

# The study of modifications in land usage in the City of Shandiz towards ecological city realization

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## ABSTRACT

the goals of this research were to identify land usage trend modifications during 1999-2010 and the direction of these changes. The main methodology of this research was a comparative study of area and main city land usage percentage during the last decade, and to evaluate the amount of usage achievement suggested in the Hadi plan at present. The result of the evaluation and comparison of the main city land usage during 1999 (the vision of the suggested ten year Hadi plan) to 2010 (current situation) indicates that during the past ten years the construction volume increased in such a way that in 1999 there was only 187.43 hectares of residential area; however, in 2010 the residential area usage was modified to 994.26 hectares. So, in the last ten years 806.83 hectares was added to residential areas, which is an average increase of 80 hectares of residential area annually, while the average population growth during this decade was 4.89%. Also, the most land usage allocation was leisure with 49.76%, which indicates that the strategy of those who prepared the Hadi Plan for Shandiz was towards tourism. Due to unbecoming usage of existing land and severe usage modifications in recent years and the destruction of orchards and agricultural lands, which was 25.61% and 72% respectively in 2010, there are now problems in balanced and sustainable development and negative effects on the quality of life in the city.

*Key words* : Land usage, Tourism, Sustainable development, Ecological knowledge, Shandiz

## Introduction

The world that we are living in is a world of cities that has unfortunately resulted in the estrangement of the natural environment and unwanted acceptance of imbalances that come from inharmonic relationships of humans and city space (Farid, 1996). Moreover, city expansion and manmade applications in nature have caused fundamental modifications in the structure and applications of landscape ecology (Foreman and Gordon, 1986). Daily population increase has also resulted in more pressure on the environment and unlimited and unprincipled usage of lands and usage modifications have caused different ecosystem effects (Lu and Weng, 2001).

The city of Shandiz within the last decade has faced significant population growth and physical development. The close distance of Shandiz to the metropolis of Mashhad and its own particular natural conditions have resulted in Shandiz becoming a center for leisure activities for Mashhad residents and its many pilgrims, which in turn has caused major changes in the internal make-up of Shandiz. Since this city is important in respect to tourism, there is a high demand for modifications in land usage and zoning, and to create residential complexes in the form of residential estates and temporary residential complexes; although the placing and designing of those complexes are not based on environmental considerations. Unfortunately, all of these men-

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tioned developments do not consider environmental factors and do not provide adequate infrastructures to services related to them and causes wide spread manipulation of the basic characteristics of the environment of the land and destruction of vegetation and agricultural fields. In this study, we reviewed the city of Shandiz usage modifications done during between 1999 and 2010 by determining area and usage percentage to show the trend of the city development process. One of the fundamental factors of sustainable development is equitable access to urban land and efficient land usage; also in order to have a successful and progressive ecological city we need qualified leadership and management. In this regard, the aim of this study was to assess the amount of agricultural usage modifications within the limits of the city of Shandiz during 1999 to 2010 and to evaluate its effect on the ecology of Shandiz with the goal of establishing environmental sustainability. Urban ecology studies and analyzes the interactions between human groups in different urban environments, the way of segregating the population of cities and construction of spaces that are used by them. System of urban ecology or construction of urban ecology is formed and realized affected by the factors such as features of the natural environment, population structure, the structure of technology, urban management system, and people's socio-behavioral conditions (Shamaei, 2003). Today, the Urban Ecology has a history of 30 years. Its mission is to create ecologically sustainable cities using the ecological principles including the revision of land use priorities for having condense urban green spaces, respecting the diversity and proportionality of the urban green spaces, having pleasant green spaces, supporting the local farmers, urban landscape projects, and urban gardening projects, provision of affordable, cost-effective and safe housing, and supporting those businesses that guarantee the dynamics of the ecological sound of the environment, etc. (Roseland, 1997). With respect to the above-mentioned principles, efficient use of land is one of the indicators of an ecological city. In this regard, there are definitions to provide and fulfill an ecological city Land use is in fact the proper utilization of human nature and this term indicates the use of features and capabilities of the land (Saroor, 2005). He expressed that the land use at the urban scale depends on factors such as land constraints, the shape and position of the land, different types of activities, density, concentration, how land

