

Investigation of Land Use and the Analysis of Landscape Elements in Sivar Village from Environmental Viewpoint

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Introduction

Population growth has increased the pressure on natural areas and the inappropriate utilization of lands and land use changes have caused different reactions of ecosystems. Human activities such as vegetation destruction and inappropriate agricultural techniques change the natural mechanisms. Land use change is one of the main factors of changes in the ecological systems, which influences on biodiversity and climate. To preserve natural environment, environmental planning should be based on the land sustainable development. Land use change may occur by factors such as drought, fire, flood, volcanic activity and human activities such as livestock grazing, urban development and agricultural lands development. There are researches which concluded that urban development and soil erosion has increased change in central Apennine in Italy from 1954 to 1985 due to land use changes. Also other researchers have investigated the tourism land use of the forestry landscape in the Serra San Bruno district using GIS. These researches concluded that a general plan in the urban and rural environments with tourism proposes would contribute to nature protection. Land use changes in mountainous forests were investigated in other studies. Results showed that the areas under agricultural activities have been decreased by 6%, forest areas have been increased by 8.15%, pastures have been decreased by 3.51%, and residential homes have been increased by 1.36% during 1945 to 1994. In another research, land use changes in Tange Sorkh basin in Shiraz was investigated using satellite images. The results showed that the forest areas have been decreased from 29.8% to 28.3% and the pastures areas have been reduced from 36.9% to 26.8% within seven years. In the present research, land use determination and landscape analysis have been carried out for Sivar village, considering the unique landscape and special biodiversity of this village using RS and GIS. This research will help to have a suitable regional planning and natural resources conservation of study area and it can recover the land uses development considering environmental factors.

Materials and methods

- *Geographical location of the study area*

Sivar village is located in semi-urban city in Isfahan province. The village is in 539,836 to 540,183 eastern longitudes and 3440675 to 3441359 Northern latitudes in UTM coordinate (Figure 1).



Fig. 1: Landscape of Sivar village in Satellite Image

Methodology

- Preparation of land use map of Sivar village using Satellite images and Arc GIS 3, 1 software

QuickBird satellite image in Google Earth software was used to recognize all of the human uses and natural spots in Sivar village. First, the ground reality map was prepared by field survey using GPS. Afterwards, training areas were identified within the taken polygons on the satellite image. Classification operation was done using training areas and various algorithms. Thereafter, the resulting map was transferred to ArcGIS 3,1 software and the land use map of area was prepared in the software after the necessary processes.

- Assessment of accuracy of harvested complications

Beside primary field surveys, field surveys were carried out again to evaluate the accuracy of harvested terrain and to control the harvested polygons. For reaching to this purpose, all the harvested layers were transferred to GPS and then all of the harvested terrains were controlled by field survey.

- Landscape analysis using Frag Stats software

Land use map of Sivar village was transformed to Grid format and was transferred to Frag Stats software. CA (area of land use), PERIM (perimeter of land use) and NP (number of polygons in land use) metrics in Frag Stats software were used to determine the area and perimeter of all the uses (patches) in the land use map. The natural bed of Sivar village was finally determined.

Results

- Land use Map of Sivar village

Area of Sivar village is about 2424.11 hectares. All of the land uses (including polygons or patches) have been shown in Fig. 2. Sivar village has seven land uses including pastures, Sivar village, agricultural areas, agricultural and garden areas, vacant lands, Aliabad village and gardens (Figure 2).

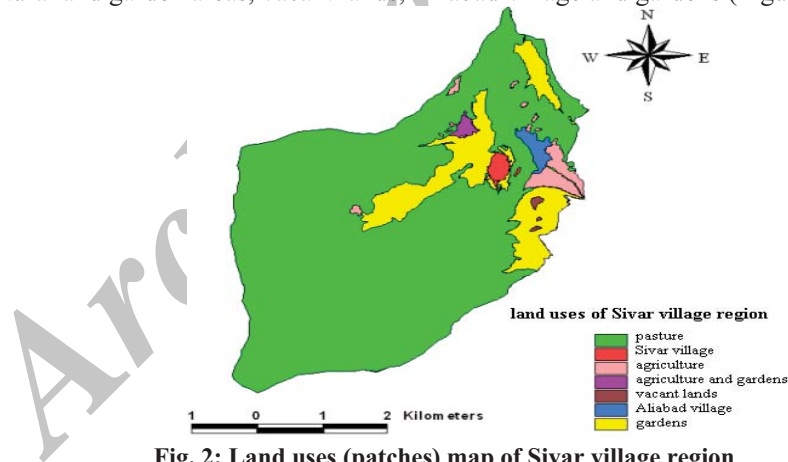


Fig. 2: Land uses (patches) map of Sivar village region

- Landscape analysis of Sivar village

Results of Landscape analysis of Sivar village using CA, PERIM and NP metrics in Frag Stats software has been shown in Table 1.

Table.1 Area, perimeter and number of polygons for all of the land uses of Sivar village region in Frag Stats software

Land uses	Area using CA metric (hectare)	Perimeter using PERIM metric (meter)	Number of polygons (patches) using NP metric
pasture	2013.08	64438.81	1
Sivar village	15.36	3053.82	3
agriculture	52.26	12898.98	13
agriculture and gardens	9.81	2142.24	1
vacant lands	34.4	1777.59	3
Aliabad village	21.81	3874.27	1
gardens	277.39	35118.31	7

Discussion and Conclusion

The optimal development of land depends on adequate and accurate knowledge of the current land use in this research, first land use of Sivar village was determined. Land use determination showed that the indigenous people have created the different uses in the region during consecutive years. These uses have been developed in the region heterogeneously and inappropriately. Distribution of patches due to human interferences is higher in the North and East of the region. Therefore, fewer changes have been occurred in natural resources in these parts. Fortunately, human uses are limited in this village, which is a great advantage for performing the next planning.

In the landscape analysis of Sivar Village, the important notation is the existence of the wide pastures for developing the medic plants. The pastures that cover a wide range of study area are representing the important pasture species in the region. It can be a major support for plant and animal biodiversity development of the human uses will reduce the extent of natural pasture in the future. Other researchers also concluded that the pastures area has been reduced from 36.9% to 26.8% within seven years. The results of another research also showed that the areas of grasslands (pastures) have been decreased by about 3.51% and the areas of residential homes have been increased by about 1.36% from 1945 to 1994. Results of another research also showed that the areas of the pastures and open lands have been decreased by about 29.9% in a rural region. The pastures reduction may be due to the urban development, roads and buildings. The existence of gardens is an important advantage to develop alternative livelihoods along with the natural resources conservation. It is also a financial support for indigenous people. Agricultural activities in the study area act be a big risk for the area. Other researchers also concluded that human activities such as vegetation destruction, road development and agricultural improper techniques disturb the natural resources. The proper tourism plans along with natural resources protection should be performed in the region to develop the Sivar village based on sustainable development and biodiversity conservation. As the results of other researches have also shown, a comprehensive tourism program in rural environments based on biodiversity protection will contribute to natural resources conservation.

Key words

Land use, Analysis, landscape elements, Sivar