International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 03 | Mar 2022 www.irjet.net p-ISSN: 2395-0072

ASSESSMENT AND MAPPING OF WASTELAND CHANGES IN BANDA DISTRICT OF UTTAR PRADESH USING REMOTE SENSING AND GIS TECHNOLOGY

Abhyuday Singh [1], Dr. Udai Raj [2], Dr. Sudhakar Shukla[3]

[1]M.Tech Scholar, School of Geoinformatics, Remote Sensing Applications Centre, Uttar Pardesh, India.
[2] Scientist-SE, Remote Sensing Applications Centre, Uttar Pardesh, India.
[3]Scientist-SE and Head of School of Geoinformatics, Remote Sensing Applications Centre, Uttar Pardesh, India.

Abstract - *Wasteland has been a matter of concern for land users due to deterioration of land quality for agricultural production. Wastelands are one of the main cause of land degradation. The current status of wasteland in India is around 56 million hectares out of which the total wasteland area in Uttar Pradesh is 1.698416 million hectares. The aim of the current study is to temporal analysis along with area calculation of wasteland in the Banda district of Uttar Pradesh with the help of geospatial technology. Different analysis has been done to assess the magnitude of different types of wasteland in the study area namely Gullied or ravenous land, Land with dense scrub, Barren rocky and stony waste. The result shows that the area of 103.04 sq. km corresponding to 2.33% of geographical area of Banda has been estimated to be under wasteland during year 2021-22 compared to 393.45 sq.km (8.915%) in 2003-04. This shows that there has been reduction in the spatial extent of the wasteland from 2003 to 2021.*

Key Words: **Wasteland; land degradation; geospatial technology; magnitude; Calculation.**

1.INTRODUCTION

The increase in the population has created an excess demand for food, fuel, land use etc. This has resulted in the increment of productive land under consumption which simultaneously deterioted the quality of land and put them under the category of wastelands. Wasteland has been one of the most serious environmental and human survival challenges in recent decades. Wasteland means degraded land which can be brought under vegetation production cover with fairly good efforts, and which is currently under-utilized or land which is deteriorating due to lack of appropriate water and soil management or on account of natural causes (NRSA, 2007). From the utilization point of view, wastelands are classified as forest wasteland and non-forest wasteland, culturable wasteland and non-culturable wasteland. Wasteland is considered "Degraded" when its productivity is diminished. Wastelands can be brought under vegetation with adequate endeavour. The major types of wasteland considered for mapping are Land with dense scrub; Gullied or ravenous land; Barren rocky and stony wasteland Satellite imagery high resolution Google earth data has been used for the study. Evidence on geological position, aerial extent and spatial distribution of wastelands is essential for their useful conduct and sustainable development (Gautam and Narayan, 1988). Change detection is very crucial process in monitoring and managing natural resources. Geographic Information Systems (GIS) and Remote Sensing (RS) techniques provides valid tools for examining the wasteland changes of the region as well as for monitoring, mapping, and management of natural resources (Sreenivasulu and Udaya Bhaskar, 2010) and forecasting the future screenplay using models like cellular automata (Ramana et al., 2012). Manoj Kumar (2017) has mapped wasteland categories systematically and explained wasteland development plan in district of Haryana State using IRS-IC/ID LISS-III digital data along with on-screen visual interpretation techniques. Change spotting in Wastelands using Remote Sensing and GIS Techniques for SPS Nellore District, Andhra Pradesh was studied by Sastry et al., (2011). Nathawat et al., (2010) described the utility of temporal satellite data (IRS-P6 LISS-III) and high resolution satellite data (IRS-P6 LISS-IV) for monitoring & analysis of wastelands and its dynamics for Vaishali district of Bihar State. Keeping the above studies in view, the work has been undertaken to prepare the multi-date wasteland maps from Remote Sensing data and to monitor the changes in various wasteland categories using GIS techniques.

1.1 Objectives

The main objective of the present study is to map the spatial extent and distribution of wastelands of two time periods and to assess the wasteland change in the Banda district of Uttar Pradesh during the period 2003-04 and 2021-22 by using a Survey of India Topo sheets for the year 2003-04 and google earth imagery for the time period 2021-22.

