

Land Use Land Cover Mapping in Dhamangaon Railway, MH with the help of GIS Software and Remote Sensing

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ABSTRACT

Mapping land use land cover changes at regional scales is essential for a wide range of application, including, landslide, erosion, land planning, global warming etc. The aim of the project is to develop an action plan for land use cover mapping is the process of creating and implementing plans. To maintain the present natural resources and to understand to causes and consequences of over exploitation of soil and water resources the land use, a land cover mapping and monitoring was done in the study area i.e., Dhamanagaon railway. In this study satellite image for January 2015 and February 2019 were used for LULC (land use land cover) supervised classification. For the classification purposes, seven LULC classes were decided change detection between both the image for al the land use and land cover classed were computer.

Keywords: Land Use Land Cover, Remote Sensing, Source of Energy

I. INTRODUCTION

1.1 Introduction on LULC

Land use land cover change has turned into a core part in present day procedures for supervision of common assets and checking natural adjustments. Information of land use land cover is huge for some arranging and administration exercises and considered as crucial component for demonstrating and understanding the earth as a framework, additionally contributes fundamentally to earth-atmosphere interactions.

The in-depth knowledge gained through the categorization and case studies of land use change will become handy in developing regional and global LULCC models. Land use studies and investigation has turned into a pre-imperative for proposing formative exercises in a region. The developing requests have brought about an emergency of land mess up. Land assets are the establishment for the financial improvement at the national, regional and local levels in a large number of the creating nations, such as India. Land use land cover information is fundamental

for organizers, decision maker and those worried about land assets administration.

1.2 Remote Sensing

Remote detecting implies estimation of some property or getting information of an object that is not in physical contact with the object.

1.2.1 Evolution of Remote Sensing

- 1) 1858: - Aerial photograph using hot air balloon
- 2) 1887-1888: - Aerial photograph using kite.
- 3) 1903: - Pigeon mounted camera
- 4) 1908-1945: - Aero plane were used
- 5) 1947: - First space-based photo
- 6) 1972: - Landsat 1 First Satellite
- 7) 1980: - Hyper spectral, Microwave, Radar

1.2.2 GIS & Remote Sensing

In past when there were no computers and remote sensing the LULC change was detected using tracing paper and topographic sheet. But this method was very time consuming and tedious for larger area and took big effort. The past ways of land mapping were labour dependent and less accurate. Thus, with this technology preparing LULC map and detecting changes at regular time intervals is simpler specially for those areas where we can't go manually means inaccessible areas. So, this method is suitable for accessing such highly critical areas, and monitors their periodic changes. To understand ground reality, we have to prepare the maps from statistics generated by algorithms needs GIS software's.

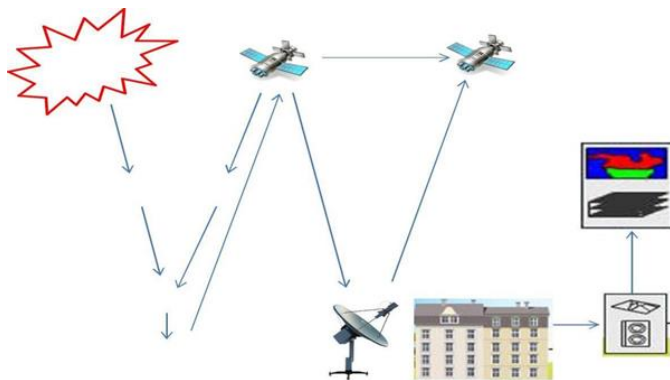


Figure 1.1: Process of remote sensing

a) Source of Energy: - Wellspring of vitality which lights up or gives electromagnetic vitality to the objective of intrigue.

b) Atmosphere: - Vitality heads out from its source to the objective; it will interact with and communicate with the environment it goes through.

c) Interaction with the Target: - Once the vitality advances toward the objective through the climate, it cooperates with the objective relying upon the properties of both the objective and the radiation.

d) Recording of Energy by the Sensor: - After the vitality has been scattered by, or discharged from the objective, we require a sensor to gather and record the electromagnetic radiation.

e) Transmission, Reception, and Processing: The vitality recorded by the sensor must be transmitted, regularly in electronic shape, to an accepting and handling station where the information is prepared into an image.

f) Interpretation and Analysis: - The processed image is interpreted, visually and/or digitally or electronically, to pull out information about the object.

g) Application - The last component of the remote sensing uncovers some new data, or help with tackling a specific issue.

1.3 Band Designations

Here we have shown the band designation of images that we have used in our research work.

