Study Of Land Use Land Cover Changes Around Nh-48, Rewari District, Haryana

Arti Chouksey[a], Kshboo[a], Tarun[a]

a- DeenBandhu Chhotu Ram University of Science and Technology.

Abstract: One of the most important natural resources is land. The population of a city increases, but so do changes in spatial parameters. It is impossible to stop the natural process of land transformation, nevertheless. So, in this paper, we have discussed the development of roads. What are the changes that can be seen due to the development of roads? A change detection model was applied in ERDAS Imagine to find out the land use/land cover from 2006 to 2021. Five land use classes were identified but the dominant classes were built-up agricultural land. A drastic change has been recorded during 16 years i.e. (2006-2021) in the Deodhai village (10Km away from Rewari), district Rewari Haryana (with the help of ERDAS)after the construction of the expressway NH-48. In 2006, 59.85% of the land was under agricultural practice, which reduced to 51.57% in 2021. One of the main factors of this land use change is the development of roads.

Keywords ERDAS, Google Earth Pro, QGIS land use land cover (LULC), NH-48.

1. Introduction. . Roads primary purpose is to put a city or region on the path to development while also supporting growth in the production and service sectors. More development is attracted by road infrastructure. The new development of roads helps to move the states in the direction of progress. A city's or region's regional development and the growth of the production and service sectors are all primarily supported by roads. The relationship between road infrastructure development and land use changes around the road infrastructure is crucial to be explored. The building of roads helps to move the states in the direction of progress. Building roads is a task that involves moving forward or the country's progress.

The construction of roads benefits cities' growth. As a result of making it simpler for people to settle in a new location, things can reach people easily and on time.

2.Literature Review:

Sr no.	Year	Researcher	Title of Research paper/concept	Conclusions/ Results
1.	2020	**H.J.Syiemlieh, Preciouswell N.**	The dynamic change in land use and land cover has been studied by using a GIS-based technique	The study area of Nongpoh will continue to re-modify the land use and land cover in the years to come. Development along with education will change the

			Landsat imagery captured before road widening (2011) and road widening (2018).	land use and land cover pattern sustainably.
2.	2015	**John Tiah Bugri , D.O. Appiah.**	This study can analyze the land use and land cover change dynamics in the Bosomtwe District of Ghana.	The study findings have shown important changes in land use and land cover patterns in the district. After an urbanization process, coupled with farmland abandonment between 1986 and 2010, substantial increments in peri-urban to urban land uses and clear increments in farmland coverage were found between 2010 and 2014.
3.	2021	**P L Hadi , W Santosa.**	This study was conducted to analyze the effect of road construction on the rate of land use change. Land use change caused by the construction of this road was identified by analyzing land use change with the help of a GIS.	The research paper shows the difference in the increment rate of the residential areas before and after new roads are operated. They show that land use is significantly faster
4.	2017	**Bhat, Parvaiz A.**	To find out the urban growth development in metropolitan cities they can be analyzed by remote sensing and GIS.	In this paper, the study was to detect and analyze the trend of land use and land cover changes.
5.	2017	**Veeraswamy, G.**	The main concept of the study is to find out the national land use and land cover change classification with the help of GIS and remote sensing data that can be	This study has demonstrated the recent advancements in remote sensing and GIS technologies. They are a powerful tool for mapping of LU/LC. This research was carried out in a part of the