2. STUDY AREA

Banda is a district of Uttar Pradesh state in northern India. The administrative headquarters of the district is at Banda. Total area of Banda district is 4413 km^2. The district is located in the Chitrakutdham Division of Uttar Pradesh and lies between Lat. 24º 53' and 25º 55' N and Long. 80º 07' and

81º 34' E. It is enclosed in the north by district of Fatehpur in the east by the district of Chitrakut in the west by the district of Hamirpur and Mahoba and in the south by Satna, Panna, and Chhatarapur the districts of bordering Madhya pradesh. Banda district has a population of 17,99,410 people, according to the 2011 census. It is ranked 265th in India as a result of this (out of a total of 640 districts). The population density of the district is 404 people per square kilometre (1,540 people per square mile). It had a population growth rate of 17.06 percent from 2001 to 2011. Banda, Naraini, Baberu, Atarra, and Pailani are the five tehsils that make up the district.

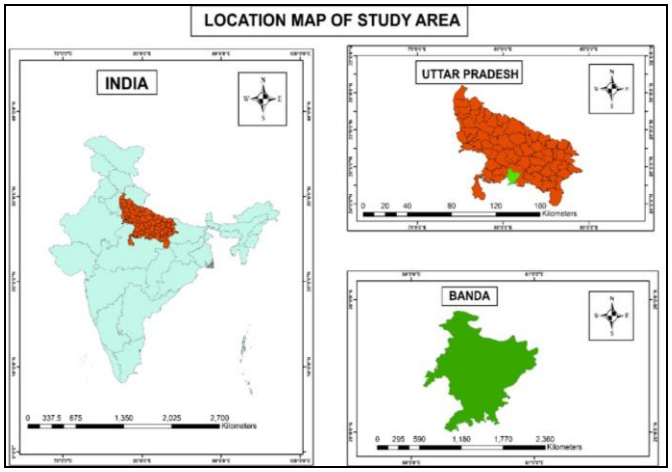

Fig-1: Location map of study area Banda, Uttar Pradesh

3. MATERIAL AND DATA USED

3.1 Data Used

- Survey of India Topographical Sheets: **63C/1, 63C/2, 63C/3, 63C/5, 63C/6, 63C/7, 63C/8, 63C/9, 63C/10, 63C/12, 63C/13, 63C/14, 63C/15.**

3.2 Software Used

- ArcGIS 10.8
- Google Earth Pro

4. METHODOLOGY

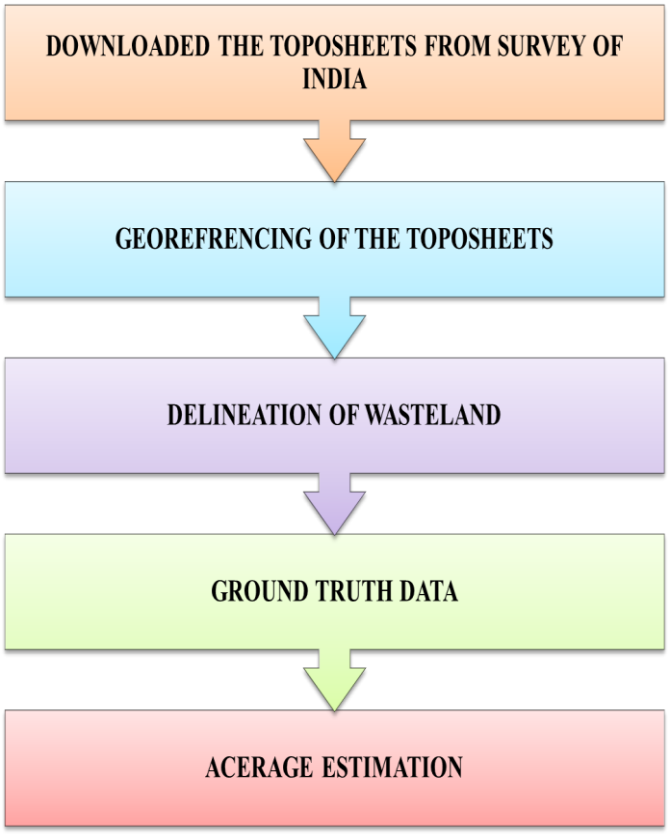

Fig-2: Flow chart of methodology used

For the acerage estimation of wasteland total 13 toposheet maps were downloaded from the Survey of India.The georeferencing of all the toposheets was done and then the mosacing of all the toposheets was done and area of interest was extracted. Determination and discrimination of cultural wasteland require quantitative use of unnoticable difference in their spectral data and hence rely mostly on computer based digital image processing technique.

