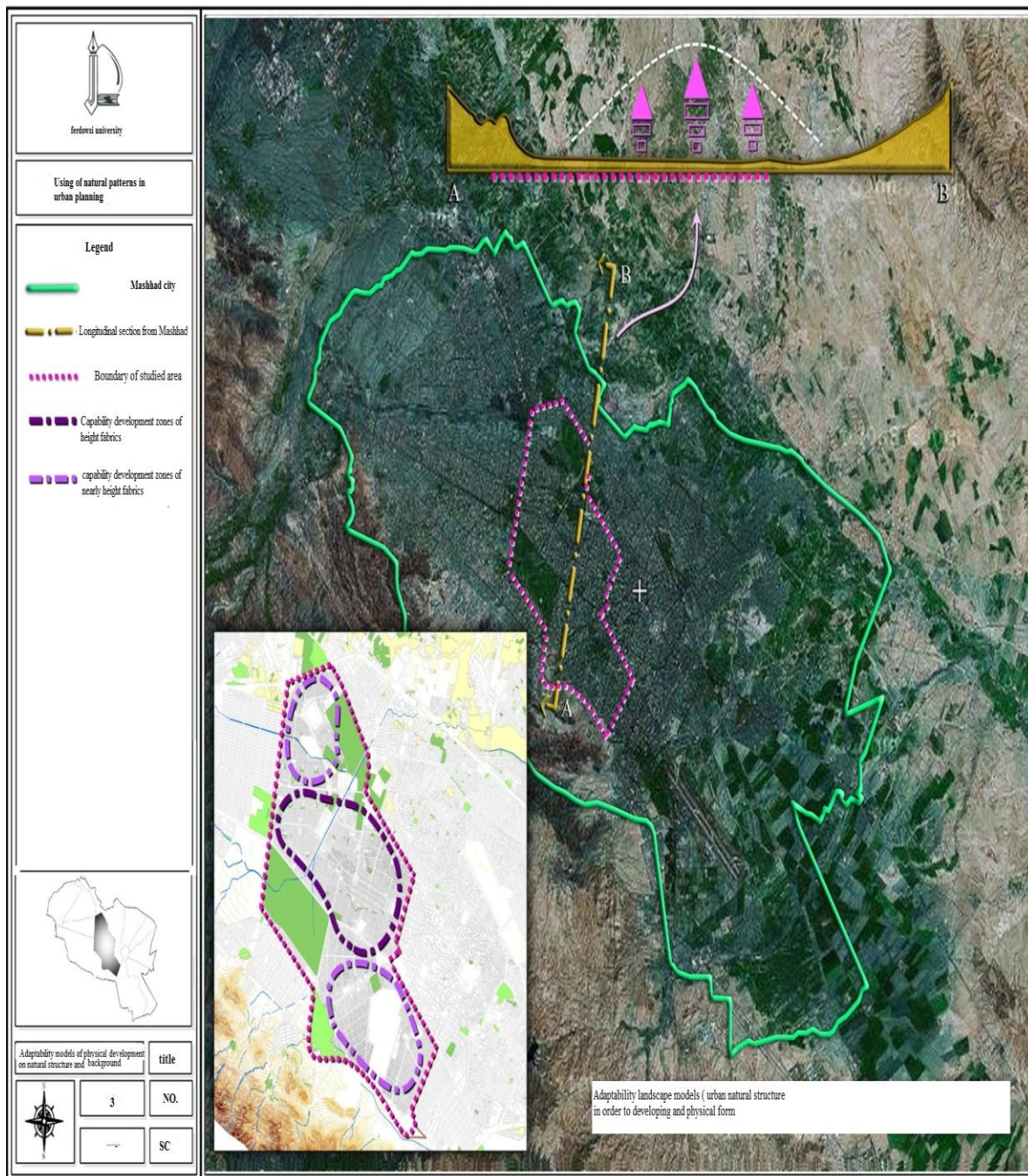
**3.3. Complete physical and spatial dissociation in order to spiral pattern (green space network)**

Spiral model is consequence of development in limit environment in order to utilization of natural conditions (terener, 1999:65).

