WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Land Use and Land Cover Mapping of Rohtak District

Amit Kumar

Student of MSc. in Geography, DNPG College, Hisar, Haryana, India

ABSTRACT:

Resource management is essential for today's development at the national and international levels. Due to the increase in population and development activity, the natural resources are overstretched often leading to depletion constantly. For this purpose, the geospatial application is being effectively used for more accurate and precise mapping. The present study assesses the land use and land cover mapping of Rohtak district for the years 2000 and 2022. Integrated Remote sensing, GIS, GPS, and IT technology were used for mapping. The study concludes that the geospatial application has immense potential and is used in various aspects of land use and land cover mapping.

Keywords: RS, GIS, Land Use, Land Cover, Geospatial Application

Introduction:

Land use and land cover are very important for the development of the environment and the environment's health in the era of mechanization. Land use refers to the land that is used for cultural activities, while land covers refer to the natural components that cover the land [1-4]. Changes in Earth's surface caused by human activities are referred to as land use and land cover change around the world. Humans have altered land for thousands of years to obtain necessities and livelihood but the pace of land use and land cover are far greater today than they were a thousand years ago [5]. These changes are driving unprecedented changes in the ecosystem and environmental processes at the local, regional and global levels. Data on land use and land cover changes are essential for providing critical input to ecological management and environmental planning, as the data available on such is essential for studying and analyzing global change scenarios today [6-7].

Various research has been taken to monitor land use and land cover changes. As a result of their accurate georeferencing procedures, a digital format suitable for computer processing, and repetitive data acquisition, geospatial technology is the most common approach for quantifying, mapping, and detecting land use patterns and land cover [8-9]. Land use and land cover changes were monitored by traditional methods in the nineteenth century. The interaction between humans, natural resources, and the environment is crucial to understanding change detection [10-11]. Geospatial and remote sensing technology have made the monitoring of land use/land cover changes more reliable, up-to-date, economical, and time-saving [12]. The use of remotely sensed data has led to the development and application of several methods for change detection, such as image differencing, post-classification comparisons (PCC), vegetation index difference detection, and principal component analysis, to detect changes in LULC [9].

In the modern period of fast growth, anthropogenic activities, mainly urbanization, growing population levels, and industrialization generate imbalances in a natural ecosystem. LULC is changing in both positive and negative aspects. Positive change means unusable land is changing into usable land by modern techniques while the negative aspect means that usable land is degrading [13]. Change analysis is considered an important factor for micro-level development and environmental change [14-15]. Various studies have been undertaken already to analyze land use and land cover change utilizing different methodologies and satellite data [16-20].

Land use and the land cover change affected by human interference in the Rohtak district of Haryana State have been a prominent concern in the last few decades. Keeping all such facts in mind, the land use and land cover change detection from spatial and temporal perspectives has been undertaken to analyze the LULC in Central Haryana. The main objective of this study is to assess the land use and land cover change in the Rohtak district region from 2012 to 2022.

2. Study Area

Rohtak district lies in the central part of the Haryana state. The spatial extent of the study area is $28^0$40’30” to $29^0$5’35” N latitude and $76^0$13’22” E to $76^0$51’20” E longitude. It covers an area of 1745 sq. km. Rohtak district comprises Rohtak, Meham, Lakhan Majra, Sampla, and Kalanaur blocks. The study area has sub-tropical and semi-arid climatic conditions. It receives about 458 mm mean annual rainfall. Fig. 2.1 shows the location map of the study area.

