



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

AN ASSESSMENT OF LAND USE AND LAND COVER CHANGE: A CASE STUDY OF ANASAGAR LAKE, RAJASTHAN

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Abstract: Wetlands are of great importance to man and nature as they purify water, reduce flood, store water, prevent soil erosion, and support varied biodiversities. This wetland is a freshwater lake and is rich in diversity. Lake Anasagar is a threatened water body of Ajmer city of Rajasthan. The present paper is an attempt to study the impact of human-induced activities on land use land cover change in and around Anasagar wetland. Land use and land cover mapping have been done with the help of satellite imagery for the years 2008 and 2013. The study tries to evaluate the changing pattern of land use land cover by analysing the changing pattern of agriculture development, vegetation cover, swampy land and build-up area. Images were analysed for aggradations changes, meanders and water bodies alterations. Then the images were classified with the supervised classification technique to calculate the area for different land use classes. The result shows, there was an increase in build-up land whereas vegetation cover, shows a decreasing trend in recent years. Reference of topographical sheets has been used to corroborate the findings with ground realities. A reconnaissance survey of the field was carried out for the accuracy assessment and finally the study has been done.

Keywords: land use change, multi temporal data, anthropogenic interference, spatio-temporal analysis, change detection

Introduction

Lake Anasagar is a threatened water body of Ajmer city of Rajasthan. The lake area is being encroached on for housing which has reduced water spread. The land use land cover pattern near Anasagar Lake is an outcome of natural and socio-economic factors. Land cover refers to the physical and biological cover over the land surface including water, vegetation, bare soil, and artificial structures. Land use in terms of syndromes of human activities such as agriculture, forestry and building construction that alter land surface processes including biogeochemistry, hydrology and biodiversity such as subsistence versus commercial agriculture, rented versus owned, or private versus public land.

Scope of Study

Due to industrial growth, the land use of the region changed rapidly in recent years. The present paper is an effort to investigate land use land cover change, using special techniques (Remote Sensing and GIS) as land change at the regional scale is vital for extensive applications, including regional management and land planning. The analysis confirmed that extensive amounts of barren land, water bodies and agricultural land are covered in the land settlements, industrial areas, and commercial buildings in the absence of any legal regulations. The land, whose land cover has changed over the past years can be an asset to urban planners, decision-makers, and industrial society to advice sustainable land use and environmental planning in the area.

Result and Discussion

Land use/Land cover categories have been identified with the help of the Satellite imageries and field observation. The different land-use pattern practises in the catchment area of Anasagar Lake including its major land-use changes that have taken place over a period of six years (from 2008 to 2013) are presented in the table. With the help of land use/land cover analysis, the whole area has been categorised into five categories. The water spread area includes those which are completely under water termed permanent water area and another area, which is time of summer, term as the swampy area. Small societies are situated near the lake area termed as the built-up land area. Then after farming farmland is considered agricultural land which is the most important activity carried out in the catchment area.

Satellite Image of Anasagar Lake 2008-2013



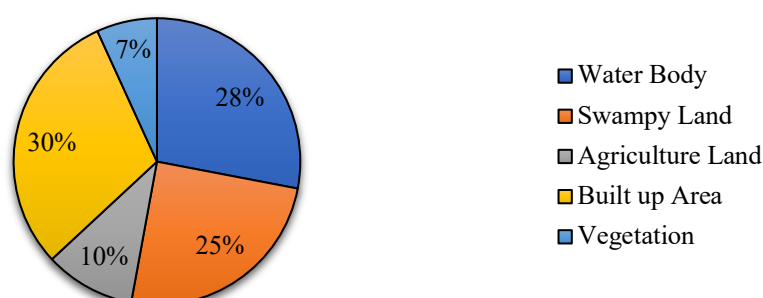
Source- Google Earth

Land use and land cover of Anasagar Lake in 2008 and 2013

S.No.	Land Use	2008	2013	Rate of Change
1	Water Body	155.6574348 Km ²	218.7467766 Km ²	26.80%
2	Swampy Land	94.358458 Km ²	123.981102 Km ²	23.80%
3	Agriculture land	532.564335 Km ²	482.312931 Km ²	9.76%
4	Built up Area	3206.4637949 Km ²	3586.8220644 Km ²	28.80%
5	Vegetation	515.5647342 Km ²	483.7094005 Km ²	6.52%

Source: Ministry of forest and Environment Report, 2014.

