Evolution of land use changes using Remote Sensing (Case Study: Hiv Basin, Taleghan)

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Abstract: Deterioration of the ecosystems can be realized by monitoring of land use changes on environmental issues such as land degradation process in time intervals. One of the important features in any watershed is land use changes that effect on economic and social conditions. Therefore, awareness of land use conditions and changes over time is necessary to achieve sustainable development. Today, modern techniques of remote sensing provide appropriate abilities for the analysis of land use changes. The aim of this study was to evaluate the land use changes of Hiv watershed, Taleghan. For this purpose, Landsat-TM's images of 2001, 2008 and 2015 were used and land use changes were studied. The results showed that there are four land uses in study area including rangeland, degraded rangeland land, gardens and rock mass. The results showed that during 2001 to 2015 the area of rangeland has been decreased and degraded. The rural area and gardens have been increased according to the process of industrialization, during this period.

Keywords: Hiv, Remote Sensing, Land Use Changes, ENV

Introduction

Land use changes have many faces, and these changes are often not carried out in a sustainable way. Land use change is important for social, economic and regional development and environmental changes (Chen et al., 2013; Barsimantov & Navia Antezana, 2012; Zhang et al., 2010; Klosterman, 2008). Indirect land use change the theory that the use of cropland for biofuels raises food prices and thus increases the incentive to convert forests and grasslands to crop production (Farber, 2011).

Today, there are many problems in natural resources and agriculture lands and its negative consequences in all region of economic and social life was threatened (Valizadeh et al., 2015). Changes in land use and land cover have been linked to species extinction (Davies et al., 2006), changes in species diversity (Rittenhouse et al., 2012), declines in water (Foley, 2005) and air quality (Romero et al., 1999; Rosset al., 2006), increases in carbon dioxide emissions (Houghton & Hackler, 2001), and climate change at regional and global scales (Bonan, 1997; Pielke et al., 2002; Lawrence et al., 2010; Pitman et al., 2011).

Today, there are several ways and methods for monitoring environmental changes for evolution of land use change, traditional methods and large-scale precision land surveying on the ground is expensive and time-consuming and, in some cases, impossible (Mirkatouli et al., 2015). Remote sensing is the major source of data and is used in the study of areas with urban or manmade characteristics, landscapes and natural environments (Peled and Gilichinsky, 2013; Ye and Fang, 2011; Bhatta et al., 2010; Pelorosso et al., 2009). Remote sensing technology offers high spatial resolution and is avaluable mechanism for the monitoring, diagnosis, identificationand zoning of natural resources, especially in land-use mapping (Tan et al., 2015). Remote sensing digital images provide updated information and comprehensive views and use different parts of the electromagnetic spectrum to record characteristics of the area under study (Antwi et al., 2014; Fonji and Taff, 2014). As a result, techniques such as remote sensing, geographic information system (GIS) is useful for the early identification and evaluation of land changes and it can be useful tool for planning and management environment. One of the direct methods of land use impacts on the hydrological conditions in every land is relation between land use changes and the groundwater table fluctuations. This issue can help managers to optimized management of natural resources (Nasrollahi et al., 2014).

Matakan et al. (2011) used remote sensing techniques for evaluating land cover changes associated with the construction in Taleghan region. The results of their study showed that 20-year period has been relatively stable level of pasture but their quality has dropped due to over grazing and change of pasture land to arable land.

Yanli et al. (2012) using GIS techniques and remote sensing to monitoring land changes and the processes of desertification in the province of Basra in southern Iraq during 1990-2003. The processes of desertification, urbanization, salinization, destruction of vegetation and the destruction of wetland eco-environmental degradation of the region have identified as main factors of land use changes.

Darvish et al. (2012) using remote sensing and GIS, ETM 2000, TM1900 and IRS 2009 showed that garden full coverage rate reduced during periods. Such that, this lands has been decreased from 2972 hectares in 1990 to 1612 in 2009. While, area of urban lands have been increased from 9179 hectares in 1990 to 14591 hectares in 2009.

Sanjari and Borumand (2013) studied desertification process in Zarand using remote sensing methods. They used the data of MSS 1976 satellite and the data of ETM 2005 satellite. Their results showed the extent of desert areas from 1976 to 2005 decreased 1582.7 hectares. As well as, garden area in this period has increased 5.2893 hectares.