			developed by NRSC and ISRO.	Gudur area Nellore district, Andhra Pradesh.
6.	2012	**Kaul, Harshika A., and Ingle Sopan**	In this paper, the land use/ land cover change classification can be high-resolution temporal satellite data with kappa analysis.	In this study paper the result can done with the help of IRS P-6 LISS III data. They identifying areas of Agriculture, Harvested, Barren, Saline, Forest, Water Body and Settlement. This study successfully shows that the change detection techniques can applied to land use land cover change using remote sensing data.
7.	2012	**Yadav, P. K., Kapoor, M., & Sarma, K.**	As per the study water body can be decreasing continuously in to the corridor. At the present moment these corridors suffering from the diversion forest land.	As per the study the overall forest cover and water bodies are decreasing continuously in the corridor. If the present scenario of deforestation and degradation of water bodies were to continue.
8.	2020	**Gupta, N., Mathew, A., & Khandelwal, S.**	In this research paper, they determine the change in land surface temperature (LST) the over Jaipur study area during the period from 2008 to 2011analyzelyzes the spatial variation of LST.	The study can show the specific contributing temp. value. They shows the growth establishment pattern area. The study can also observe the increase in %ISA in all the classes over the duration of the study period.

From the above literature, it is concluded that infrastructure plays a vital role in development of an area. Prediction of role of infrastructure in a particular development project help authority plan development in a planned way. GIS and remote sensing are the tools which help in change detection due to any infrastructure project in fast and reliable way. This study is one such attempt to calculate the changes occurs in a particular stretch of a highway due to development of infrastructure.

3. Study Area : The stretch used in the search lies between Deodhai village to Harchandpur village (NH-48) and is located 10 km away from Rewari City in the southern part Haryana, India . It is located at an area extending from 28° 07'31.06" N to 28° 04' 53.84" N latitude and from 76° 38'10.56 " E to 76° 34' 21.06" E Longitude.

4.Methodology:

For assessing and detecting the land use land cover we have used the Google Earth Pro for the aerial photographs of the stretch.The imaging data used spans a 16-year period, from 2006 to 2021. Google Earth Pro, Q GIS and ERDAS Imagine 2014 software were used to conduct this research. After the supervised classification of the images through ERDAS imagine 2014 of the year 2006, 2014& 2021 we saw lot of changes in cultivable land, barren land ,built up area and water bodies .