- 1) ETM +
- 2) LISS 3
- 3) Landsat 8

1.3.1 ETM +

The Landsat Enhanced Thematic Mapper Plus (ETM+) sensor is carried on Landsat 7, and images consist of eight spectral bands comes with 30M resolution up to band

7. Last band comes with 15M resolution. The estimated scene size is 170 km north-south by 183 km east- west.

1.3.2 LISS-3 Sensor

The LISS-3 (Linear Imaging Self Scanning Sensor) is an optical sensor working in four spectral bands (green, red, near infrared and short-wave infrared). It covers a 141 km- wide swath with a resolution of 23 meters in all spectral bands.

1.4 Electromagnetic Spectrum

Co-operation of electromagnetic radiation with surfaces makes EMR be reflected or transmitted into the surface and sub-surface and all incompletely, reemanated or scattered. Every one of the procedures is firmly reliant on the wavelength of the occurrence radiation and also the nuclear and sub-atomic structures of the material sand its condition. The measure of vitality reflected back to a sensor relies upon the wavelength and power of the episode vitality, the surface unpleasantness, the introduction of the objective and the objective's ingestion qualities as for wavelength reflection; transmission, assimilation and discharge are frequently regarded as surface marvels. Everything in the nature has its own supply of reflected, transmitted and assimilated radiation.

1.5 Resolution

The minimum distance between two objects, means resolving power to identify not only presence of two objects but also their properties. There are different resolutions listed below.

- 1) Spatial
- 2) Spectral
- 3) Hyper spectral
- 4) Radiometric
- 5) Temporal

Aim

Land use Land cover Mapping Dhamangaon Railway Maharashtra using GIS and Remote Sensing

Objective

- To identify land use land cover pattern in the study area.
- To identify and understand the urban growth in the study area. Change
- detection analysis of 2015 to 2019 in the urban area.
- To prepare groundwater potential Zone Map using GIS to Technique

II. Review of Literature

According to Kiran Bagade unsupervised classification comes with some drawbacks and supervised classification comes with more benefits because supervised classification provides us more accuracy as compared to unsupervised classification so first of all ISODATA unsupervised order was applied for image classification. So we have collective both classifiers give more exactness. MLC (Supervised) general accuracy was 69%, MLC (Hybrid) general accuracy was 85%. MBC (Supervised) overall accuracy was 56%, whereas MBC (Hybrid) general accuracy was 83%. Also an outcome demonstrates that Hybrid characterization gives more precise outcomes when contrasted with supervised classification technique alone.

As per C.R. Prakash said that the LULC is very crucial element for environment change; here author collected LISS 3 data to display the change occurred in Greater Hyderabad Municipal Corporation, LULC has big impact on sustainable development of city. As per the research methodology is concerned he followed fundamental steps such as database gathering, visual interpretation, ground truth analysis and thereafter he prepared map and come to conclusion

that for the proper planning, management and administration of city LULC must frequently monitor by authority which will help to make city clean, green and healthy.

As per Amol D.Vibhute RS and GIS used for LULC mapping of Aurangabad region of Maharashtra. LISS3 data is used and to improve visual image interpretation filtration such as median and sharpen with linear contrast stretch these enhancement techniques also used,

Envi and Arc GIS software were used for image classification. Here different classifiers used for supervision. Accuracy assessment is done with the help of error matrix, kappa coefficient and ground truth analysis. Among all classifiers the maximum likelihood classifier resulted superior, so we understand that MLC is best image classification technique.

According to Sandipan Das said urbanization is an overall issue because more population expansion has led to critical problems such as destruction of agricultural land illegal constructions this made urban governance critical task to maintain human health, so this study discuss about different classes their past and presence using supervised classification for change detection. Here LISS 3 and Landsat TM images were used for classification. Urban planning is always important task for urban planners, decision makers, policy designers to achieve this goal land use land cover changes are very useful, by merging resolution of PAN and LISS 3 improved the resolution of multispectral image. The result have shown that settlement area has increased and agricultural are got decreased.

As reported by Nayana S. RS and GIS is used to monitor activity on land using LISS 4 high resolution images, where pre-processing is done to obtain high quality image and accuracy in result ENVI software is used for further processing of images where MLC

algorithm is used for classifying different components in images such as follow land, crop land, built up area, non-crop land. Here ground survey is used to match accuracy of result.

As per Yogesh V Kene traditional per pixel classification method comes with several problems such as mingle of pixels to tackle such problems author introduced OBIA (Object Based Image Analysis method where classification is done on homogeneous image segments means pixels form cluster by taking consideration of some properties such as texture, shape spatial relationship, intensity. Landsat 8 OLI (Operation Land Manager) is used which is collected from us government website, for object extraction from image edge based and curvelet transformation is used. After image classification we come to know that radial basis neural network and back propagation also used. OBIA gives better result than traditional per pixel classification method, as well as highly accurate result is obtained with the help of OBIA.

As reported by Kanta Tamta the overall goal of this paper is to present classification of high-resolution image using fuzzy set, here image is divided into different classes. OBIA method is used to produce better result and nearest neighbourhood algorithm is used to discriminate different land cover classes. Image classification and further processing high end software recognition developer 8.9 Software used.