The aim of this study is to evaluate land use changes in Hiv watershed, Taleghan. For this purpose, Landsat-TM's images of 2001, 2008 and 2015 were used and land use changing were studied including rangeland, degraded rangeland land, gardens and rock mass.

Martial mad Methods

The study area

The study area is located in the southern heights of the Alborz Mountains. It is located at 35° 59' to 36° 07' latitude and 50° 36' to 50° 43'. It is Located at 70 kilometers Northwest of Tehran in the North of Hashtgerd city. This watershed is adjacent from North with

Taleghan watershed, from south with Karaj-Qazvin highway, from east with Khor and Sefidark watershed and from west with Abeyek watershed. Figure 1 shows the location of the study area in Iran.

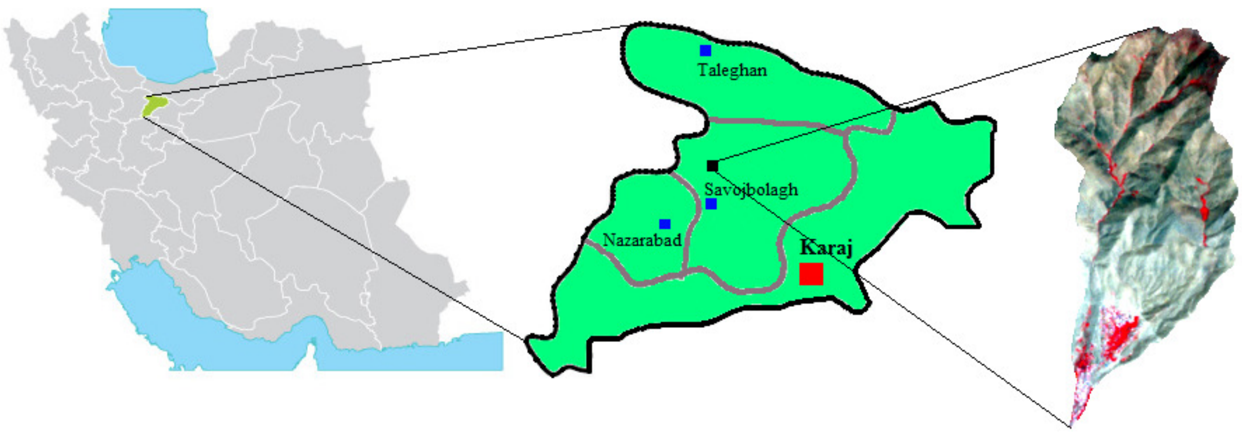

Fig1: location of the study area

Methodology

At the firs the study area with 1:2500000 topography maps was determined. Then remote sensing was used to assessment of change in land use and land degradation during 2001 to 2015. Information that used in this study contains the sensors of ETM and TM data of the study area obtained with image of this sensors in 2001 and 2008 and 2015 years. In this study due to the spatial resolution satellite images that is 30 meters, study area by ENVI was divided into 5 classes contains rangelands, degraded rangelands, rock mass, gardens and residential area, and unclassified area. Then with land use map that obtained to help ENVI software the size of each class was calculated.

Results

According to available data and maps, land use map was prepared in 2001 year in ENVI software (Figure2). The area of each unit is shown in table1.