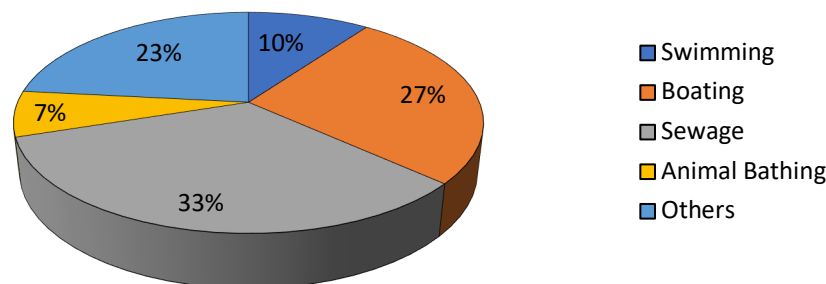
Rate of change from 2008-2013



Water Body

In the year of average rainfall, Anasagar gets connected to the Foisagar through the drainage system. But in late summer the water is confined to the deeper depression and only about 155.65 to 218.74 sq.Km in 2008 and 2013 respectively. During this period water has changed 28% since (2008-2013). With the help of the drainage canal. 500 Cusecs water extracted from the lake for agriculture practices and drain to the Foisagar. A slice of drainage canal was deliberately widened by a rich farmer and influential person to drain more water from Anasagar to Foisagar. With the help of this activity, rich farmers get receding land and do agricultural practices for profit maximisation despite knowing of the detrimental effect of ecological stability. The rich farmer overexploited the bed lake for farming. Also lake has increased these years because of the dumping of sewage into the lake whole of Ajmer city's sewage is been drained into this lake and due to the population pressure near the lake the sewage dumping has increased due to which the area of the lake has been increased drastically but the quality of lake water is being decreased. Through interacting with the local people residing near the lake have said that this lake is now used majorly for sewage dumping. Almost 33% of the population that I have interviewed feels that sewage dumping is the only use of this lake nowadays.

Uses of lake



Swampy Land

The shares of swampy areas in the catchment area are in increasing trend. It has increased from 94.35 to 123.98 sq.Km in 2008 and 2013 respectively. During this period water has been changed 25% since (2008-2013). This may be due to the drainage of water from Anasagar Lake to the Foisagar lake. In 1994-1995, the drainage canal was cleaned and removed weed. Widening of the outlet of the canal causes more water to drain to Foisagar. Due to which area under swampy land has been increased. This kind of Swampy land has been converted into a vegetation area.

Agriculture Land

Majority of the land in these villages is used for agricultural purposes. The share of agricultural practices has decreased from 532.56 to 482.31 sq.Km. There has been an overall 10% decrease in agricultural land in the last 6 years. In 1994, a land survey was done subsequently land acquisition was completed. Due to this use for agricultural practices around the lake area has been restricted. People are discouraged from agricultural practice. Finally, the share of agricultural practice decreased from 2008 to 2013.

During the late summer when the water recedes and land comes out of submergence from the lake, people are engaged in cultivation activities. Early paddy sowing and transplantation are done. When water comes back to submerge the land again the crop grows taller. The crops are harvested and transported by boats (Focus group discussion with local farmers). Mustard crops were grown unexpectedly in 2011 first time (Discussion with local people). It has grown in receding land of water and simultaneously it indicates illegal agricultural practices.

Built-up Land

Mostly rural settlement has been seen around the Anasagar Lake. The built-up area has significantly increased from 3206.46 to 3586.82 sq.Km of the total catchment area from 2008 to 2013. During this period the built-up area has been changed 30 % since (2008-2013). Most of the settlements are very small and situated near the fringe area of the lake. Due to the increasing population, increasing road connectivity and availability of fertile land are the main reasons for the increasing built-up area majorly the commercial area has been increased like shopping complexes, showrooms and malls. Anasagar Lake has also an island which can be approached by boats a small restaurant has been set over there for the amusement of the local public and tourists. At the time of flood, 20% of the total area submerges in water. Due to this number of houses are made

up temporarily with the help of wetland products. Anasagar Lake is not struggling to get privilege it is because of the sparse rural settlement.

Vegetation

Vegetation cover has been decreased from 515.56 to 483.70 sq.Km in 2008 to 2013. Sparse vegetation has also been seen on water body itself. It has occurred due to excessive use of fertilizer and pesticide, which are carried into the lake by runoff, subsequently it increases vegetation in upper surface of the lake. Some people also practise the making sculptures of god and goddesses using Plaster of Paris.

Effect on Catchment Area

Changes in land use and land cover of the Anasagar wetland are important drivers of water and soil pollution. Most of the catchment area has been transferred for agricultural practices and the overproduction, of fertiliser pesticides has been used unsustainably. This has been the cause of land pollution along with the wetland deterioration. Vegetation removal leaves the soil vulnerable to a massive increase of soil erosion by runoff water, especially near Chandrawardai Nagar and the Regional College area. This not only degrades soil fertility over time, reducing the suitability of land for future agricultural use but also releases huge quantities of phosphorous, nitrogen and sediments to streams and other aquatic life (increased sedimentation turbidity, eutrophication and hypoxia). Modern agricultural practices, which include intensive inputs of nitrogen and phosphorous fertilizers and the concentration of livestock and their manures within a small area have substantially increased the pollution of surface water by runoff and erosion and the pollution of lakes by reaching excess nitrogen (Nitrate). Due dumping of solid waste near the lake area has stopped the water from flowing properly, and blockage of water is been created near the lake.

Conclusion

The land use/land cover of the study area has changed markedly over the period pointing to excess pressure on the existing landscape. Through the analyses of multi-date satellite imagery of 2008 and 2013. It has been observed that there has been an overall increase in the water body, built-up area and swamp area. Other hand vegetation and agriculture have decreased. The catchment area is an integral component of the wetland ecosystem. The anthropogenic activities in the catchment areas such as overgrazing, use of fertilizer in agricultural practices and development activity are causative factors of the accelerating soil erosion, and hydrological alteration and consequently course ecological instability near Anasagar Lake.

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