Table 1: Software Used

| Software	Function
Google Earth Pro	Data Capture , data visualization, data Creation, Real – time streaming
Q GIS	Displays multiple layers , geo references
ERDAS Imagine 2014	Simplifies image classification (supervised & Unsupervised classification), image interpretation.
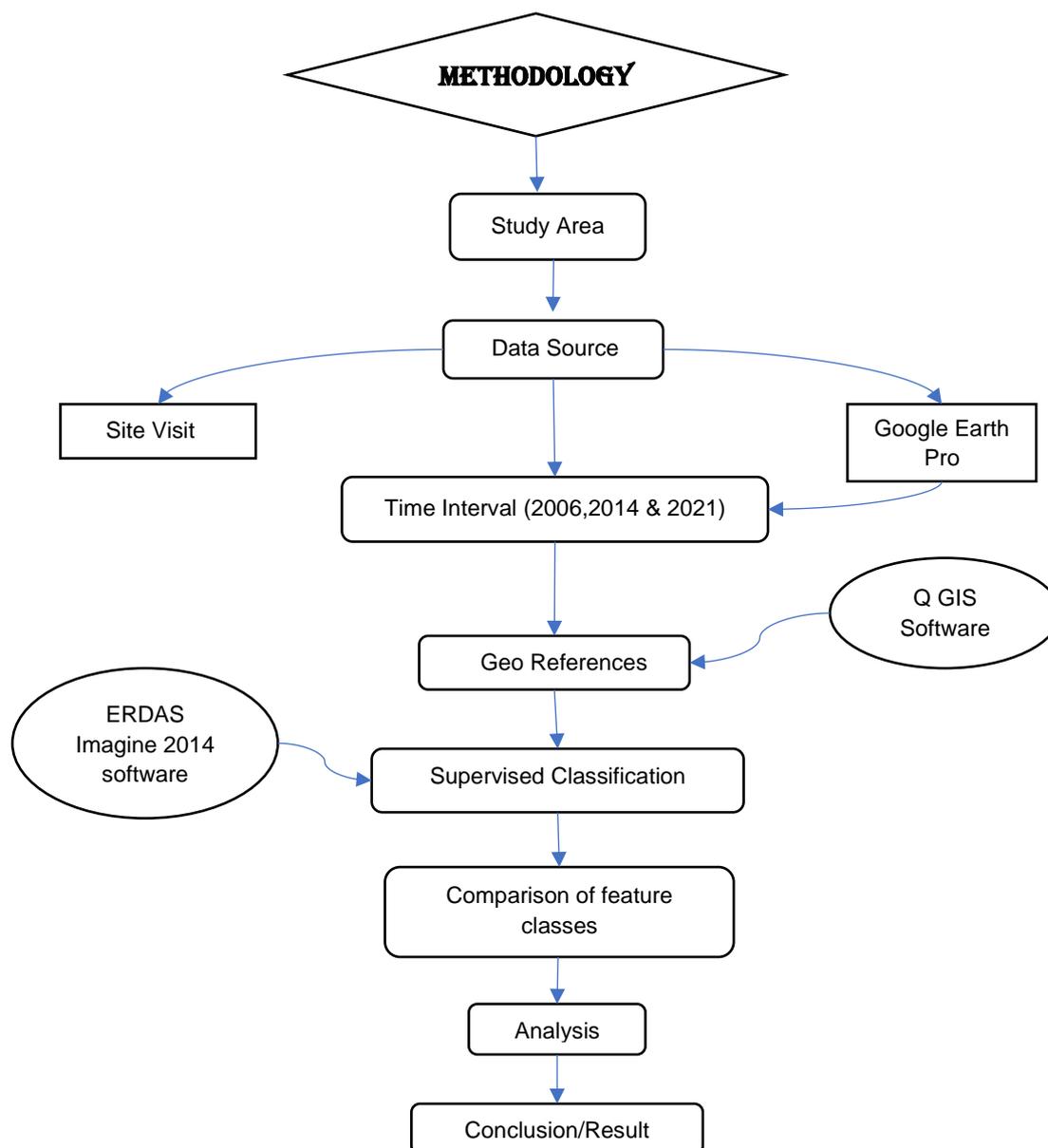
Fig 1 Methodology Flow Chart

5. Data Analysis:

The main data used in this study is an aerial image of a road development area .These images are obtained based on a database from Google Earth pro The road section that are analyzed in this study is from Deodhai village to the Harchandpur village expressway the length of road stretch of site is 7.87km with six-lane two-way divided expressway.

5.1 Location of study area

The pictures of the Rewari district NH-48 which was taken by the google earth pro follows as:

Figure2: The topographical Image of year 2006 of an Expressway (six – lane two way) in Deodhai village, district Rewari ,Haryana

Figure3:The topographical Image of year 2014 (harvested season) Expressway (six-lane two way) in Deodhai village, district Rewari,Haryana of the year 2014

Figure4: The topographical Image of year 2021 Expressway (six – lane two way) in Deodhai village, district Rewari , Haryana

5.2 Land Use land Cover at Deodhai village NH-48 Rewari district , Haryana
The following tables are shows the land use land cover in the period between 2006 to 2021 as shown below:

Table 2: Area Statistics of Rewari district of Haryana, the Year 2006

Land Use Land cover of Delhi - Jaipur Expressway NH-48 (2006)			
Sr. No	**LULC Class**	**Area (in square Km)**	**Area (in %)**
1	Agricultural Land	9875.65	59.85
2	Barren land	6115.62	37.06
3	Built up	107.56	0.65
4	Water Bodies	75.61	0.46
5	Roads	327.04	1.98
	Total	**16501.48**	**100**
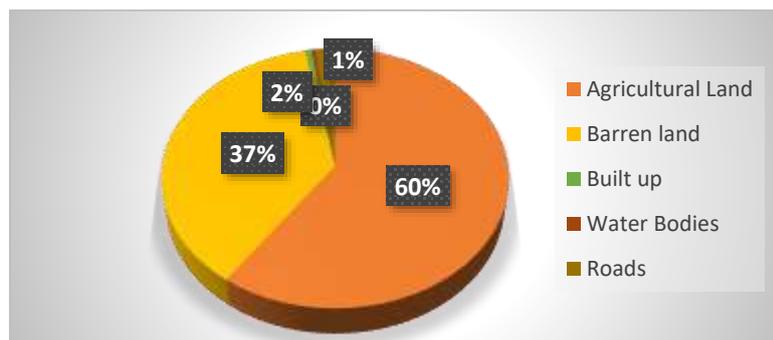
Figure 1: Pie Chart Showing land use land cover at Rewari district of Haryana NH-**48Year 2006**

Table 3: Area Statistics of Rewari district of Haryana , Year 2014

| Land Use Land cover of Delhi - Jaipur Expressway NH-48 (2014)			
Sr. No	LULC Class	Area (in square Km)	Area (in %)
1	Agricultural Land	5023.56	55.08
2	Barren land	3056.25	33.51
3	Built up	589.62	6.46
4	Water Bodies	112.45	1.23
5	Roads	338.8	3.72
	Total	**9120.68**	**100**
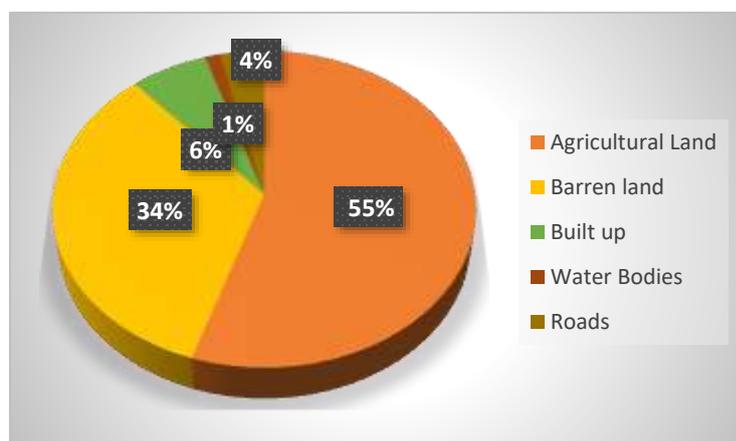
Figure 2: Pie Chart Showing land use land cover at Rewari district of Haryana NH-48 ,Year 2014

Table 4: Area Statistics of Rewari district of Haryana , Year 2021

Land Use Land cover of Delhi - Jaipur Expressway NH-48 (2021)		
Sr. No	LULC Class	Area (in square Km)	Area (in %)

1	Agricultural Land	4120.26	51.57
2	Barren land	2185.64	27.36
3	Built up	1120.35	14.02
4	Water Bodies	217.67	2.72
5	Roads	345.89	4.33
	Total	**7989.81**	**100**
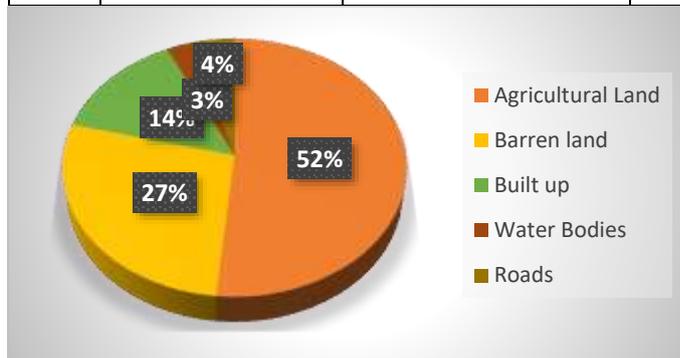
Figure 3: Pie Chart Showing land use land cover at Rewari district of Haryana NH-48 , the Year 2021

