CASE STUDY

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Monitoring land use/land cover change using remote sensing and GIS techniques: a case Study of Pandharpur city, district Solapur, Maharashtra, India

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ABSTRACT

Land use/land cover changes have become major problem in recent worldwide environmental change and sustainability research. The concept can be broadly classified as natural and activities that unenthusiastically impact on all environmental factors. The manmade Land use/land cover changes impact is speedily as compare to the natural changes and most biomes of the world have been changed due to the increasing manmade activities. The present research work examines the use of GIS and Remote Sensing in mapping Land use Land cover in Pandharpur City for the year 1989, 2003 and 2015. Change detection pattern of vegetation, built-up area, water bodies and waste land were studied. The vegetation and water bodies were decreased and built up area and waste land were increased for the time period of 1989, 2003 and 2015.

Key words: LULC, Remote Sensing, GIS, Pandharpur City, etc.

1. INTRODUCTION

Anthropogenic activities have in current years become known as a most important force determining the earth. The manmade actions rather than natural forces are the source of modern change in the states and flows of the earth. For most of human time, the modification of the earth by manmade action primarily involved impacts on the all agricultural base. Land use / land cover changes take part in a main function in the study of worldwide change. Land use/land cover and anthropogenic or natural modifications have mostly resulted in vegetation, water bodies, built up area and waste land (Mas et al., 2004; Dwivedi et al., 2005; Kasahun Kitila Hunde, 2015; Augusta Ayotamuno and Akuro Ephraim Gobo, 2016; Sutandra Singha, 2016). These ecological problems are often related to Land use/land cover changes. Therefore, available data on Land use/land cover changes can provide critical input to decision-making of environmental management, mitigation and planning for the future (Fan et al., 2003; Prenzel, 2004).

The growing population and increasing socio-economic requirements creates a pressure on land use/land cover. This pressure results in unplanned and uncontrolled changes in Land use/land cover (Seto et al., 2002). The Land use/land cover alterations are generally caused by mismanagement of agricultural, urban, water bodies and waste lands which lead to severe ecological problems. The main aim of change detection process is to recognize Land use/land cover on digital images that change features of interest between two or more decades (Muttitanon and Tripathi, 2004; Selcul Reis, 2008).

2. STUDY AREA

Pandharpur city is located in the western side of Solapur district and is bordered by Malshiras tahsil to the northwest, Sangola to the south and southwest, Madha taluka to the north and Mohol taluka to the east. Pandharpur city lies between 17°32′05″ to 17°56′79″ N latitude and 75°00′56″ to 75°35′45″ E longitude. According to census 2011, Pandharpur is 3rd largest tahsil in India and ninth largest population city in Maharashtra. As per the satellite data average altitude of the Pandharpur city is 500 meter from mean sea level. The average rainfall of the Pandharpur city is 611 mm.

3. MATERIALS AND METHODS

3.1. Data Acquired and Source

For the research work, Landsat7 satellite images of Pandharpur city were acquired for three Epochs; 1989, 2003 and 2015. Both 1989 to 2015 were obtained from Earth Explore an Earth Science Data Interface, earth explore.

3.2. Data Used

Data is soul of any information system. Any kind of analysis or results mainly depends upon reliability and accuracy of data. The efficiency and performance of any information system highly depends on nature, quality and availability of data. The 30m spatial resolution of Landsat MSS, 1989 (www.glcf.com); Landsat ETM +2003 and Landsat 8 2015 (www.earthexpoler.usgs.com) data were used for the study. The ArcGIS 10 and EDRAS Imagine 2011 software were used (Neha Singla et al. 2015; Naveen Kumar et al. 2016).

3.3 Methodology

The Geodatabase is created for storing, processing and retrieval of spatial data. The Feature Dataset is created with WGS 1984 Complex UTM Zone 43N.prj projection system which will applicable to all Feature Classes to be created in this Feature Dataset. The Polygon, Line and Point Feature Classes are generated here.