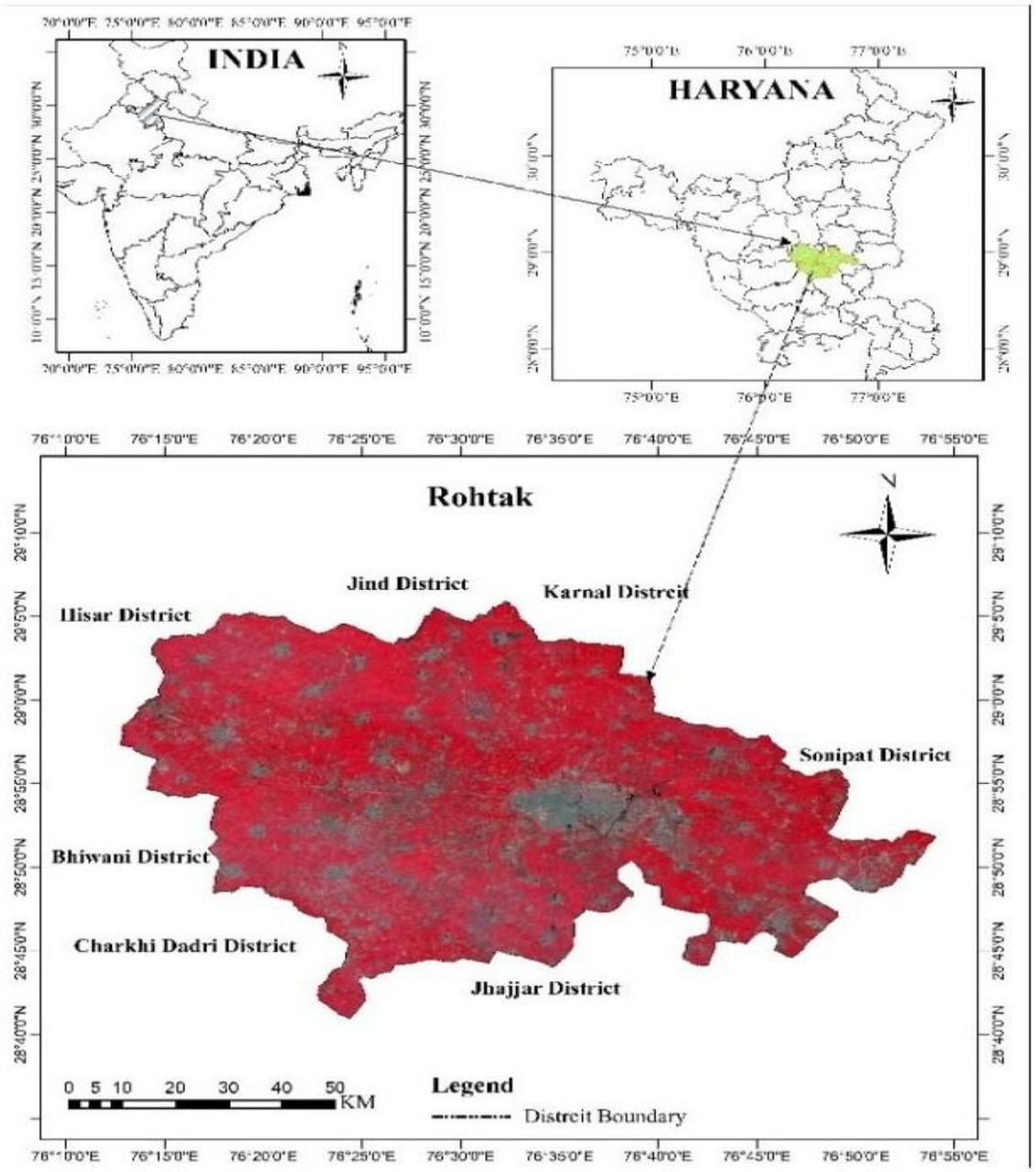

Fig. 2.1: Location map of the study area

3. Database and Methodology

LANDSAT series data were used to assess the study area's land use and land cover mapping. The satellite data was downloaded from the USGS site. The resolution of the satellite is 30m. NDVI and unsupervised image classification was done by using the satellite data with the help of image processing software. Fig. 3.1 shows the flow chart of the methodology.