The area estimation process broadly consists of distinguishing representative sites of culturable wasteland classes on the image based on the ground truth collected GPS Data (Lat. Long.). On screen delineation of different culturable wasteland classes will be done according to their spectral signature and their area statistics will be generated using by image processing /Arc-GIS software. Ground truth data collection would be carried out around in the entire district Block level information regarding various culturable wastelands would be collected. Only limited ground truth data collection/verification of culturable wasteland would be carried out during the ground truth period.

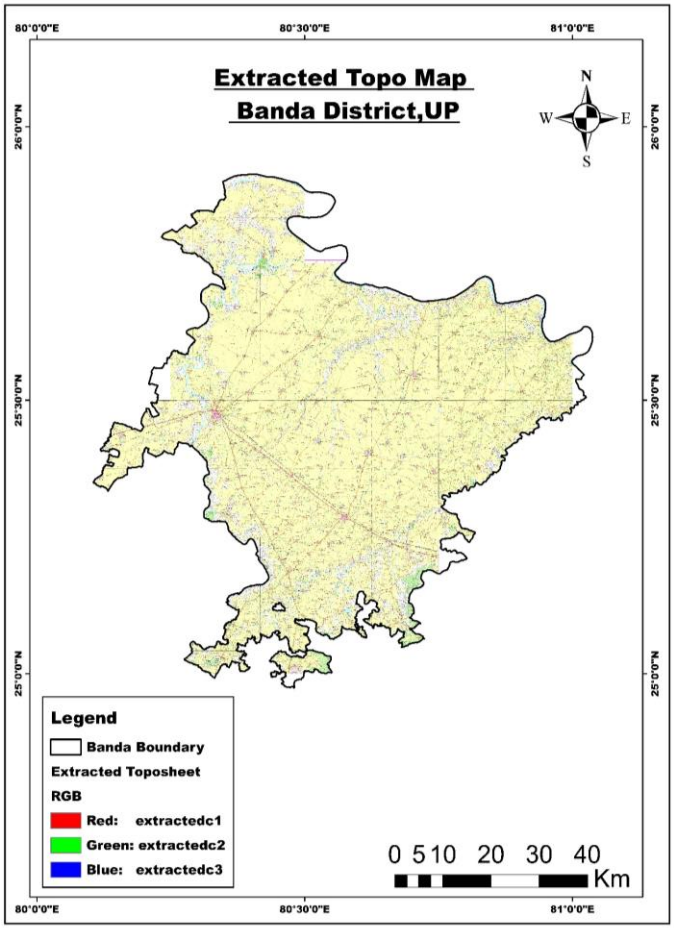

Fig-3: Extracted wastelands of Banda district on Toposheet

5. RESULTS

Every second, the world changes, and everything is in constant motion. The world is made up of tangible parts that are constantly changing and evolving. The process of development is the production of new entities and the disappearance of old entities, in which new entities take the place of old entities. As a result, a thorough understanding of the changes in geographical entities is essential . contributes to a deeper knowledge of society and its modernity (Yang Ping, et al., 2008). According to Macleod and Congalton (1998), there are four important aspects of change detection that are critical for natural resource monitoring. Change detection is one of them, that have occurred, determining the form of change, quantifying the change's spatial extent, and evaluating the change in spatial pattern in the Maps of the Wasteland Total area of Banda district. In this study I have calculated the area which is under wasteland by mapping with the help of ArcGIS software. The Ground Truth data is used for accuracy statement. Area calculated under the influence of Wasteland is mentioned below. Wasteland status map of Banda district was prepared using the Google earth imagery for the years 2003-04 and 2021-22 are given in figures below. Change in area under Wasteland can be access from the given maps. Wasteland mapping for the year 2003 reveals that around 9% of the geographical area was under wasteland and in the year 2021-22 around 2% of the geographical area of the district is only under the category of wasteland. Comparison of geological process standing maps are prepared with the help of ArcGIS of The year 2003 and 2021 reveals that there's an overall decrease of the wasteland area.