Table 4: Area statistics of NH-48 Rewari district of Haryana , Year 2006, 2014& 2021

Year	Land use (in %)				
	Agricultural Land	**Barren land**	**Built up**	**Water Bodies**	**Roads**
2006	59.85	37.06	0.65	0.46	1.98
2014	55.08	33.51	6.46	1.23	3.71
2021	51.57	27.36	14.62	2.72	4.33

**5.3 Land use land Cover (LULC) Classification through ERDAS Software**
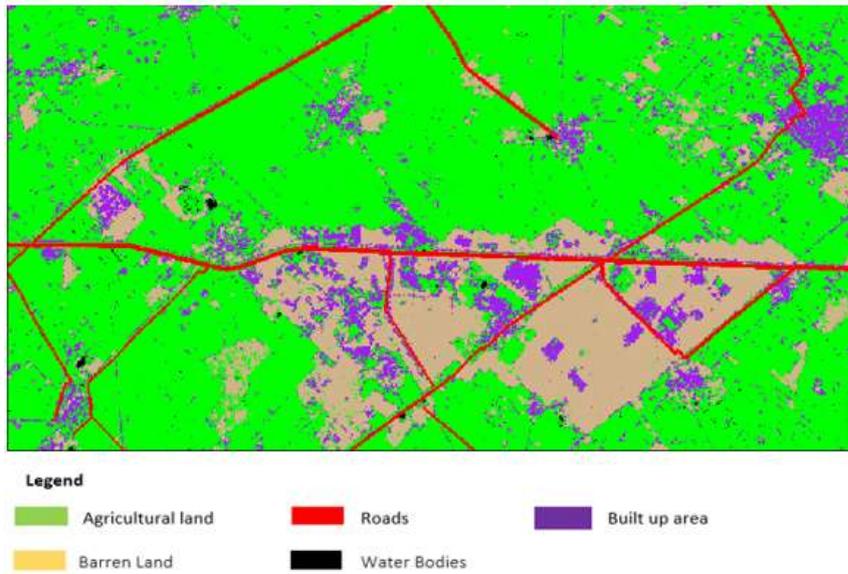
**Figure 4: Land Use / Cover Map of Rewari District – NH48 Year 2006**
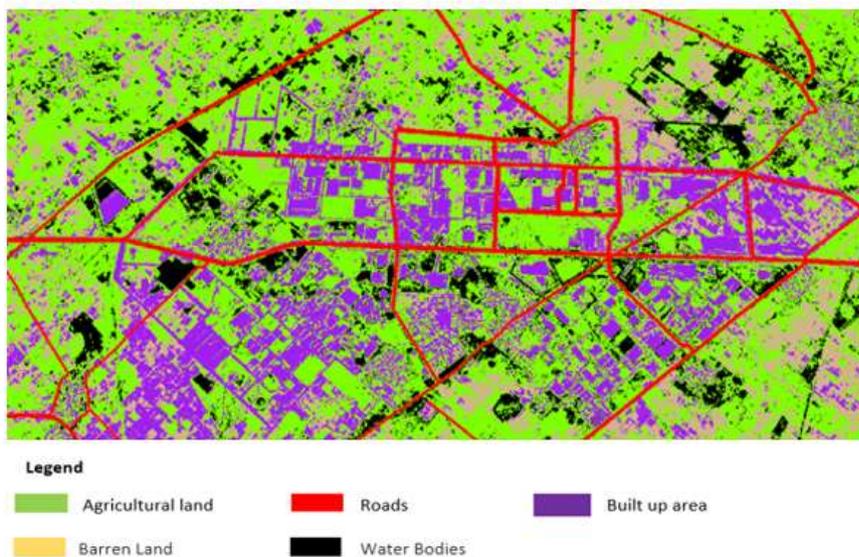
**Figure 5 : Land Use / Cover Map of Rewari District – NH48 Year 2014**