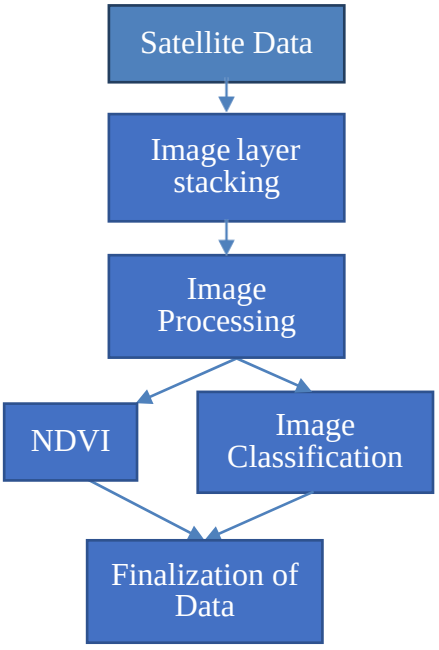

Fig. 3.1: Methodology chart

4. Result and discussion

The final result has been concluded on the basis of NDVI, land use and land cover maps for the two different years of 2000 and 2022. The distribution of land use and land cover of the study area for 2000 and 2022 maps are represented in maps 4.1 and 4.2. Based on NDVI mapping, the study area was classified into four classes- No vegetation, Built-up/Fallow Land, Thin vegetation and Dense vegetation. Based on unsupervised image classification, areaof Rohtak district was classified into five classes- Built-up land, waterbody, agricultural land, vegetation and fallow land/sand dune. Fig. 4.1 and fig. 4.2 shows the NDVI and unsupervised image classification of 2000 and 2022. Table 4.1 and 4.2 show the area calculation of the Rohtak district.