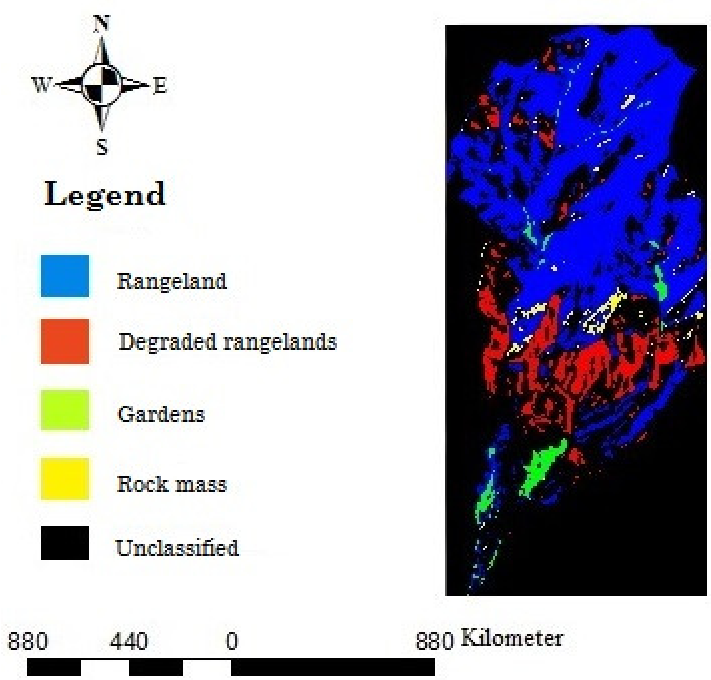

Fig2: Classification of land use in 2001

Table 1: Area of land use classes in 2001

User Type	Area (ha)	Percentage
Degraded Rangeland	256	8.93
Gardens	87	3.02
Rangeland	2188	76.20
Rock Mass	55	1.91
Unclassified	285	9.94
Total	2871	100

Land use map of 2008 shows that area of land in classes of degraded rangeland, gardens and residential area, rangeland and rock mass are calculated 467, 111, 1946, 74 hectares, respectively (Figure3).

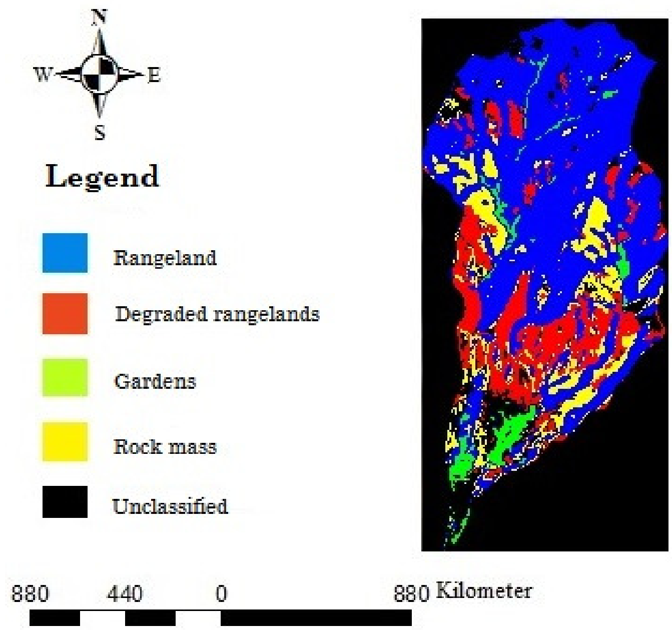

Fig3: Classification of land use in 2008

Table 1 shows the area and the percentage of land use types of the various classes in the study area in 2008. The results showed that the area of degraded rangeland and rural area increased compared to 2001.

Table 2: Area of land use classes in 2008

User Type	Area (ha)	Percentage
Degraded Rangeland	466	16.23
Gardens	112	3.90
Rangeland	1945	67.76
Rock Mass	74	2.56
Unclassified	274	9.55
Total	2871	100

Figure 3 shows land use map of study area in 2015. According to this map, the area of degraded rangeland, gardens and rural area, rangeland and rock mass are calculated as 467, 111, 1946, 74 hectares, respectively.
In order to investigate effective factors on willingness to payment and effectiveness of each variable, logit pattern was calculated by Maximum Likelihood Method. The result is shown in table 3.