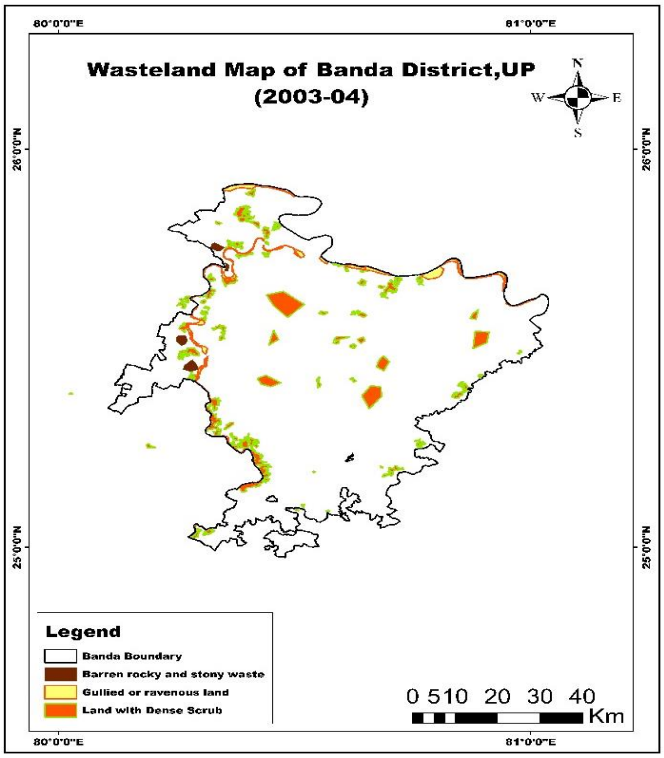

Fig-4: Wastelands of Banda district for year 2003-2004

S. No	Wasteland Category	Year (2003-04) (in sq. km)	(%)	Year (2021-22)	(%)	Change (in sq. km)
1.	Gullied or ravenous land	220.88	56.139	57.62	55.92	-163.27
2.	Land with dense scrub	154.89	39.367	40.38	39.19	-114.52
3.	Barren rocky and stony waste	17.67	4.49	6.04	5.86	-11.63
Total		393.45	100	103.04	100	-290.41

Table-1: Category wise wastelands distribution and changes during the period 2003-2004 and 2021-2022 (area in sq.km)

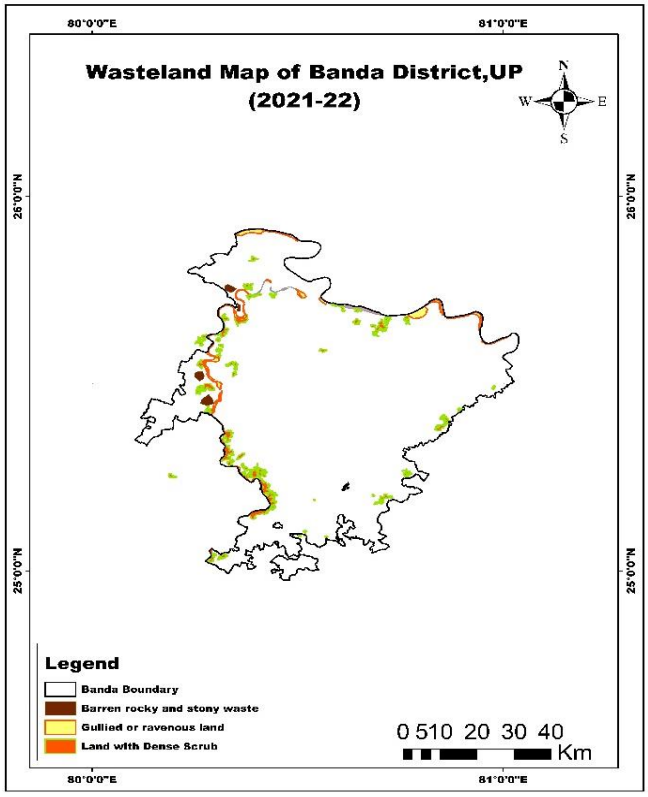

Fig-5: Wastelands Map of Banda district (2021-2022)