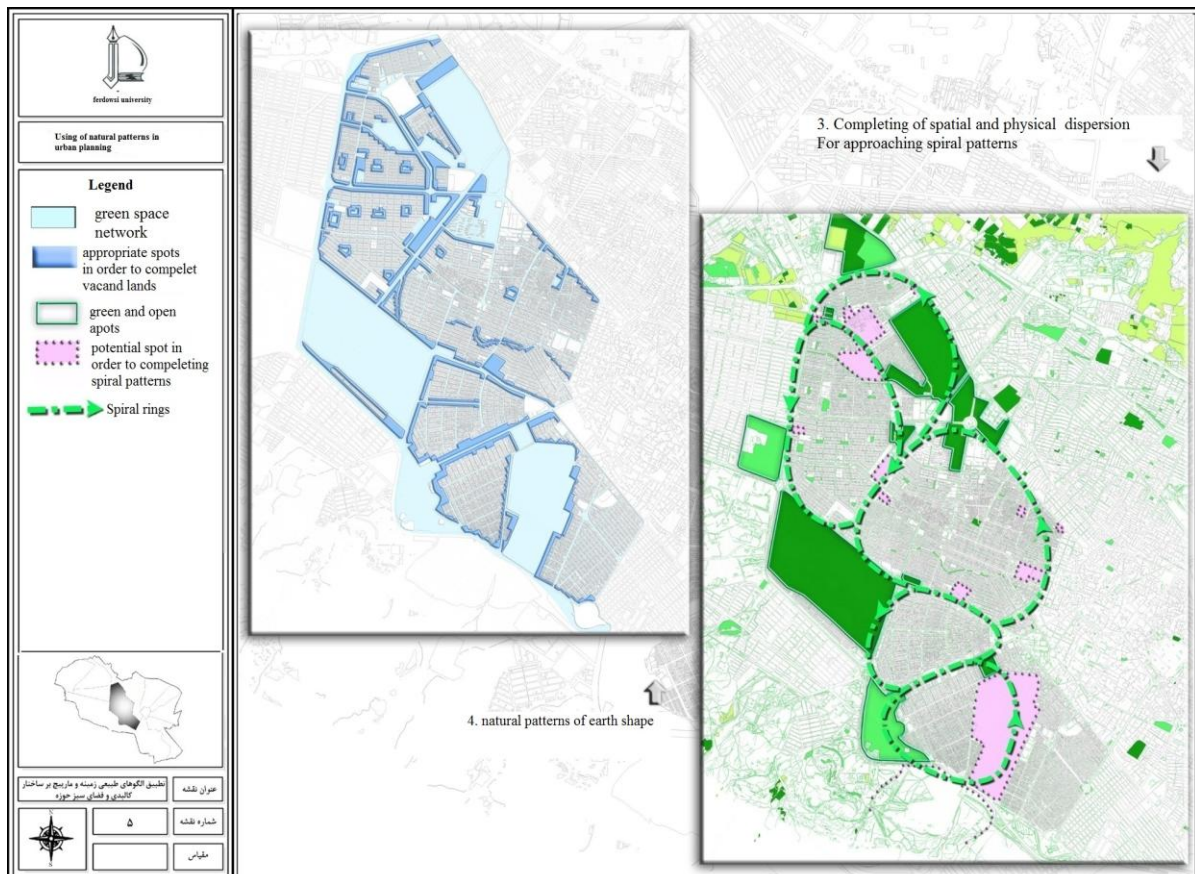
According to factors area, are used from this model in order to completing green space network as spiral rings of green space. This pattern relate to structure and natural networks. So the results of Continuous green space networks are green axes, potential green spots and etc. natural pattern are led to utilization and balanced dispersion n studied area. Also, it complete spatial dispersion in this zone

**3.4. Physical structure that has been resulted from earth slope (open space network as background)**

Totally, mountain structure is created Based on earth shape. This factor are led to balanced condition in this area or every where ( Bell, 1999: 178). Using of pattern has been done relation background. Utilization of spots potential are led to improved quality of urban environment .







**3.5. Adaptation shape and physical form in combination with climatic factors such as wind**

Each form shows existed limitation and process in exist condition. Shapes and forms are various due to environment factors such as: wind, sun and etc (Spearman, 1998: 243). Also, urban fabrics should be adapted environmental condition. For example orient of wind is one of the most important factors for land uses. So, the land uses should be located in appropriate location that should be matched by environmental condition.

