The impact of irrigation system of Karkheh Dam
on land use changes using satellite images
Case study: semi-arid region of Abbas Plain

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Extended Abstract

Introduction

Land use changes is a widespread and accelerating process, mainly driven by natural phenomena and anthropogenic activities, which in turn drive changes that would impact natural ecosystem. Because of the human population growth and its impacts, land-use patterns are changing very fast. Most of the population in Iran depends on agriculture, so the land use changes are mostly linked to agricultural developments. In recent decades, rapid land use changes have been associated with the degradation of natural resources, especially in sensitive ecosystems. On the other hand, like many other developing countries in the world, significant land-cover changes have been occurred in Iran within two last centuries. These changes were primarily due to human activities in connection with the population increase, which forced people to clear forest for cultivation and other activities. This study tries to present the effect of irrigation systems on land use changes since over three decades.

Methodology

Abbas plain with a surface area of 34104 ha, is located in Ilam province near the Iran's western border. The average of annual precipitation and temperature are 207mm and 26.1o respectively. Karkheh dam, one of the largest soil dams in the world and the largest soil dam in Iran and the Middle East, located 15 km east of Abbas plain. The Karkheh Dam is designed to irrigate 320,000 hectares of downstream land including Abbas plain. The water transfer project to the Abbas plain was launched in May 2005. In the present study area, changes in land cover were evaluated in the pre and after- exploitation period of irrigation networks of Karkheh dam to the Abbas plain in Ilam province, Iran. To obtain more accurate results, Landsat sensors imagery of TM, ETM + and OLI were used for the years of 1989, 2003 and 2013, as well as topographic maps, Google Earth images and area coverage. To classify the land use changes, supervised classification method with maximum likelihood algorithm was applied in the ENVI4.8 software. Images of all three periods were classified into five classes: rangelands, agricultural land, residential land, river bed and barren lands and hill moor. In order to determine more precisely changes, areas were obtained for two other periods.

Results

The classification accuracy results showed that the Kappa line was more than 87% for every three years and the overall accuracy obtained were 90.43%, 92.28% and 94.76% respectively for these years. The results also showed that barren lands and hill moor class has covered the largest area of this study place during the two periods (pre and after- exploitation), so that, it was 12344.1 hectares in the first period and 17370.5 hectares in the second one. In both study periods, the rangeland class has been destroyed, but in the second period 13.8% was destroyed more than the first one. Due to the exploitation of irrigation systems by farmers in the second period, more changes in land use have been converted to agricultural use, so that, 3671.8 hectares (55%) have been added to these lands during 10 years. The growth of residential areas was 0.27% of the study area after channelling, which was estimated 1.6 times higher than the first one. The area increase average in this class is 10.2 hectares per year. The most frequent conversion to farm use was barren lands and hill moor class. These lands have undergone a change by residents of the region due to their location between agricultural lands and a short distance from irrigation systems. A large number of land use changes can be prevented by defining the scope for agricultural land.

Conclusion and Discussion

In the present study area, irrigation has been in practice since over 25 years ago. Significant land-use changes have occurred in the study area in response to the Karkheh Dam from time to time affecting agricultural productivity leading to land-use changes. Unfortunately, some parts of these changes are out of schedule and unskillful and, that is significant for planners to know about these. All in all, for providing management activities and environmental programmes, accurate data on land use changes are essential. Satellite images and maximum likelihood algorithm provide the baseline data essential for proper understanding on the land-use patterns in the past and its impacts. It is also proper to understand the past land use changes ratio, and the physical and socio-economic factors behind.