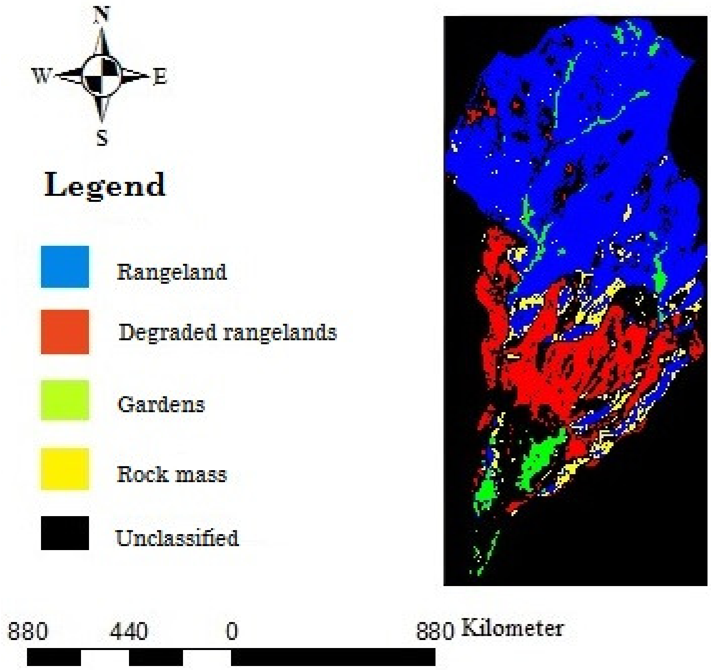

Fig4: Classification of land use in 2015

Table 3: Area of land use classes in 2015

User Type	Area (ha)	Percentage (%)
Degraded Rangeland	541	18.84
Gardens	152	5.30
Rangeland	1818	63.31
Rock Mass	89	3.09
Unclassified	271	9.46
Total	2871	100

The general changes trend of rangeland, degraded rangeland, gardens and rural area and rock mass have been shown in figures 5 to 7. As shown in the table 3, degraded rangeland, gardens and urban area and rangelands has increased generally, but the increase of rangeland area was slower over time.

In the above integral, amount of WTP was gained 3030 Rial. For estimation of total willingness to payment in the study area, we should multiply the study area population by tendency to payment. So the whole willingness to payment in the study area was calculated equal to 23.09 Milliard Rial.