is distributed among uses and comparison between different land uses (Rahnama *et al.*, 2008). In fact the use of land, as a non-renewable commodity, is important in terms of the urgent needs of human, the living space, close relationship with the environment, and having a safe, beautiful, and healthy environment for the comfort (Rang wala, 2000). Therefore, failure to locate properly and corresponding to the functional properties of land uses and characteristics of the urban environment studied in each functional scale will be finally resulted in skewed distribution of land uses in the city and heterogeneous and unbalanced spatial structures which in turn will lead to the vulnerabilities in the existing spatial structure (Athari and Najian, 2006). In fact, equitable access to land and efficient use of it is one of the major components of sustainable development (Mehdizadeh, 2000). In fact, the land management and land preservation activities are along with the development of landscape ecology (Urban and Nill, 1987). Landscape ecology is strongly related to the land use, especially in terms of spatial patterns as the basis for land planning and management (Wu, 2000). Therefore, sustainable development of land is a kind of land use which provides the needs of the present generation, but at the same time, preserves the opportunities to meet the needs of future generations; so that future generations will have the opportunity to have at least a situation that is not worse than that of the current generation (Askari *et al.*, 2002).

#### **The region understudy**

The city of Shandiz with a population of 6570 with an area of approximately 45 acres in the Torghabeh section from Mashhad county is located at 36°23'N and 59°18'E, 35 km west of the Mashhad metropolis. This area has an important role and position, especially in the field of eco-tourism. Moreover, it has a specific importance for city expansion due to its suitable land potential and environmental characteristics. The city of Shandiz is a popular recreational spot in the region that borders the fertile Binalood mountain skirt and reaches to the planes of Mashhad. General characteristics of this ecological city are as follows: it has a natural structure, specific climate characteristics, is a suitable distance from Mashhad, orchards, orchard hills, open and green spaces, waterways, creeks, springs, suitable mountainous climate for winter and summer tourism, shopping and tourism centers, restaurants and other

similar services, historical, cultural and religious capacities, and is well-known nationally and even internationally, which counts as a potential capital for this ecological city (Architects and Urban Design Consulting, 1999).

**Study methodology**

This study was conducted as a descriptive analytical method by considering the importance and position of ecological city usage and how the space is distributed in the city; also by reviewing the ecological environment in the region. In this study, we used information that existed in documents of different organizations found in libraries to determine area and land usages percentage and based on this data we preparing maps and charts for the time understudy An eleven-year period between 1999-2010 also, the study area covered all of Shandiz city limits. Land usage indicators that were evaluated include educational, commercial, healthcare, residential, religious, and sports. Finally, we used map references for the mentioned times and data related to analysis usage, determined area and usage percentage was transferred to the Arc GIS software for analysis.

**Results and Discussion**

**Land usage**

In this article, initially, we tried to determine land usage percentage and area in 1999 based on the rec-

ommended ten-year strategic plan that is in existence and in 2000 based on the existing situation at that year, which included data on land for educational facilities and other facilities, commercial, leisure, health, and production use, religious activities, sports, agriculture, ranges, orchards, and undeveloped land. Also, we prepared maps and charts for all of these land usages for that time. Table 1 shows the area and percentage of different land uses during the two periods of 1999 and 2010 in Shandiz.

Surveys of Shandiz urban plans show that the plan prepared in 1999 for the City of Shandiz has offered following uses for this city: Based on this plan, 1.53% of the area of Shandiz was devoted to the educational use in a 10-year horizon. 22.26% of the proposed area was also allocated to the residential use. It is also noteworthy that most of the land area was devoted to the recreational use. In the next stage we evaluated land usage for education, orchards, commercial, residential, religious, undeveloped lands, sports, which was mentioned in the recommended ten-year strategic plan and compared it with the current situation to find out how much of those land usages have been followed or have been changed for other usages. Table 2 shows the rate of changes in the uses offered in the Guild Plan (1999) compared with other land uses (2010).