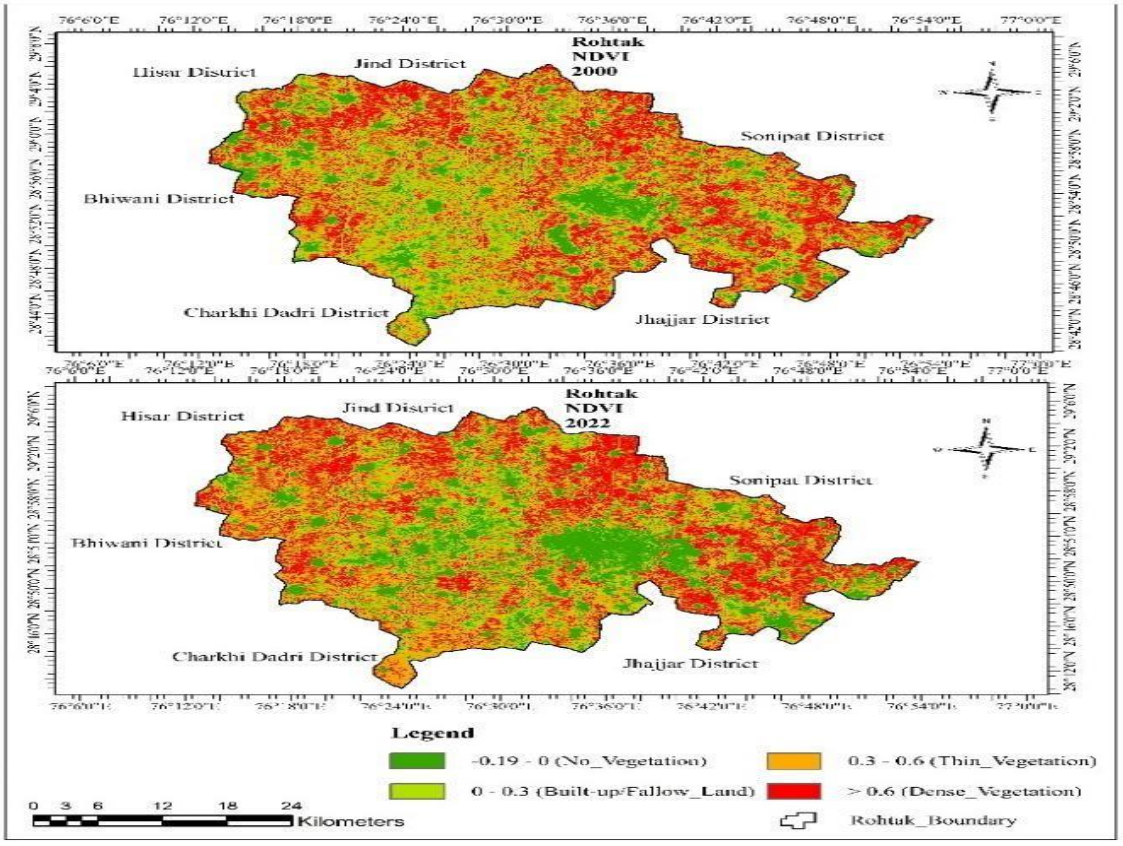

Fig. 4.1: NDVI mapping

Table. 4.1: NDVI area calculation

NDVI Class	2000 Area (ha)	2022 Area (ha)
No Vegetation	26801	31191
Built-up/fallow land	57982	67334
Thin Vegetation	35441	37912
Dense Vegetation	54276	38063

According to the above table, the area under the no vegetation class has increased by 26801 to 31191 from 2000 to 2022. Built-up and fallow land area is also increased from 57982 to 67334 ha from 2000 to 2022. The area under thin vegetation and dense vegetation have been decreased from 35441 to 37912 and 54276 to 38063 ha between 2000 and 2022.