Legend

🟩 Agricultural land		🟥 Roads		🟪 Built up area	
🟨 Barren Land		⬛ Water Bodies			
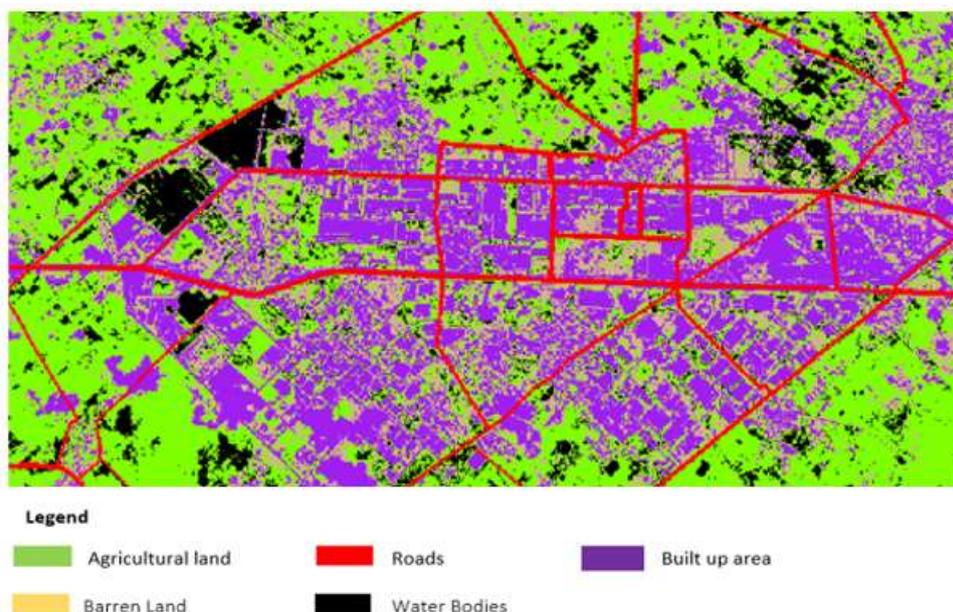
Figure 6: Land Use / Cover Map of Rewari District – NH48 Year 2021

2006   2014   2021   x-axis represents LULC classes
y-axis represents Area (in%)
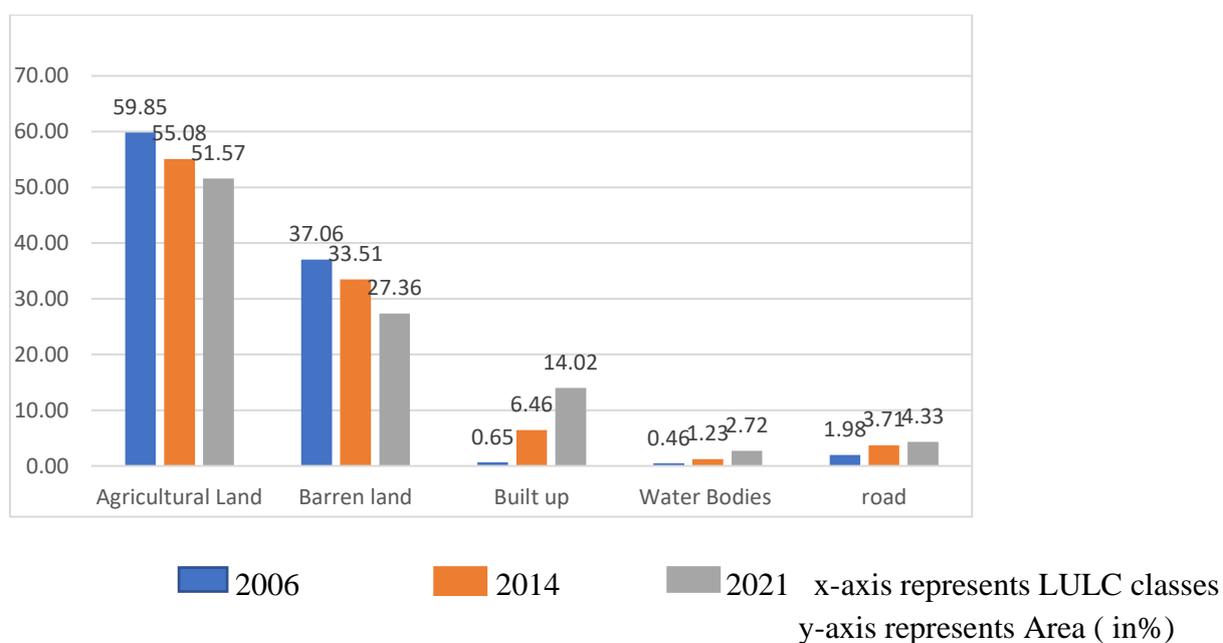
Figure 7: Bar graph showing land use land cover at Rewari district of Haryana NH-48