Based on the Table 1, it was specified that the that in 1999 in the city limits of Shandiz there was only 187.43 acres of residential areas, while in 2000 this amount reached 994.26 acres. This means that in a

**Table 1.** The scope of different land uses in the City of Shandiz during the two periods of 1999 and 2010

Land uses	Area in sq.m, in 1999	Area in percentage, in 1999	Land uses	Area of current land in sq.m, in 2010	Percentage of the current land in sq.m, in 2010
Educational	93518	1.53	Educational	81685	0.60
Rangelands and gardens	1254268	20.54	Rangelands and gardens	3480502	25.61
Security	1701	0.03	Security	6915481	50.88
Facilities and Equipment	62693	1.03	Urban infrastructure	107450	0.79
Business	29792	0.49	Business	33346	0.25
Recreational	3037925	49.76	Recreational	62321	0.46
Therapeutic	58291	0.95	Therapeutic	15585	0.11
Production	64763	1.06	Production	61470	0.45
Religious	48994	0.80	Religious	5523	0.04
Residential	1357802	22.24	Residential	2718531	20.00
Sport	14719	0.24	Sport	3621	0.03
Green space	81085	1.33	Green space	97289	0.72
Total	6105551	100.00		13591955	100.00

Source: the authors, 2013.

period of ten years there was an expansion of 806.83 acres of residential area, so on average 80 acres of residential area was added annually. The results show that the amount of achievement in each land usage, which was targeted in the strategic plan are as follows:

**1. Educational Usage :** The study shows that this was less than 1% and that most of the area was allocated for educational usage, but at this moment remains as undeveloped land (60.12%) and 27.55% were modified for residential usage. So we can conclude that 94% of the recommended educational usage in the strategy plan was not achieved.

**2. Orchard Usage:** As shown in the study, there was 43.89% usage achieved, 26.12% was for residential usage and 27.05% remained undeveloped land. Therefore, 56.11% of the recommended orchard usage was not achieved.

**3. Commercial Usage:** There was 51.45% of achievement. From the area that was recommended for commercial usage, at this moment 17.99% is used for orchards and 19.09% is undeveloped. This means that 49.5% of recommended commercial usage was

not achieved.

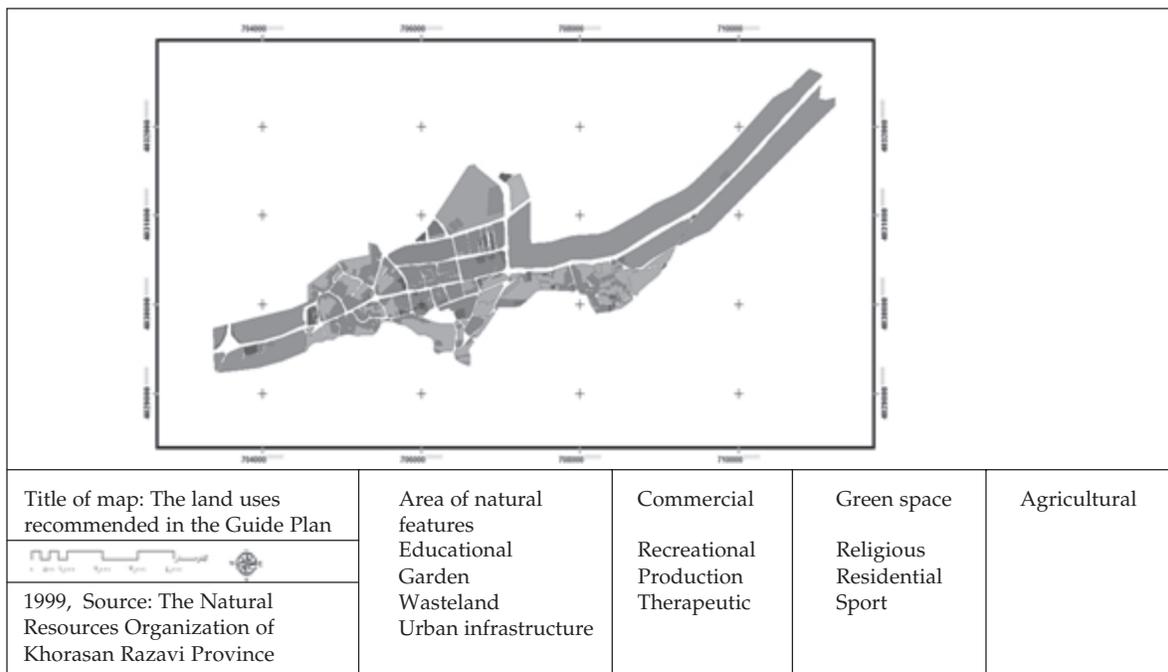
**4. Healthcare Usage:** Most of the land that was allocated for healthcare is undeveloped (87.74%) and about 5.6% has been used for education and 6.66% for residential purposes and so almost all of the recommended healthcare usage area of the plan has not been achieved.