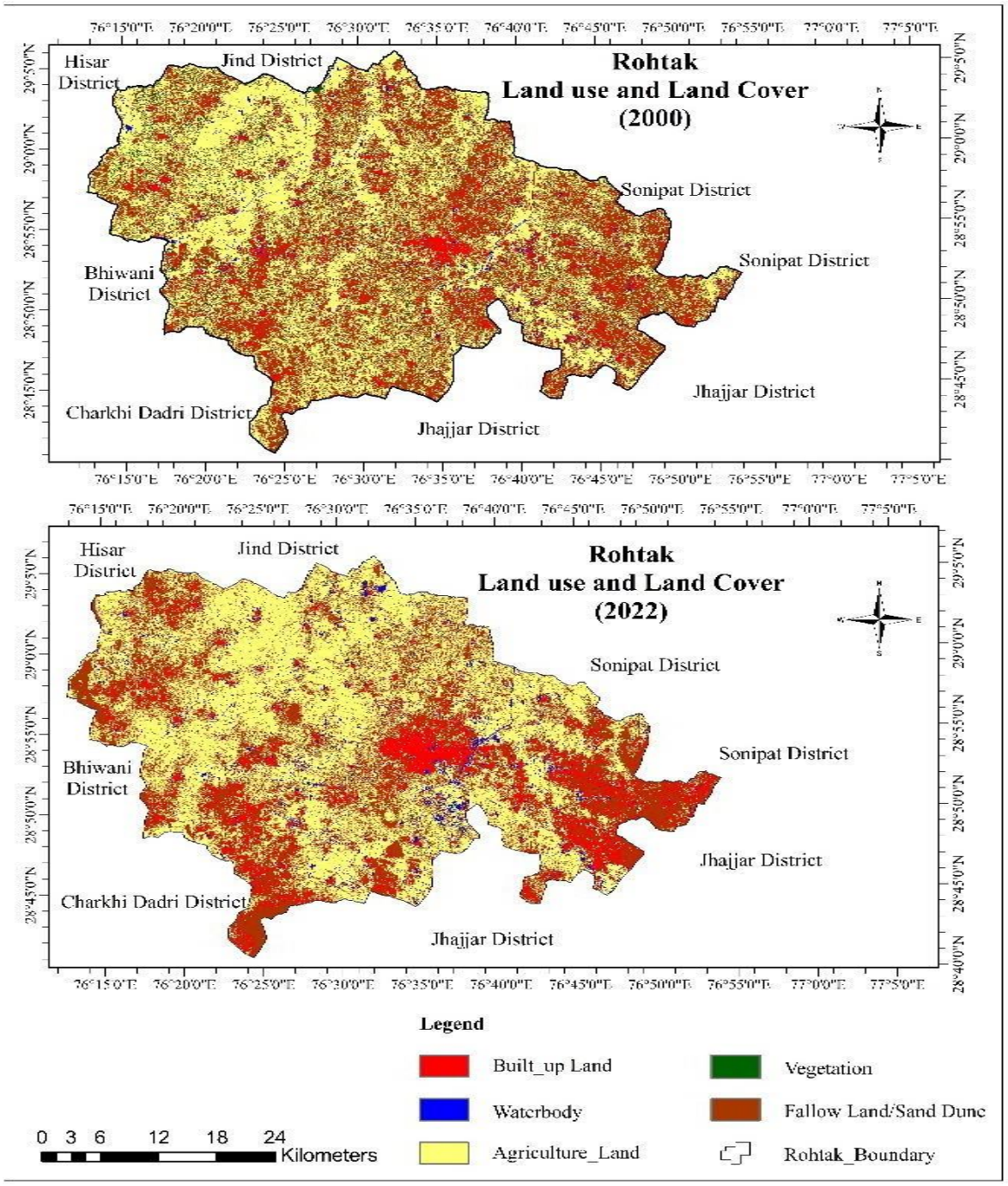

Fig. 4.2: Image classification map

Table 4.2: Area of LULC classes

Image Classification	2000 Area (ha)	2022 Area (ha)
Built-up Land	21307	28196
Waterbody	14112	17253
Agriculture Land	69631	70283
Vegetation	22674	17182
Fallow Land /Sand Dune	46776	41586

Table number 4.2 shows the area under different classes of the study area from 2000 to 2022. The area under built-up land, water body, and agricultural land classes have been increased from 21307, 14112, and 69631 ha to 28196, 17253, and 70283 ha from 2000 to 2022. While the area under vegetation andfallow land and sand dune has been decreased from 22674 and 46776 to 17182 and 41586 ha from 2000 to 2022.

Thus, the geospatial application provides the accurate change in land use and land cover of any area.

CONCLUSION:

Land use and land cover mapping of Rohtak district show that satellite data-based land use and land cover mapping is very useful & effective. The study demonstrated that the application of geospatial application helps in studying the changes in the land use pattern of an area. Different types of human activities have resulted in vast changes in the land use and land cover of the study area in the district. Accurate & updated land cover change records arenecessary for future planning & environmental consequence of changes. By geospatial techniques we can monitor such changes extracting the change from satellite data relies on effective & accurate change detection techniques with maximum accuracy of land use/land cover.

REFERENCES:

[1] Burley T.M.: Land use or land utilization? Professional Geographer, vol.13, no.6, 1961, pp.18–20. https://doi.org/10.1111/j.0033-0124.1961.136_18.x.

[2] Lo C.P.: Applied Remote Sensing, Geocarto International, vol.60, issue 4, 1986, p.60. https://doi.org/10.1080/10106048609354071.

[3] Chamling M., Bera B.: Spatiotemporal patterns of land use/ land cover change in the Bhutan-Bengal foothill region between 1987 and 2019: a study towards geospatial applications and policymaking. Earth Systems and Environment, vol.4, 2020, pp.117–130. https://doi.org/10.1007/s41748-020-00150-0.