5.4 Change Detection: Comparison between LULC Year 2006 to 2021

The following table shows the comparative study of the percentage of change that happened as
:

Table5: Showing comparative percentage of land use and land cover of NH-48

Change detection at NH-48 between 2006 and 2021 (Area in %)				
SI no.	**LULC class**	**2006**	**2021**	**change**
1	Agricultural Land	59.85	51.57	-8.28
2	Barren land	37.06	27.36	-9.7
3	Built up	0.65	14.02	+13.37
4	Water Bodies	0.46	2.72	+2.26
5	road	1.98	4.33	+2.35
	Total	**100**	**100**	

It can be observed that due to the growth of the infrastructure a lot of cultivated land decreased in the year 2006 the agricultural land was 59.85% but due to the rapid development along the expressway it will be decreased to 51.57% in 2021. For settlement of infrastructure barren also decreased from 37.06% to 27.36% .. The analysis shows that the rate of increment in a built-up area at the beginning of the expressway was 0.65%(in 2006) but with the passage of time, the settlement of the built area rapidly increasing up to 14.62%(in 2021). For the comfort of people who are settled through this period road connectivity is also increasing from 1.98% (in 2006) to 4.33% (in 2021). For better understanding, we have tried to analyze through graphs.

6. Conclusion:

Based on the above analysis it can be concluded that the agricultural land and Barren land decreased for the development of the infrastructure and this result also proves that the road connectivity is also increased for the movement of the people. The rate of infrastructure increased faster around the NH-48 as compared to the year 2006. It can be drawn from the data is that the share of developed land usage is growing annually.

References:

- Hadi, P. L., Wasanta, T., & Santosa, W. (2021, November). Land use change due to road construction. In IOP Conference Series: Earth and Environmental Science (Vol. 920, No. 1, p. 012003). IOP Publishing.
- Appiah, D. O., Schröder, D., Forkuo, E. K., & Bugri, J. T. (2015). Application of geo-information techniques in land use and land cover change analysis in a peri-urban district of Ghana. ISPRS International Journal of Geo-Information, 4(3), 1265-1289.
- Preciouswell Nongsiej, and H.J.Syiemlieh, Road Widening and Land Use Land cover Change Detection at Nongpoh Town Meghalaya. Applied Ecology and Environmental Sciences, vol. 8, no. 5 (2020): 278-281. doi: 10.12691/aees-8-5-14.
- Bhat, P. A., ul Shafiq, M., Mir, A. A., & Ahmed, P. (2017). Urban sprawl and its impact on landuse/land cover dynamics of Dehradun City, India. International Journal of Sustainable Built Environment, 6(2), 513-521.
- Veeraswamy, G., Nagaraju, A., Balaji, E., & Sreedhar, Y. (2017). Land use and land cover analysis using remote sensing and GIS: a case study in Gudur area, Nellore District, Andhra Pradesh, India. Int. J. Res, 4(11).