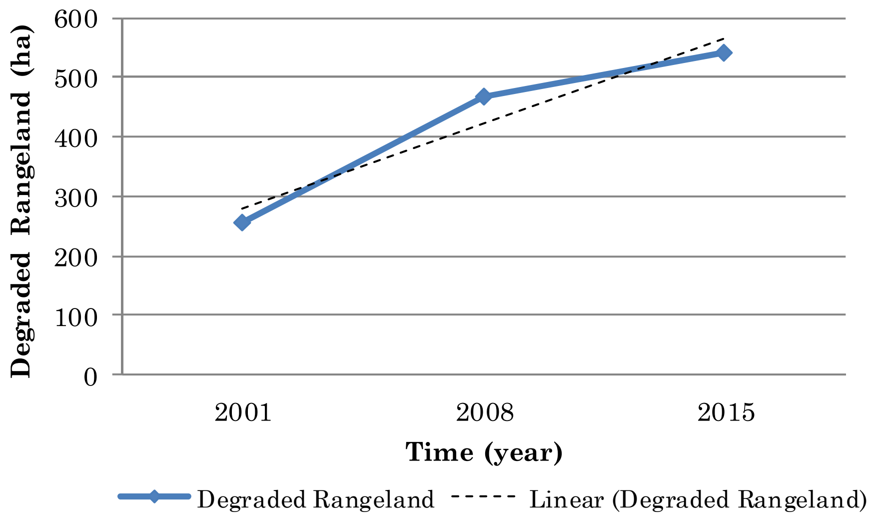

Fig5: The trend of degraded rangeland in 2001 to 2015

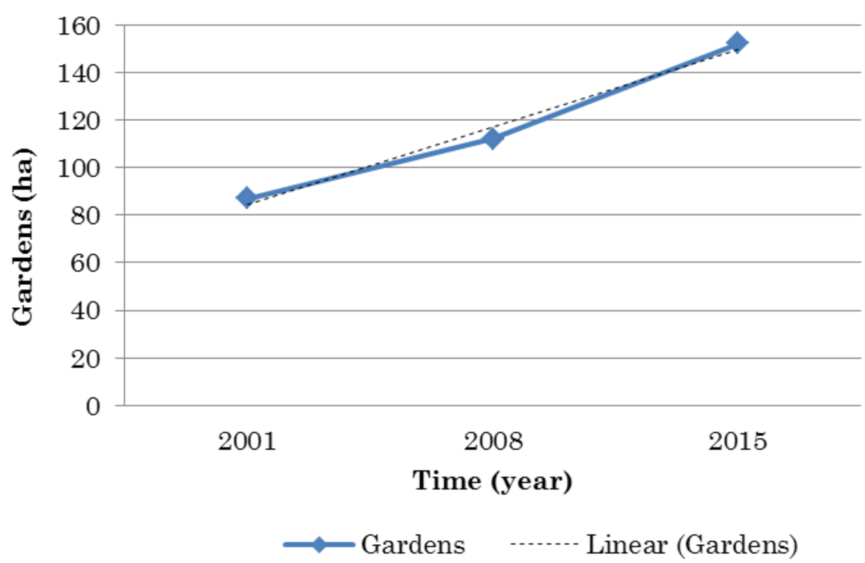

Fig6: The trend of garden land use in 2001 to 2015

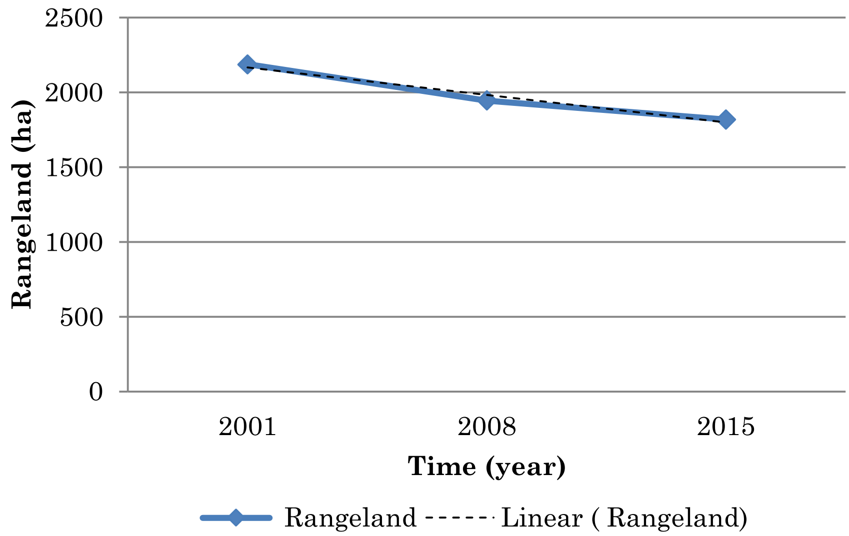

Fig7: The trend of rangelands in 2001 to 2015

Conclusion

Land use change is a process by which human activities transform the landscape. Today, destruction of lands and land use change are occurs in all the big cities, daily. There are many evidences that show a lot of transformation in various fields of land has created due to the demands and needs of civil society. However, conversion of different land and villages reduces the amount of lands available for food.

In recent decades, we are seeing significant changes in land use, with the population growing and industrialization of human societies. Land use change and land degradation can effect to organic matter and physical and chemical properties of soil. Knowing the proportion of land use and how it changes over time is one of the most important indicators in planning. Detect and predict of land use changes are evaluated ecosystem changes the needs of and natural resource management. To inform the user of changes can predict future changes and appropriate measures taken.

Land use changes are different human activities occurring in a different area, the human activities and behaviors create theirs that they will be affected on the environment. However, these activities take place at the local level; they can also contribute to global processes, such as climate change.

In this study, the results showed that area of degraded rangeland is increased from 256 hectare (8.93 percent) in 2001 increased to 541 hectares (18.84 percent) in 2015, gardens (and residential area) is increased from 87 hectares (3.02 percent) in 2001 to 152 hectares (5.30 percent) in 2015, due to increase of village's industrial processes. Rangelands is decreased from 2188hectares (76.20 percent) in 2001 to 1818 hectares (63.31 percent) in 2015, rock mass is increased from 55 hectares (1.91 percent) in 2001 to 89 hectares (3.09 percent) in 2015 that has been little change compare to other land use.

During the 2008 to 2015 the rangeland area is decreased and degraded rangeland increased, due to increase of population and increase of livestock in village which grazing more than rangeland capacity. Also rock mass has changed a little, during at this time. Also urbanization caused that rangeland gets away from its main use every year, that rangelands are changed to residential area.

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