[4] Kumar, S., & Singh, R. (2021). Geospatial Applications in Land Use/LandCover Change Detection for Sustainable Regional Develo pment: The Case of Central Haryana, India. *Geomatics and Environmental Engineering*, *15*(3), 81–98. https://doi.org/10.7494/geom.2021.15.3.81

[5] Hassan, Z., Shabbir, R., Ahmad, S.S. *et al.* Dynamics of land use and land cover change (LULCC) using geospatial techniques: a case study of Islamabad Pakistan. *Springer Plus* **5,** 812 (2016). https://doi.org/10.1186/s40064-016-2414-z

[6] Dwivedi RS, Sreenivas K, Ramana KV (2005) Land-use/land-cover change analysis in part of Ethiopia using Landsat Thematic Mapper data. Int J Remote Sens 26(7):1285–1287

[7] Fan F, Weng Q, Wang Y (2007) Land use land cover change in Guangzhou, China, from 1998 to 2003, based on Landsat TM/ETM+ imagery. Sensors 7:1323–1342

[8] Rahman A, Kumar S, Fazal S, Siddiqui MA (2011) Assessment of land use/land cover change in the North-West District of Delhi using remote sensing and GIS techniques. J Indian Soc Remote Sens. doi:10.1007/s12524-011-0165-4

[9] Lu D, Mausel P, Brondizio E, Moran E (2004) Change detection techniques. Int J Remote Sens 25(12):2365–2407

[10] Agarwal C., Green G.M., Grove J.M., Evans T.P., Schweik C.M. (2002): A review and assessment of land use change model: dynamics of space, time and human choice. General Technical Report (GTR), U.S. Department of Agriculture, Forest Service, Northeastern Research Station. https://doi.org/10.2737/NE-GTR-297.

[11] Jasrotia A.S., Bhagat B.D., KumarA., KumarR. (2013): Remote Sensing and GIS approach for delineation of groundwater potential and groundwater quality zones of Western Doon Valley, Uttarakhand, India. Journal of the Indian Society of Remote Sensing, vol.41, no.2, pp.365–377. https://doi.org/10.1007/s12524-012-0220-9.

[12] Xiong J., Thenkabail P.S., Gumma M.K., TeluguntlaP., Poehnelt J., Congleton., YadavK., ThauD. (2017): Automated cropland mapping of continental Africa using Google Earth Engine cloud computing. ISPRSJournal of Photogrammetry and Remote Sensing, vol.126, pp.225–244. https://doi.org/10.1016/j.isprsjprs.2017.01.019.

[13] Kumar S. and Kumar G. (2019). Role of geospatial application in waterlogging and salinity: a review. Our Heritage. 67 (1). 1-10

[14] Noor A.M., Alegana V.A., Gething PA.J., SnowR.W. (2008): Using remotely sensed night-time light as a proxy for poverty in Africa. Population health metrics, vol.6, no.1, art. no. 5. https://doi.org/10.1186/1478-7954-6-5.

[15] Mahiny A.S., Clarke K.C. (2012): Guiding SLEUTH land use/land cover change modeling using multi-criteria evaluation: towards dynamics sustainable land use planning. Environment and Planning B: Planning and Design, vol. 39, no. 5, pp. 925–944. https://doi.org/10.1068/b37092.

[16] Singh A.: Digital change detection techniques using remotely sensed data. International Journal of Remote Sensing, vol. 10, pp. 989–1003. https://doi. org/10.1080/01431168908903939.

[17] Kumar, S. (2017). Geospatial techniques based on geomorphologic mapping in Fatehabad district, Haryana. *International Journal of Creative Research Thoughts (IJCRT)*, *5*(4), 3780-3788.

[18] Lambin E.F. (1996): Change detection at multiple scales: Seasonal and annual variations in landscape variables. Photogrammetric Engineering and Remote Sensing, vol. 62, no. 8, pp. 931–938.

[19] Kumar S. (2018). Remote sensing and GIS-based groundwater prospects and quality assessment in Haryana's Fatehabad district. i-Manager's Journal on Future Engineering and Technology. 14(1), 48

[20] Xiuwan C. (2002): Using remote sensing and GIS to analyze land cover change and its impacts on regional sustainable development. International Journal of Remote Sensing, vol. 23, no. 1, pp. 107–124. https://doi.org/10.1080/01431160010007051.

[21] S. Kumar (2018). Monitoring Gangotri glaciers using remote sensing and GIS technique. International Journal of Engineering Research in Computer Science and Engineering (IJERCSE). 5(1), 21-25