- Kaul, H. A., & Sopan, I. (2012). Land use land cover classification and change detection using high resolution temporal satellite data. J. Environ, 1(4), 146-152.
- Yadav, P. K., Kapoor, M., & Sarma, K. (2012). Land use land cover mapping, change detection and conflict analysis of Nagzira-Navegaon Corridor, Central India using geospatial technology. International Journal of Remote Sensing and GIS, 1(2), 90-98.
- Gupta, N., Mathew, A., & Khandelwal, S. (2020). Spatio-temporal impact assessment of land use/land cover (LU-LC) change on land surface temperatures over Jaipur city in India. International Journal of Urban Sustainable Development, 12(3), 283-299.
- Arveti, N., Etikala, B., & Dash, P. (2016). Land use/land cover analysis based on various comprehensive geospatial data sets: a case study from Tirupati area, south India. Advances in Remote Sensing, 5(02), 73.
- Sen, A., Abdelmaksoud, A. S., Ahammed, Y. N., Banerjee, T., Bhat, M. A., Chatterjee, A., ... & Mandal, T. K. (2017). Variations in particulate matter over Indo-Gangetic Plains and Indo-Himalayan Range during four field campaigns in winter monsoon and summer monsoon: role of pollution pathways. Atmospheric environment, 154, 200-224.
- Tripathi, D. K., & Kumar, M. (2012). Remote sensing based analysis of land use/land cover dynamics in Takula Block, Almora District (Uttarakhand). Journal of Human Ecology, 38(3), 207-212.
- Shetty, A., Nandagiri, L., Thokchom, S., & Rajesh, M. V. S. (2005). Land use-land cover mapping using satellite data for a forested watershed, Udupi district, Karnataka State, India.
- Jedlička, J., Havlíček, M., Dostál, I., Huzlík, J., & Skokanová, H. (2019). Assessing relationships between land use changes and the development of a road network in the Hodonín region (Czech Republic). Quaestiones Geographicae, 38(1), 145-159.
- Rahman, A., Kumar, S., Fazal, S., & Siddiqui, M. A. (2012). Assessment of land use/land cover change in the North-West District of Delhi using remote sensing and GIS techniques. Journal of the Indian Society of Remote Sensing, 40(4), 689-697.
- Mothorpe, C., Hanson, A., & Schnier, K. (2013). The impact of interstate highways on land use conversion. The Annals of Regional Science, 51(3), 833-870.
- Donaubauer, J., Meyer, B. E., & Nunnenkamp, P. (2016). A new global index of infrastructure: Construction, rankings and applications. The World Economy, 39(2), 236-259.
- Huang, W., Liu, H., Luan, Q., Jiang, Q., Liu, J., & Liu, H. (2008). Detection and prediction of land use change in Beijing based on remote sensing and GIS. Int. Arch. Photogramm. Remote Sens. Spat. Inf. Sci, 37, 75-82.
- Brown, D. M. (1999). Highway investment and rural economic development.
- Van Asselen, S., & Verburg, P. H. (2013). Land cover change or land-use intensification: simulating land system change with a global-scale land change model. Global change biology, 19(12), 3648-3667.
- Vizzari, M. (2011). Peri-urban transformations in agricultural landscapes of Perugia, Italy. Journal of Geographic Information System, 3(2), 145.
- Regos, A., Ninyerola, M., Moré, G., & Pons, X. (2015). Linking land cover dynamics with driving forces in mountain landscape of the Northwestern Iberian Peninsula. International Journal of Applied Earth Observation and Geoinformation, 38, 1-14.

● Rimal, B. (2011). Application of remote sensing and GIS, land use/land cover change in Kathmandu Metropolitan city, Nepal. Journal of Theoretical & Applied Information Technology, 23(2).

● Zhou, Q., Li, B., & Chen, Y. (2011). Remote sensing change detection and process analysis of long-term land use change and human impacts. Ambio, 40(7), 807-818.