As per Mohit Kumar this paper talks about a tool optics which is open-source tool used for image analysis. This toll is used to partition image by taking into consideration different characteristics temporal, spatial and spectral, spatial bandwidth, spectral bandwidth, minimum region area, perimeter, roundness, compactness, centroid, contrast, direction, roughness, mean red, mean green, mean blue, standard deviation green, standard deviation blue, standard deviation red.

As per Gaurav Kalidas Pakhale In this study, the pixel-based and object-based image classification is used with the help of Landsat 7 remote sensing image with different spectral bands. Ground truth play big role while dealing with map preparation. ANN and SVM

algorithms are used for classification both of the algorithms come with their features and shortcomings. ENVI 4.3 and Cognition 4.0 software used for further processing means for image segmentation and classification is done using nearest neighbourhood process. An image classification neural system is finished by surface element extraction and at that point applying the back propagation. The average back propagation system has an info layer, a yield layer, and no less than one shrouded layer. Each layer is completely associated with the succeeding layer. The Neural Net method in ENVI programming utilizes standard back spread for administered learning. Learning happens by changing the weights in the hub to limit the contrast between the yield hub initiation and the yield.

According to Narayan Kayet LULC is a critical component for the interconnection of the human exercises and condition an observing which is valuable to discover the deviations to spare a viable situation. Remote sensing is an exceptionally helpful apparatus for the issue of LULC checking, which can be useful to choose the allotment of LULC. Remote sensing data collected from different authorized websites for research work, LISS 3 is collected from Bhuvan and Landsat collected from US Gov website. This investigation includes the appraisal of LULC. GIS software ArcMap is used to solve problems of classification ground data is also important for identifying correct classification, user accuracy, producer accuracy and kappa coefficient is also calculated to check exactness achieved.

III. Materials and Methodology

3.1 Study Area

Dhamangaon Railway is a tehsil place and municipal council of Amravati district in the state of Maharashtra. Dhamangaon Railway lies between 2046' 00 N to / 2076' 67" N latitude and 7810' 00 E to 78.1667" E / 20.7667; 78.1667 longitude. It is situated at an average elevation of 291 meters. 109 villages included in Dhamangaon Railway Taluka. The total area of Dhamangaon Railway is 643.49 sq.km with population density of 207 per sq.km.

Dhamangaon Railway has a population of 1,32,915 peoples There are about 109 villages in Dhamangaon Railway block.

3.2 Material used are

3.2.1 Data used

- Toposheet from survey of India.
- Digital Elevation Model – SRTM Image data from USGS explore.
- Landsat data – oli8 Images level-1 USGS Explore.

3.2.2 Software used

- Arc GIS is used spatial analysis and Extraction of topographic and drainage of element was done on Arc GIS.
- Google earth is used to locate the artificial Ground water Structure.
- Arc GIS is used classification and maximum likelihood classification land use land cover of Sample creation was done on Arc GIS

3.3 LULC Map

www.usgs.gov.in. Image Download Landsat oli8 Images then APCTool box: Data Management tool Raster: Raster Processing: Composite Band: I/p: Landsat Temp: Ok Image Classification: Training Sample Manager: Draw Polygon: Select Collection: Select and Meagre: Rename:

Enter: Create signature File : Save on folder: Ok : go to classification tool: maximum like hood classification: Input Raster: composite file: Input Signature Raster: add signature file output Raster: Save file: Ok

Open LULC Map: go to Attribute Table : Add Filed : (feature Type): go to property: symbology: Classified: Feature Type: Change Colour: ok

3.4 Thematic Map

- 1) Slope Map
- 2) Contour Map
- 3) Aspect Map
- 4) Hill shed Map

1) Slope map:

Arc tool box spatial Analyst tool surface slope

I/p: Mosaic img / Dem img fill Data O/P: slope
Ok

2) Contour Map Arc tool Box Spatial Analyst tool O/P : Condition

Ok

DEM Creation (Dhamanagaon Railway) Hydrology

- 1) Fill
- 2) Flow Direction
- 3) Flow Acumulation
- 4) Calculation / Condition
- 5) Stream Order
- 6) Stream Feature

1) Fill

Arc tool Box Spatial analysis tool
Hydrology fill

I/P: Mosaic DEM O/P : Fill Dem Ok

2) flow Direction Arc tool box spatial analysis tool Hydrology

Flow Direction I/P : Fill : Dem O/P : Flou Dir Ok

3) flow accumulation

Arc tool Box Spatial analysis tool Hydrology

Flow Direction I/p : Flow Dir O/P : Flou Accu Ok

4) Flow Condition Arc tool box spatial analysis tool map Algebra Raster Calculator