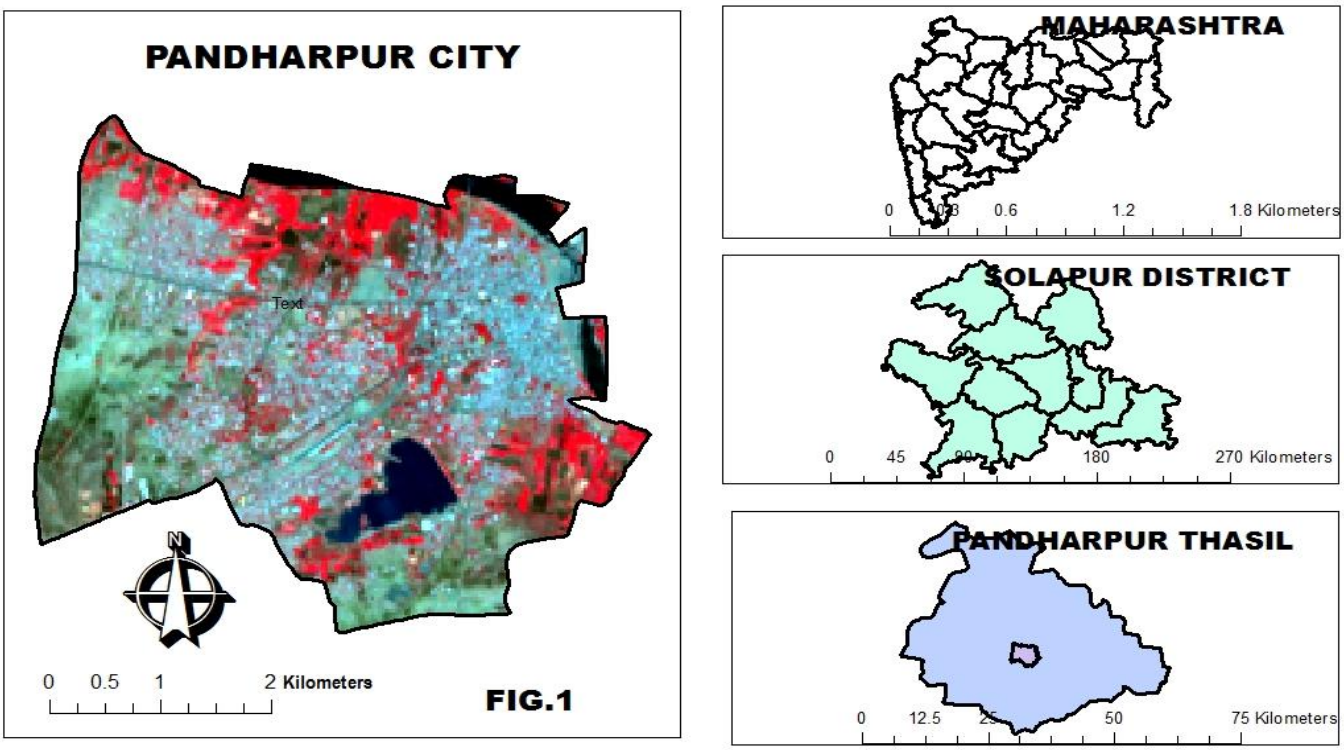
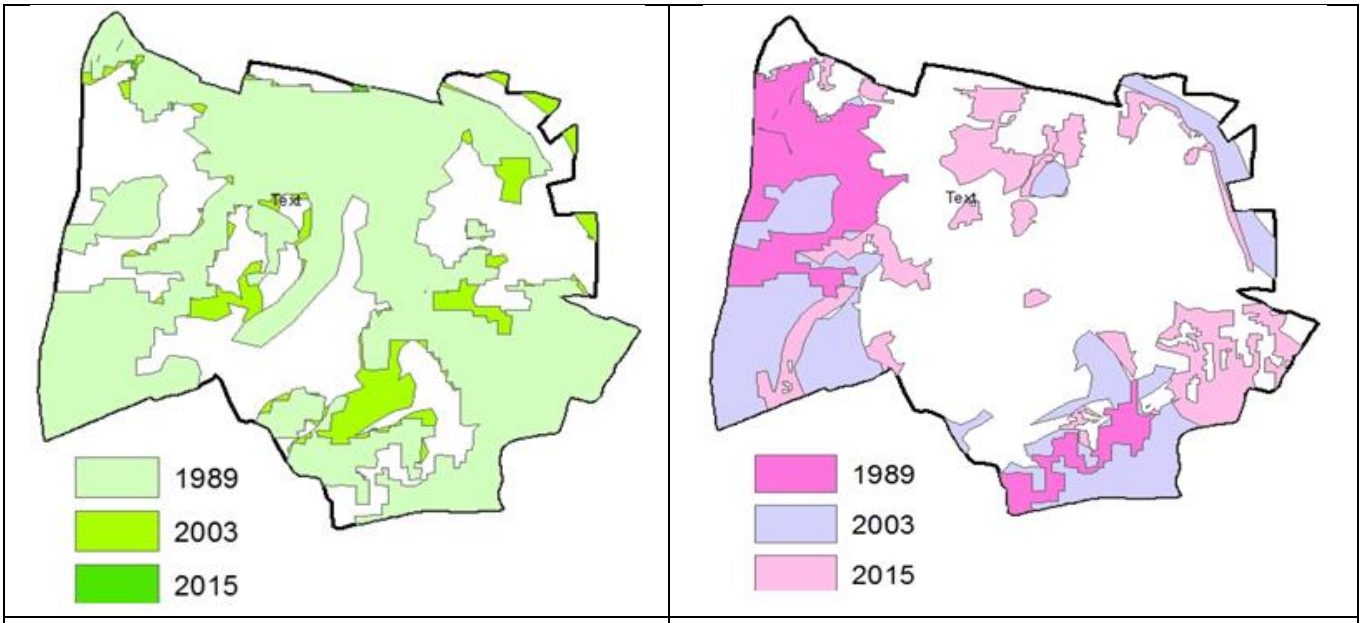