**3.6. Branching pattern and codification structure based on studied area**

This pattern is led to arrange natural elements. Often, this pattern is created by junction of rivers or other natural elements (Bell, 1999: 38). It is necessary for creating of balance terrific flows in our cites. By using of model was determined capacity of urban path.

**3.7. Adaptability of urban watercourse, follows, edges from flexible screw model**

Screw model is flexible pattern that create harmonic viewpoints, such as: plant cover, opposite edges and etc. this pattern define soft edge as physical edge, separated edge. Totally, are used for arranging potential edge. Therefore, this pattern useful in solving landscape problems in urban environment. Flexible screw model, codify density structure in cites.

**3.8. Corridors and Walking routes network models between functional mosaics**

Landscape structures are analyzed by description of detail elements such as: mosaics, canals and etc. indeed, the path relate between mosaics (Spearman, 1998: 191). By using mosaic patterns could be codified corridors and canals. Thus, based on pattern, has been proposed some path that have located between mosaic patterns. They are:

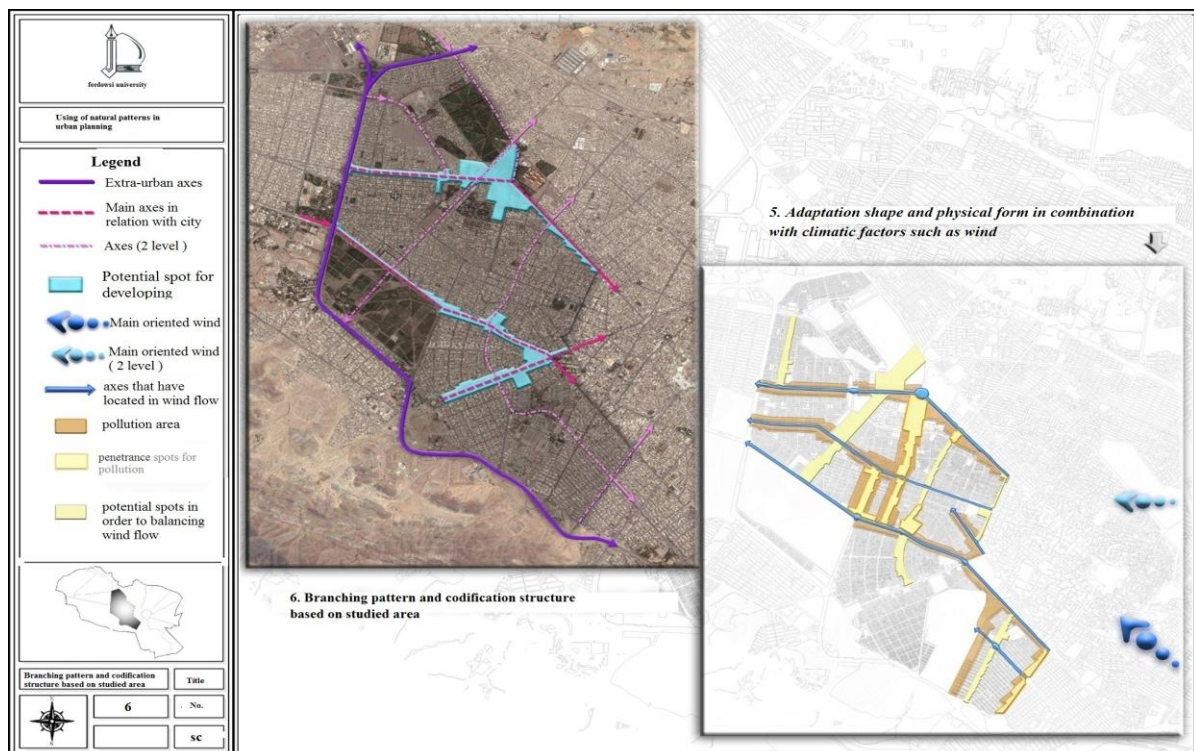
Natural tunnels (green axes), walking ways (entertainment-commercial), green path or bicycle path