Con("Flou: Accu">250,1) O/P-Condition
Ok

5) Stream ordear Arc tool box Spatial analysis tool Hydrology

Stream order

I/p : Condition Flou -Dir o/p : Stream Order
Ok

6) Stream Feature Arc tool box Spatial analysis tool Hydrology

steam Feature

I/p : Strem order flou dir O/p Stream feature
Ok

3.5 Sentinel Image Composite Process

• go to arc tool box

• Data management tools

• Raster

• Raster Processing

• Composite Bands

• Input Raster : Sentinel Image (Z) Ok
Image Classification

• go to classification tool

• Training sample manage

• Draw polygon

• Sample collection

• Select and Mearge

• Rename

• Entre

• Then Classification

• Interactive supervised Classification ok

• Unsupervised process

• go to Classification

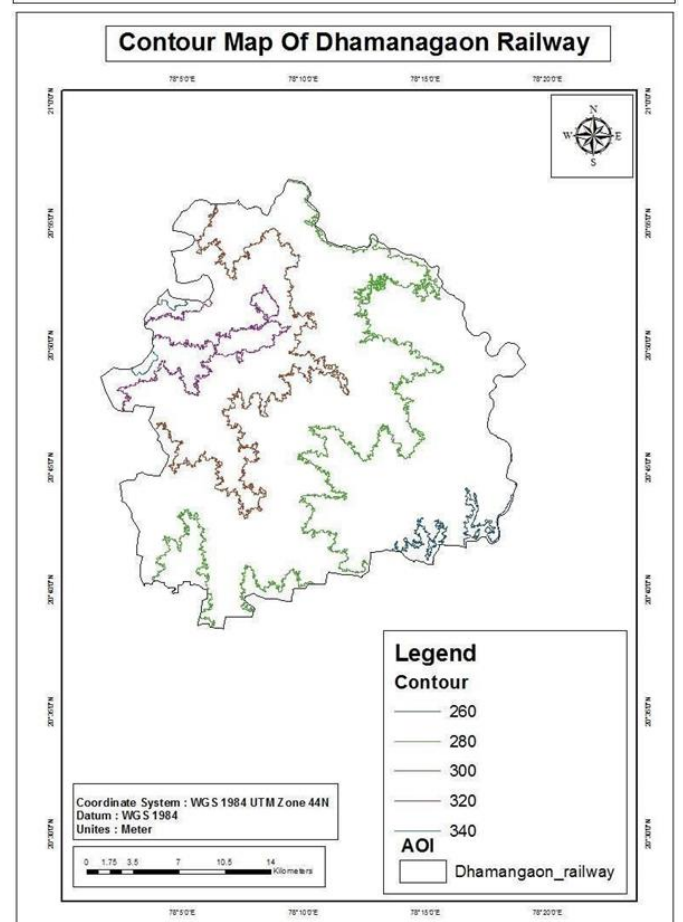
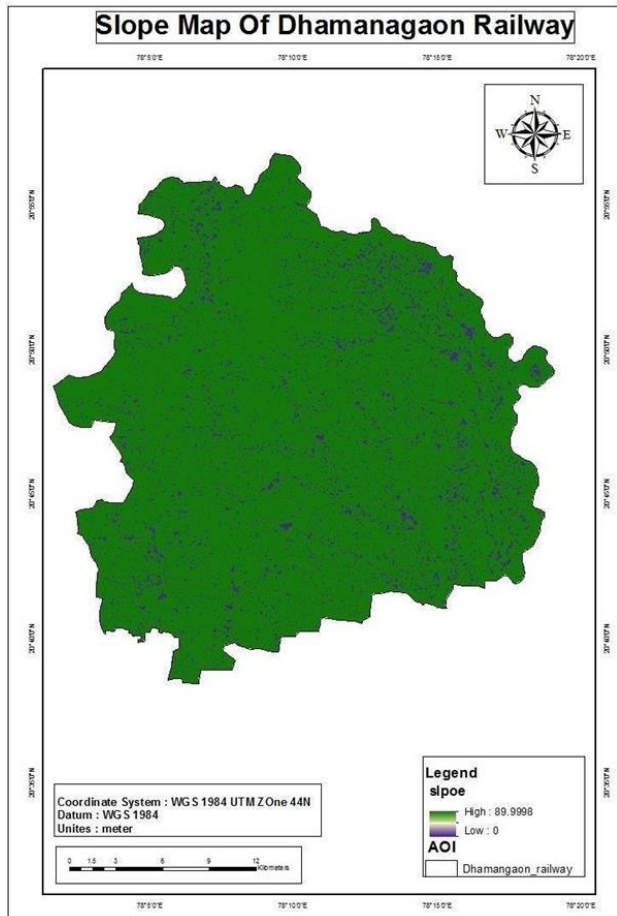
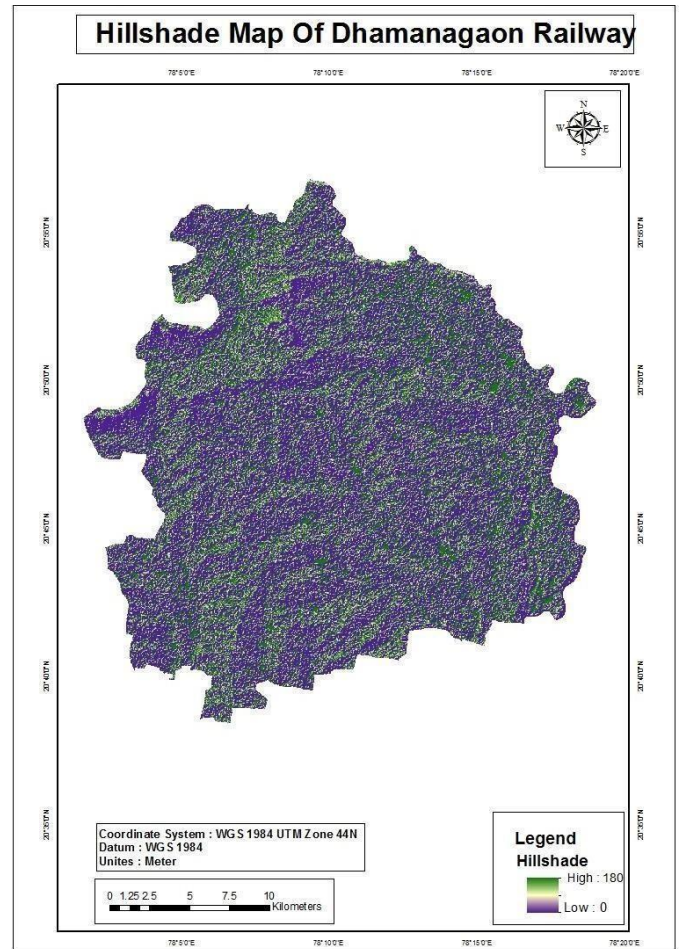
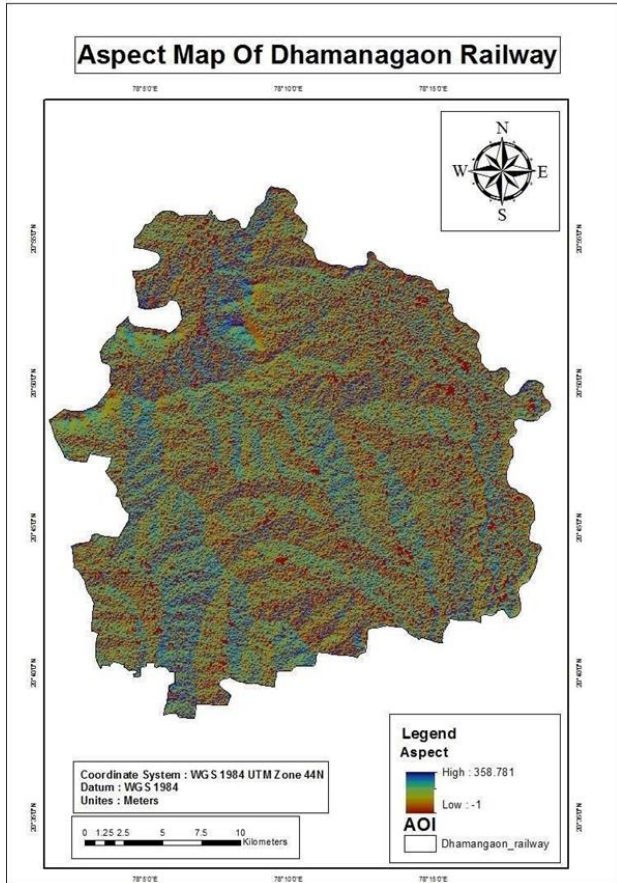
• Iso Cluster unsupervised classification