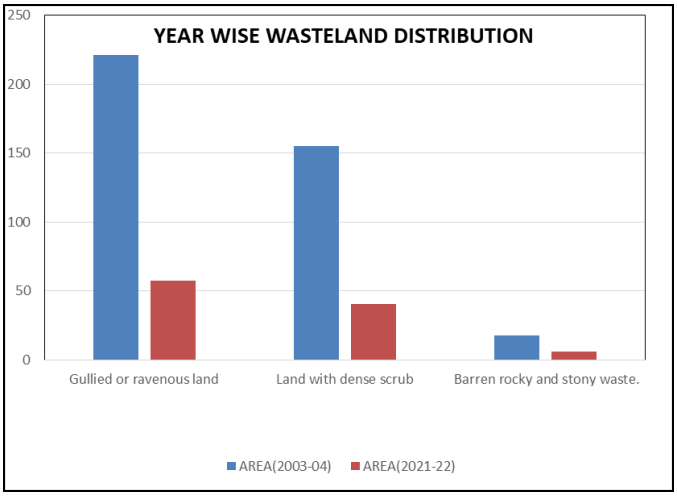

Fig-6: Graphical representation of wastelands of Banda district

6. CONCLUSION

This study provides the significance of RS(Remote Sensing) and GIS for change detection study of wastelands of an area as it offers crucial information about the spatial distribution as well as nature of changes. The integration of satellite remote sensing along with visual interpretation is an effective method for the documentation of changes in wastelands of an area. The reduction in the area of wastelands denotes the growth of non-wastelands area i.e. croplands, plantations, settlements, industries, etc. The detailed analysis has revealed that the area under wastelands is decreased from 8.915% to 2.33% during the period from 2003-04 to 2021-22. The generated information for the wastelands will aid in understanding the spatial distribution and extent which will help in further planning and taking in time appropriate decisions for sustainable development. Also the local people should be made aware of the importance of the wastelands and its change.

REFERENCES

[1] Abdel Kawy, W., & Darwish, K. (2019). Assessment of land degradation and implications on agricultural land in Qalyubia Governorate, Egypt.Bulletin of the National Research Centre.

[2] Easdale, M. H. (2016). Zero net livelihood degradation – the quest for a multidimensional protocol to combat desertification, SOIL. 129-134.

[3] Fleskens, L. a. (2014). Land management and policy responses to mitigate desertification and land degradation, Land Degrad. 1-4.

[4] Gessesse, B. B. (2015). Model-based characterization and monitoring of runoff and soil erosion in response to land use/land cover changes in the Modjo Watershed. Land Degrad. Dev, 711-724.

[5] Stringer, L. C. (2014). Land degradation in Dolj county, southern Romania: environmental changes, impacts and responses, Land Degrad. Dev., 25.17-28.

[6] Abhishek Kumar, Renu Kumari, Dr. M.S.Yadav, Dr. Sudhakar Shukla; Analysis Of Land Degraded In Maitha Block Of Kanpur Dehat District Using Remote Sensing And Gis Techniques;Irjet;2395-0056.

[7] Arif Ahmad, R.K. Upadhyay, B. Lal and Dhananjay Singh Change Detection of Sodic Land in Raebareli District Using Remote Sensing and GIS Techniques.

[8] Hill, M. J. (2005). Multi-criteria decision analysis in spatial decision support: the Assess analytic hierarchy process and the role of quantitative. 955-976.

[9] Omuto, C. T. (2014). A framework for national assessment of land degradation in the drylands: a case study of Somalia, Land Degrad. Dev., 25.105-119.

[10] Asio, V. B. (2009). A review of soil degradation in the Philippines. Annals of Tropical Research, 69–94.