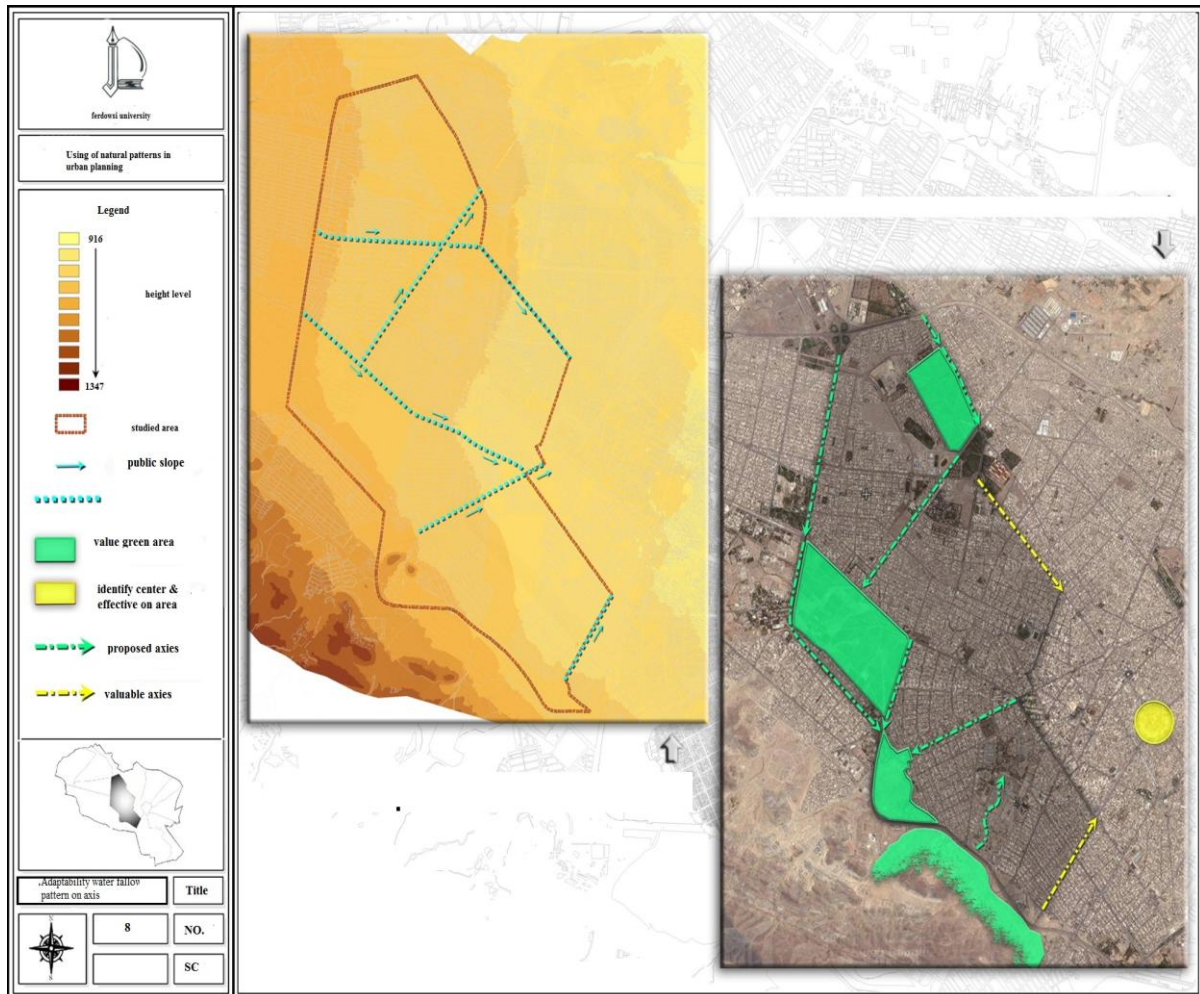
**3.9. Natural environmental quality patterns by flow networks**

Viewpoint and landscape emerge beautiful environment due to special identity foe each landscape (Spearman, 1998:70). This pattern is used in order to identity for environment. On the other hand, it should be improved other factors such as religion or natural quality. Generally, this pattern strengthens urban identity.

**3.10. Adaptability water flow path pattern by main axes**

All of the natural viewpoints consist of special elements. These patterns determine landscape language (Lind, 1996: 23). By using these patterns, could be provided natural quality in urban spaces. So by utilization of natural location could be revived rain water. Also could be reserved natural sources.





At finally by analyzing of natural models, was determined functional patterns in urban planning and urban design. Table 2 shows, natural models according to function in details plan or comprehensive plans.