**5. Residential Usage:** Achievement amount is 33.63% and most of the area that was allocated for this usage at this moment is undeveloped (43.33%). This means that 67% of the recommended residential usage has not been achieved.

**6. Religious Usage:** Most of the land that was allocated for this usage at this moment is undeveloped (70.39%) and almost 100% of the recommended usage of the plan was not achieved.

**7. Sports Usage:** Most of the land that was allocated for this usage at this moment is undeveloped (76.68%) and almost 100% of the recommended usage was not achieved.

Figure 1 shows land uses (Guide Plan) in Shandiz during the period 1999 and Figure 2 shows the land uses (current status) in Shandiz in 2010.



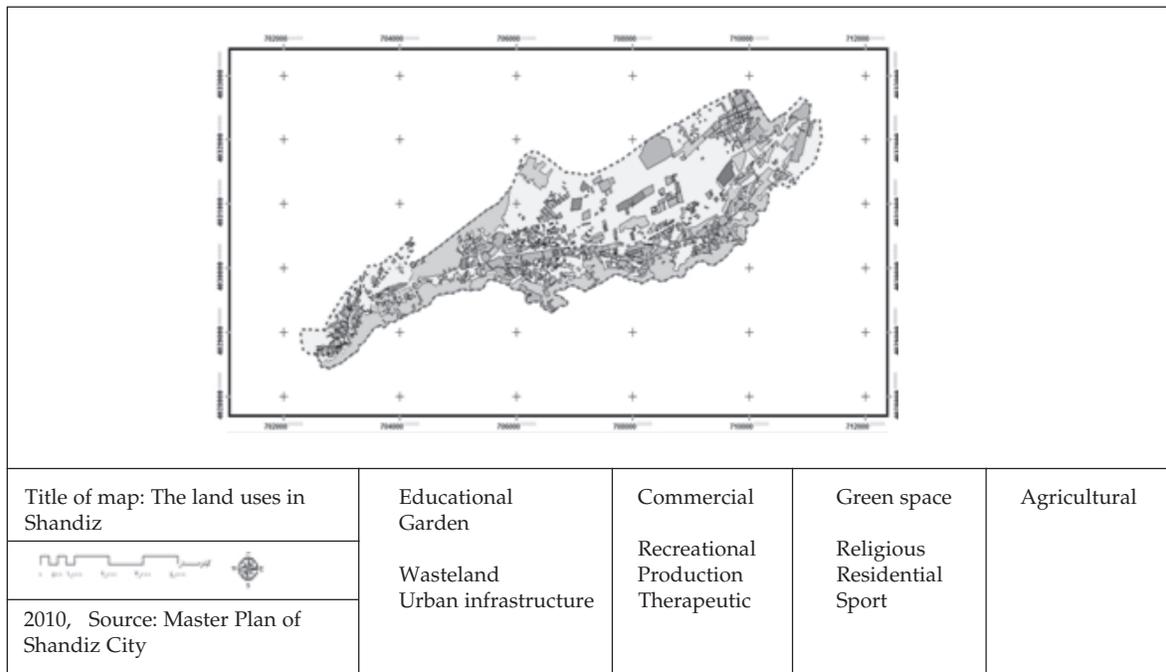
**Fig. 1.** Land uses (Guide Plan) City of Shandiz, 1999