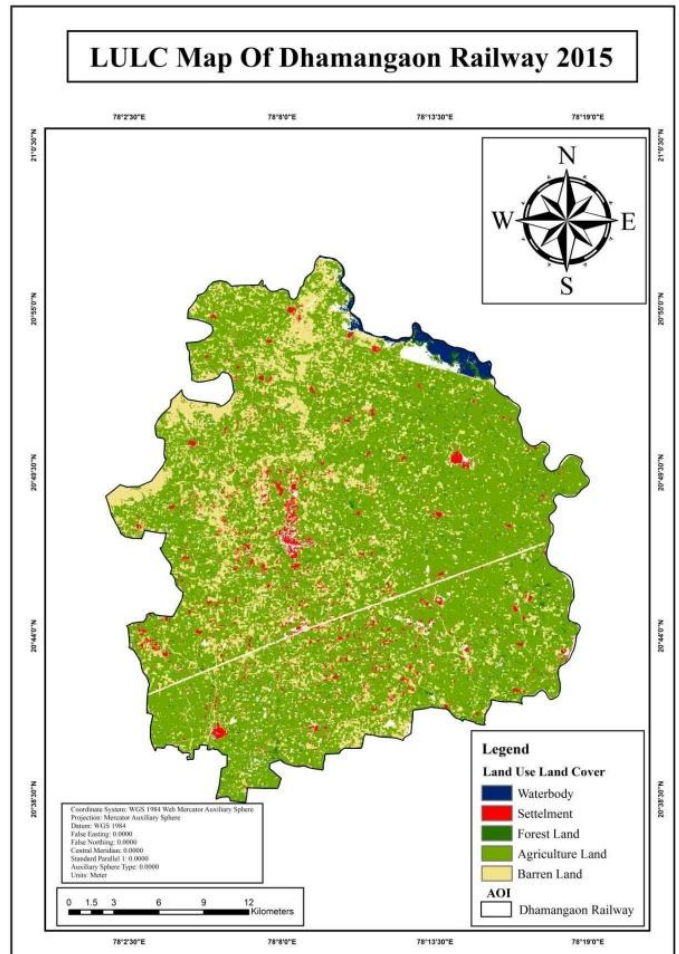
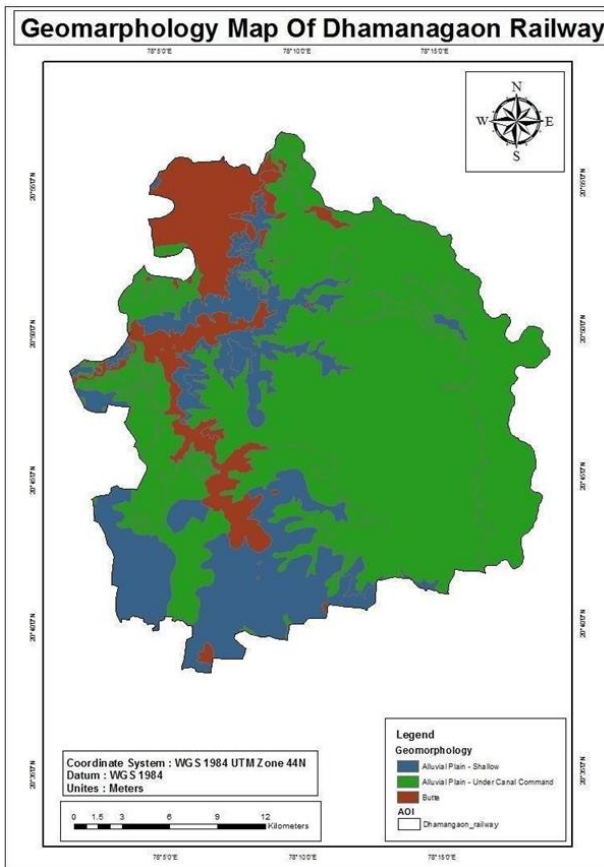
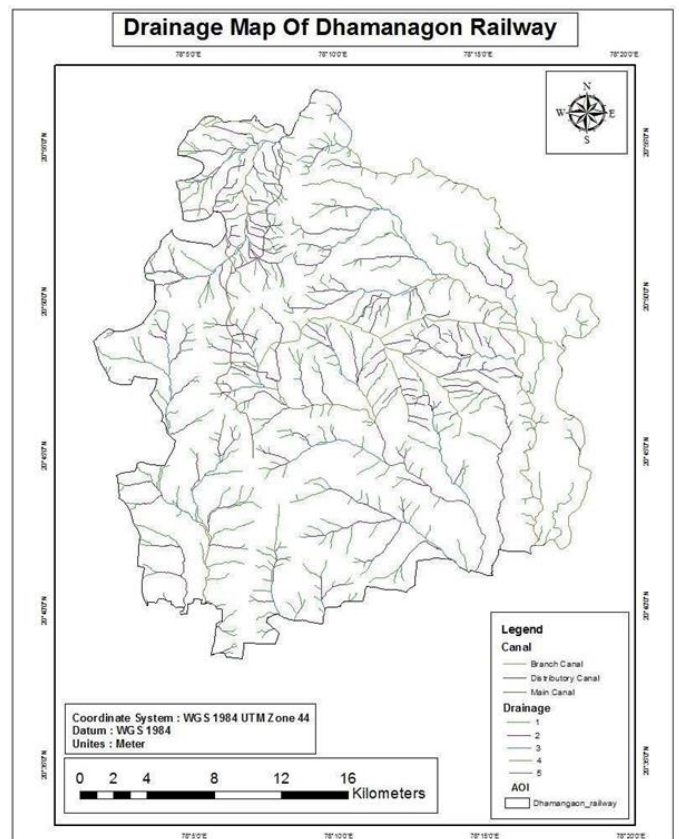
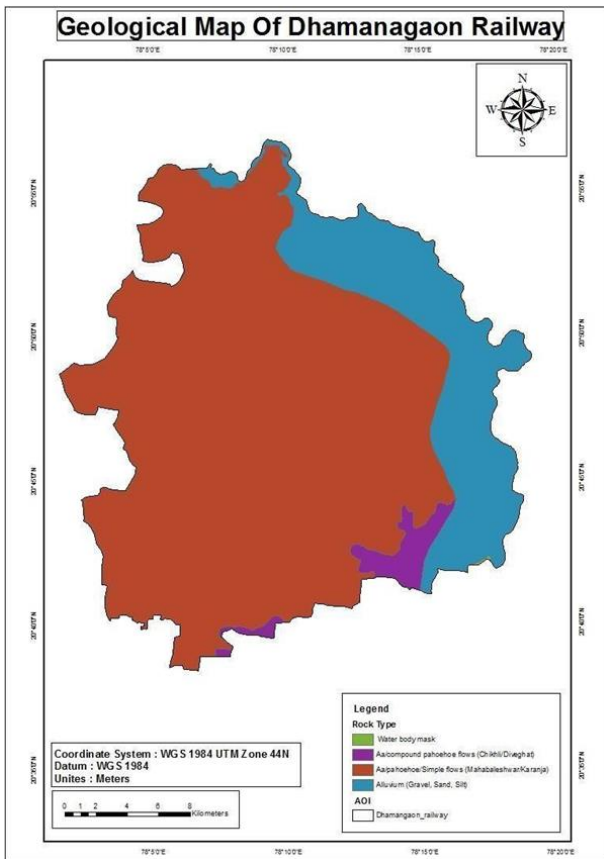
• I/Raster Band : Composite Image