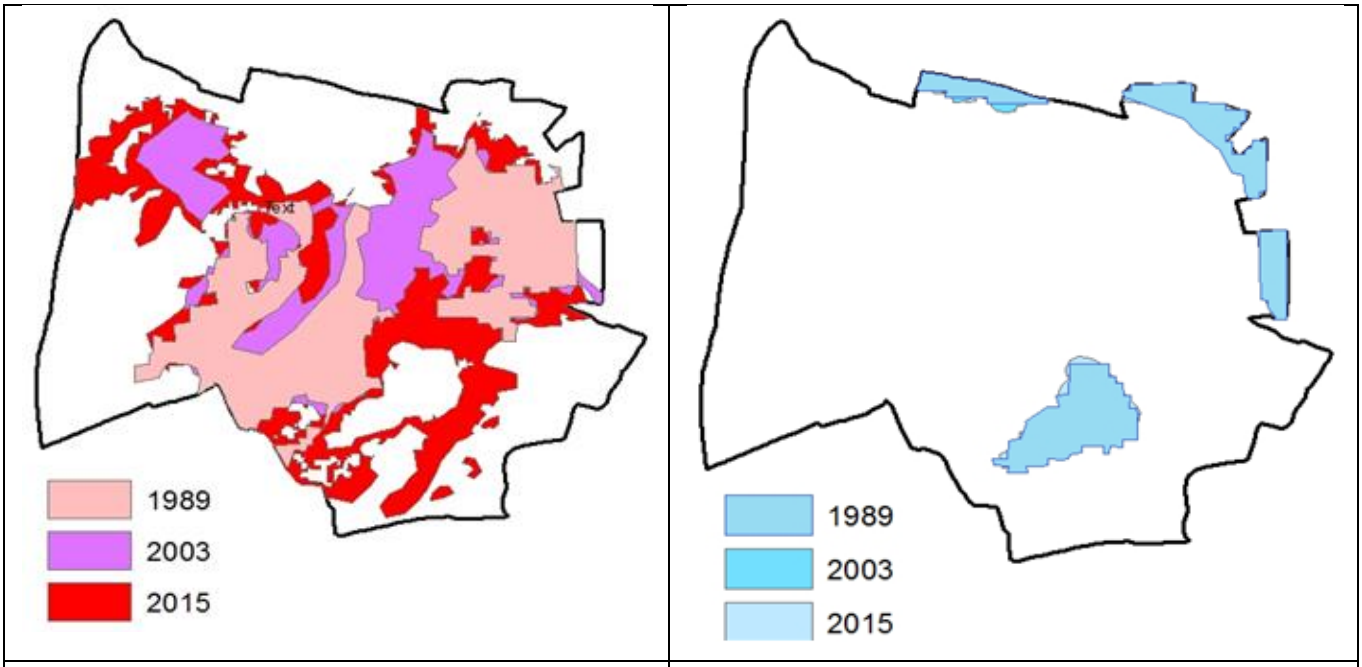
Figure 1 Location Map of Pandharpur City

4. RESULT AND DISCUSSION

In the present study, Landsat MSS Image - 1989, Landsat ETM+ Image - 2003 and Landsat 8 Image - 2015 images were used for mapping of land use land cover from Pandharpur City. The total land use land cover area (sq.km and %) and change pattern between years (2003-1989 and 2015-2003) of Pandharpur city have been discussed here (Table 1).



(a) Vegetation | (b) Waste land



(c) Built-Up | (d) Water Bodies

Figure 2 LULC Map of Pandharpur City.

Table 1 Land use land cover of Pandharpur City

Feature	Area (Sq. km)			Area (%)			Change Pattern	
	1989	2003	2015	1989	2003	2015	2003 - 1989	2015 - 2003
Vegetation	9.54	7.96	2.35	51	43	13	-1.58	-5.61
Water Bodies	3.51	0.56	0.01	19	3	0 (0.05)	-2.95	-0.55
Built up area	4.38	5.1	11.11	24	28	60	0.72	6.01
Waste land	1.05	4.86	05.01	6	26	27	3.81	0.15
Total	**18.48**			**100**			-	-

The total area of Pandharpur City is 18.48 Sq.km, which is divided by four group viz. vegetation, water bodies, built up area and waste land. Out of this area, Vegetation area covers maximum area 9.54 sq. km (51%) in year 1989 and 7.96 sq. km (43%) in year 2003. The year 2015, built up area 11.11 sq. km (60%) covers maximum area. The minimum area covered waste land 1.05 sq.km (6%) in year 1989 and water bodies 0.56 sq.km (3%) and 0.01 sq.km (0.05%) in the year 2003 and 2015 (fig. 2a-d).

The change pattern of 1989 and 2003 map shows that built up area and waste land area positively increases and water bodies and vegetation negatively decreases. Same pattern observed in 2003 and 2015 change pattern.

5. CONCLUSION

This research work investigates land use/land cover changes occurred in Pandharpur City between the year 1989, 2003 and 2015 using RS and GIS. The present change detection study by using multi-temporal satellite imagery helps in understanding landscape dynamics. The LULC changes were determined according to vegetation, water bodies, built up area and waste land. The vegetation and water bodies were decreased and built up area and waste land were increased for the time period of 1989, 2003 and 2015.

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