**Table 2: using natural models in urban planning and urban design in studied area**

Functional in urban design	Functional in proposing developed models	Functional case	Basic natural models	
Open and green space networks such as nodes and green axes	Dispersion functional spot in studied area	Completing spatial and physical dispersion in order to approaching spiral model	Basic models ( spiral )	1
Walking natural path	There is spot that have density potential	Adaptability of urban watercourse, follows, edges from screw model	Basic models ( screw )	2
- Dividing region according to main structure - Hierarchy network	Main network relation to city	Branching pattern and codification structure based on studied area	Basic models ( branchy	3
- creating neighborhoods - creating functional system	Total functional structure relation to city	Mosaic model in composition functional elements	Basic models(mosaic)	4
-	Creating density spots	Physical structure from resulting earth shape	Landscape model	5
Creating special identity	-	Natural environmental quality patterns by flow networks	Beautifully natural environment model	6
Completing special green network	-	Adaptability water flow path pattern by main axes	Landscape model	7
-	Density and physical structure	Natural structure in order to completing urban form	Earth shape model	8
Creating spots without pollution	-	Adaptability shape and form with climatic factors	Earth shape model	9
Natural access network	-	Corridor networks and walking path between mosaic	Landscape model	10

**V. PROPOSING NATURAL DEVELOPMENT MODEL**

At finally, have been proposed strategies in different structure. According table 2, each model have clear results. So, based on data and finding could be anticipated natural development models for studied area.

The main subjects in this research are:

- improving the role of studied area in Mashhad city with relation urban network
- design of functional structure that it consist of centers and activities axes according to mosaic framework
- design of physical structure according to urban spatial structure
- completing urban terrific networks in relation other parts
- design urban networks according to branch pattern

This development model would be used in future for studied area .