• Number of Classes : 5/ gol maximum

• output classified R/ : folder Ok

IV. Results and Observations





V. CONCLUSION

The study produced several thematic maps to show that computerized GIS in an effective tool in delineating agro-climate and agro-ecosystem. Some of the methods requires more data and time-consuming process. Satellite image are useful for mapping of groundwater using different parameters like geology, geomorphology, drainage, land use land cover. Remote sensing and GIS technologies are very effective tool for suggesting action plane and management strategies for agricultural sustainability of any region. In that area 2015 large area of agricultural zone but 2019 agricultural zone decreases. In change detection method.

Sr.no.	LULC Area	2015	2022
1	Agricultural Zone	494197	113063
2	Barren Land	146761	8953
3	Settlement	21007	34215
4	Waterbody	6951	1524
5	Forest Land	16999	11718

VI. REFERENCES

- [1]. Dr. Manisha Garg, Dr. Arun Joshie, Dr. Sandhya Choudhary, 2013.
- [2]. Land Use Land Cover classification in Jamuna-Kotma Coal Field Region, Anuppur District MP. IOSR Journal of Agriculture and Veterinary Science (IOSR- JAVS) Volume 6, PP38-43.
- [3]. S.D.Shinde, V.B. Lingade and S.P. Aher, 2015 Identification of Groundwater Potential Zones in Khatav Tahsil Using Geospatial Techniques, International Journal of applied information systems (IJAIS) – ISSN 2249-0868, Volume9-No.7.
- [4]. M.H. Patel, y.N.Dhivar, S.S. Nalwade, M.M. Pawar,2018
- [5]. DEM Based Topographic Survey Of Vaijapur Taluka Using RS and GIS International Journal Of Engineering Research ISSN 2319-6890, Volume No.7, Issue No. 1, pp 6-9
- [6]. Dimiyati, et al. (1995). An Analysis of Land Use/ Land Cover Change Using the Combination of MSS Landsat and Land Use Map- A case study of Yogyakarta, Indonesia, International Journal of Remote Sensing 17(5): 931– 944.
- [7]. EOSAT (1992). Landsat TM Classification International Georgia Wetlands in EOSAT Data User Notes, Vol. 7, No 1, EOSAT Company, Lanham, MD.EOSAT (1994).
- [8]. EOSAT,s Statewide Purchase Plan Keeps South Carolina Residents in the know, in EOSAT Notes, Vol. 9, No 1, EOSAT Company Lanham, MD.ERDAS, Inc. (1992).
- [9]. ERDAS Production Services Map State for Georgia DNR in the Monitor, Vol. 4, No 1, ERDAS, Inc, Atlanta, GA.
- [10]. Fazal, S. (2001). “Land Reorganization Study along Major Roads,” Land Use Policy, Vol. 18, No. 2, 2001, pp. 191-199.
- [11]. Fitzpatric-lins et al. (1987). Producing Alaska Interim Land Cover Maps from Landsat Digital and Ancillary Data, in Proceedings of the 11th Annual William T. Pecora Memorial Symposium: Satellite Land Remote Sensing: current programs and a look into the future American Society of Photogrammetry and Remote Sensing, Pp. 339–347.
- [12]. Global Land Cover Facility (GLCF). Department of Geography, University of Maryland, NASA, New York.
- [13]. Lillesand, T.M. & Kiefer, R.W. (2000). Remote Sensing and Image Interpretation. Fourth edition. John Wiley & Sons, Inc. New York
- [14]. Lopez, E., Bocco, G., Mendoza, M., & Duhau, E. (2001). Predicting land cover and land use change in the urban fringe a case in Morelia City, Mexico. Landscape and Urban Planning, 55(4), 271–285. 1), 81–97.
- [15]. Macleod & Congalton. (1998). A Quantitative Comparison of Change Detection Algorithms for Monitoring Eelgrass from Remotely Sensed Data.