Source: Housing and Urban Development Organization

**Table 2.** The rate of changes in the uses offered in the Guild Plan (1999) compared with other land uses (2010)

Recommended land uses	Changed land uses	Changed Area	Changed percentage
1 Educational	Educational	517	0.59
	Garden	10026	11.37
	Wasteland	53000	60.12
	Commercial	330	0.37
	Residential	24290	27.55
	Total	88163	100.00
2 Garden	Educational	2319	0.22
	Garden	453505	43.89
	Wasteland	279538	27.05
	Commercial	3184	0.31
	Residential	269879	26.12
	Urban infrastructure	10413	1.01
	Recreational	10842	1.05
	Therapeutic	1291	0.12
	Religious	1777	0.17
	Agricultural	597	0.06
Total	1033345	100	
3 Commercial	Educational	366	1.23
	Garden	5373	17.99
	Wasteland	5702	19.09
	Commercial	15369	51.45
	Recreational	2080	6.96
	Therapeutic	980	3.28
	Total	29870	100
4 Therapeutic	Educational	3264	5.60
	Wasteland	51165	87.74
	Residential	3883	6.66
	Total	58312	100
5 Residential	Educational	15458	1.18
	Garden	251094	19.20
	Wasteland	566791	43.33
	Commercial	3684	0.28
	Residential	439773	33.62
	Urban infrastructure	12744	0.97
	Recreational	11254	0.86
	Therapeutic	4962	0.38
	Religious	2184	0.17
Total	1307944	100	
6 Religious	Garden	8133	16.65
	Wasteland	34385	70.39
	Commercial	525	1.07
	Residential	5574	11.41
	Therapeutic	234	0.48
	Total	48851	100
7 Sport	Wasteland	1738	11.84
	Residential	11254	76.68
	Therapeutic	1685	11.48
	Total	14677	100

Source: The authors, 2013



**Fig. 2.** Land uses (current status) City of Shandiz, 2010

Source : Housing and Urban Development Organization

**Table 3.** Changes in the land uses in Shandiz during 1999-2010

Type of land use	Area	Percentage
Educational	21407	1.00
Gardens	277043	12.98
Wasteland	1013499	47.50
Commercial	9994	0.47
Residential	752389	35.26
Urban infrastructures	23250	1.09
Recreational	24176	1.13
Therapeutic	8172	0.38
Religious	3961	0.19
Total	2133891	100.00

Sources: The authors 2013

## Conclusion

The study and analysis that were conducted show that within the past ten years the rate of construction of residential areas has increasing with the average size of the area being approximately 80 hectares annually.

Considering the usage recommendations for the purposes of education, orchards, commercial, healthcare, residential, religious, and sports, there has not been full achievement in land usages for

educational usage (more than 94%), orchard usage (56.11%), commercial usage (49.5%), residential usage (67%), and religious, healthcare, and sports (almost 100%). The most modifications done are related to undeveloped lands, residential, and orchards, 47.5%, 35.36% and 12.98% respectively, which is not consistent with the recommended ten-year strategy plan. Because of the vast area that agriculture and orchard usage covers in Shandiz, which is considered as large scale, so contrary to the other usages they do not have a good possibility to be focused on. Moreover, orchards and green lands that are scattered in city residential fabric can be used to establish public green spaces, and sports and leisure spaces, by fundamental planning. Considering the important role of tourism for Shandiz, construction should be limited in the city and those areas should be allocated for tourism services and to establish open public spaces. If the trend of inappropriate and illegal construction and invasion and destruction of orchards, fields, and agricultural lands based regional ecological potentials continues as has happened in the period of this study (1999-2000), we are going to face usage modification towards unsustainability of the environment, which will cause problems in sustainable and harmonious develop-

ment and will have a negative effect on the life quality in this ecological city. One of the most important duties of land usage planning in Shandiz can be as such: tourism infrastructure development, services, and defining the suitable direction of its physical development, identifying suitable land for urban development and using unusable lands around the city (undeveloped lands, unifying land pieces, building density, and so on).

### Recommendations

1. Balanced and coordinated development of the city by appropriate distribution usage and activities.
2. Efficient use of empty lands inside the city in order to improve housing and tourism.
3. Written agreement and regulations limiting construction on ecologically valuable lands and areas, especially orchards and agricultural ones.
4. Environmental and existing enriched ecological protection in line with sustainable development.

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