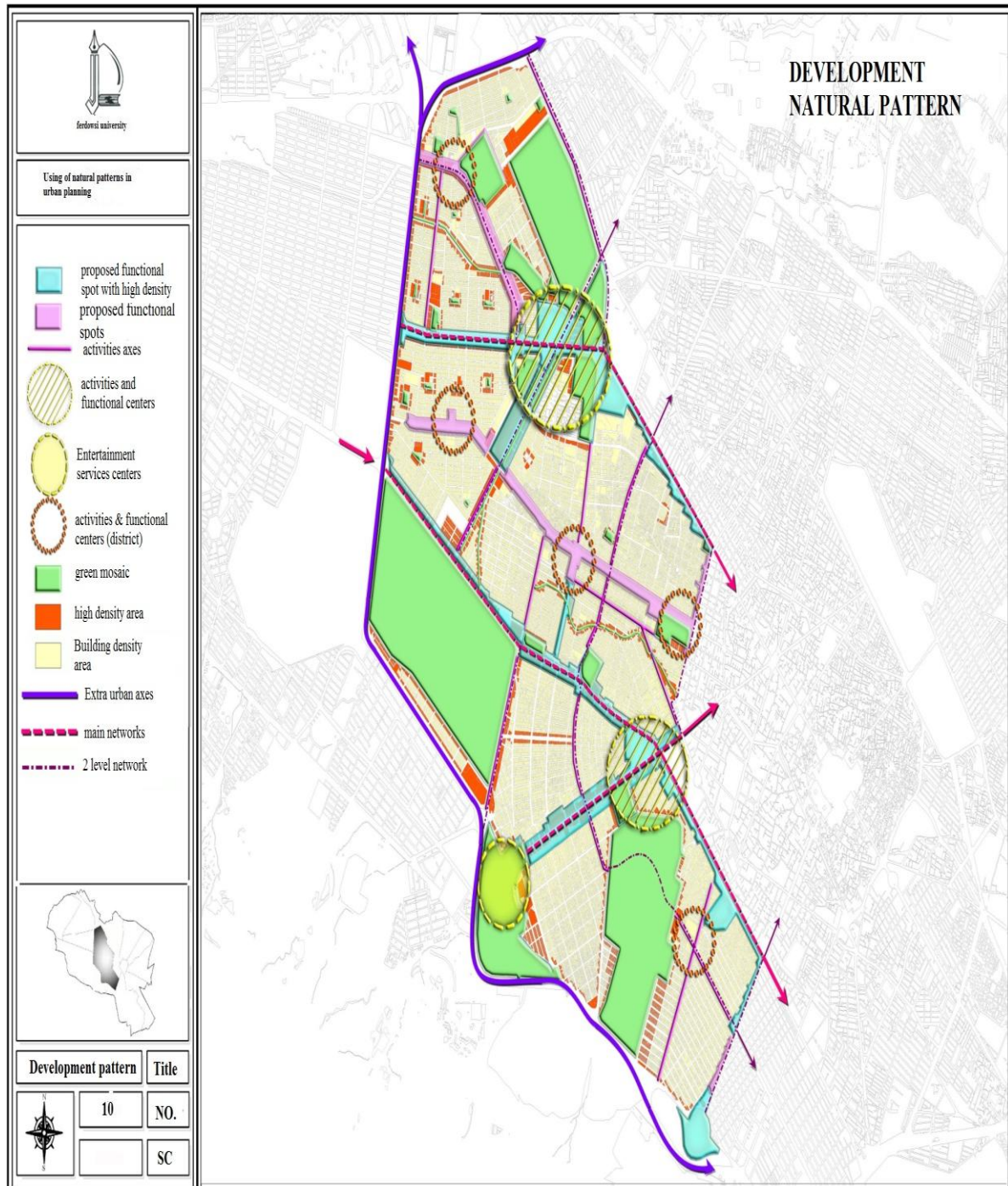


Figure 10: proposed natural development pattern

## REFERENCES

- [1] Arbier an & Higenz Catrin , land use planning for developing lands , Bahraini keyvan Karimi, Tehran University Press, 2003
- [2] Spierman , landscape language, Bahraini H. and B. Aminzadeh, Tehran University Press, 2007
- [3] Bahrain, SH. Healthy City Project, World Health Organization and the need for strict implementation of the Islamic Republic of Iran, Journal of Environmental Studies: Environmental Studies Series, No. 17. Winter. 1998
- [4] Bahraini Hussain, urban planning, expectations, Tehran University, Summer 2005
- [5] Simon Bell, perception, perspective, pattern, process, translate, B. Aminzadeh, Tehran University 2004
- [6] Edmund Bacon, Design of Cities, translated by Farzaneh Taheri, Research Center of Planning and Architecture 1989
- [7] Parsomash sustainable pattern of development of mid-western city of Mashhad, 2008
- [8] 8- Tom Turner, City as Landscape, translated by F. Nourian, processing enterprises and urban planning (affiliated to Tehran Municipality),
- [9] Farnahad, landscape and metropolitan development pattern wax Mashhad, in Persian date 2010
- [10] Jon Lang, Creating Architectural Theory, translated by A. Objective oven, Tehran University Press, 2004
- [11] Gunnar Lind, water and city B translations teacher center. Research of Urban Planning and Architecture 1999
- [12] Matlak John L., Introduction to Landscape Design and Environment, Department of Education, the parks and green spaces in Tehran in 1999
- [13] Magtyf Cliff urban design based on sustainable development, translation Narcissus Publications, 2009
- [14] Ian Mc Harg, Design with Nature, translated by Abdul Wahab Mohammad, Jihad, Mashhad University Press,
- [15] Viler SM. and Beatles T Wheeler, sustainable urban development, Urban Studies Center publications are translated into real Kianoush Zaker and Architecture Department of Housing and Urban Development, 2010
- [16] Hedman Richard and Andrew, urban design principles, translated by R. and A. Rezazadeh born, University of Science and Technology 2010
- [17] A New Landscape Design Strategy For Creating Continuous, Perceptible and Productive Urban Green , a case study of Kadıköy – İstanbul , Bahar Başer & Ayşe Sema Kubat 2007
- [18] Gowkthrapple regeneration , Greenspace & Green Network Study , Final report , by Ironside Farrar , November 2008
- [19] Developing a Green Network in Kirklees , Kirklees Council Environment Unit , 2007
- [20] Encouraging walking, the role of urban design , Experiences of the EU- ECOCITY project , Uwe Schubert & Franz Skala , Vienna- Austria 2008
- [21] Urban Design for Sustainability: Learning from Helsinki, Carol Schulz, The Sir George Pepler International Award: 2006
- [22] Green Network Strategy Ravenscraig by Land Use Consultants, December 2008 (2008)