- Photogrammetric Engineering & Remote Sensing. Vol. 64. No. 3. p. 207-216.
- [16]. Meyer, W.B. (1995). Past and Present Land-use and Land-cover in the U.S.A. Consequences. p.24-33.
- [17]. Moshen A. (1999). Environmental Land Use Change Detection and Assessment Using with Multi – temporal Satellite Imagery. Zanjan University.
- [18]. Olorunfemi J.F. (1983). Monitoring Urban Land – Use in Developed Countries – An aerial photographic approach, Environmental Int.9, 27 – 32.
- [19]. Pandit, M.K., Sodhi, N.S., Koh, L.P., Bhaskar, A., Brook, B.W. (2007). Unreported yet massive deforestation driving loss of endemic biodiversity in Indian Himalaya. Biodiverstiy Conservation. 16: 153-163.
- [20]. Pandy, A.C. and Nathawat, M.S. (2006). Land Use Land Cover Mapping Through Digital Image Processing of Satellite Data – A case study from Panchkula, Ambala and Yamunanagar Districts, Haryana State, India.
- [21]. Rahman, A., Kumar, Y., Fazal, S. and Bhaskaran, S. (2011). Urbanization and Quality of Urban Environment Using Remote Sensing and GIS Techniques in East Delhi-India. Journal of Geographic Information System. 3: 62-84.
- [22]. Seto, K.C. & Fragkias, M. (2005). quantifying spatiotemporal patterns of urban land-use change in four cities of China with a time series of landscape metrics. Landscape Ecology, 20, 871-888.
- [23]. Singh, A. (1989). Digital Change Detection Techniques Using Remotely Sensed Data. International Journal of Remote Sensing. Vol. 10, No. 6, p. 989-1003.
- [24]. Stefanov, W.L. and Netzband, M. (2005). Assessment of ASTER land cover and MODIS NDVI data at multiple scales for ecological characterization of an arid urban center. Remote Sensing of Environment, 99, 31-43.
- [25]. Taubenböck, H., Wegmann, M., Roth, A., Mehl, H. and Dech, S. (2009). Urbanization in India: Spatiotemporal analysis using remote sensing data. Computers, Environment & Urban Systems 33(3): 179-188.
- [26]. UN (2004). United Nations Human Settlements Programme (UN-HABITAT). Water and sanitation in the world's cities: local action for global goals. London: Earthscan; 2003.
- [27]. Xiaomei Y. and Ronqing L.Q.Y. (1999). Change Detection Based on Remote Sensing Information Model and its Application to Coastal Line of Yellow River Delta – Earth Observation Center, NASDA, China.
- [28]. Zomer, U.S. and Ives, J. (2002). Using satellite remote sensing for DEM extraction in complex mountainous terrain: Landscape analysis of the Makalu Barun National Park of Eastern Nepal. International Journal of Remote Sensing, 23:125 – 143.
- [29]. Balthazar, V.; Vanacker, V.; Molina, A.; Lambin, E.F. Impacts of forest cover change on ecosystem services in high Andean mountains. Ecol. Indic. 2015, 48, 63–75. [CrossRef]
- [30]. Pasha, S.V.; Reddy, C.S.; Jha, C.S.; Rao, P.P.; Dadhwal, V.K. Assessment of land cover change hotspots in Gulf of Kachchh, India using multi-temporal remote sensing data and GIS. J. Indian Soc. Remote Sens. 2016, 44, 905–913. [CrossRef]
- [31]. Baumann, M.; Ozdogan, M.; Wolter, P.T.; Krylov, A.; Vladimirova, N.; Radeloff,
- [32]. V.C. Landsat remote sensing of forest windfall disturbance. Remote Sens. Environ. 2014, 143, 171–179. [CrossRef]
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