

## Analyzing Impact on Urbanization Pattern of Delhi NCR Region due of Delhi Metro

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### Abstract:

The Delhi Metro project has played a very significant role in public urban transportation in India due to the development of metro in Delhi-NCR region. Megacities like Delhi are urbanizing at an unplanned and irreversible rate, also metro project has contributed significantly in urbanization pattern. The study envisages to study the urbanization pattern due to the escalation of Delhi Metro in the NCR region. Metro is causing linear development or parallel infrastructure around Delhi and NCR. The peripheral city of Delhi situated in Uttar Pradesh and Haryana i.e. Gurugram, Noida, Bahadurgarh, Faridabad are now connected with metro which shows the urbanisation in NCR and Delhi. The work also aims to establish the urbanization along with the social scenario, as the Delhi metro has a massive network nearly 288 kms with six different lines. Finally, it wants to suggest ways to further rising the urbanization pattern due to the rising of the metro network in Delhi and NCR region and DMRC project, urbanisation pattern is changing due to push and pull factor.

**Keywords:** *Corridors, Expressway, Green Cover, Buffering, Change detection.*

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### Introduction

Urbanisation pattern of Delhi - NCR has been significantly influenced by the development of Delhi Metro. Irreversible and unparalleled development of urbanisation can easily be seen in this megacity and surrounding

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NCR region at inclined rate. After its inauguration early 21st century the traffic and transportation pattern has been modified in this megacity. The extension of the surrounding region has been seen considerably as the cities like Gurugram, Noida, Ghaziabad, Faridabad continuously showing parallel infrastructural development as per the time wants. Now the extension of Metro Rail in Delhi and adjoining cities can be seen as lifeline transportation network which is providing advanced transportation service to the commuters. The physical landscape of Delhi's transportation is sharing advancement with its development. The coverage area is expending the growth of population due to push factor of migration are influencing to develop planned and unplanned dwelling around and inside the city. Delhi metro has 8 metro lines namely Red line, Yellow line, Green line, Blue line, Violet line, Pink line, Magenta line, Orange line Airport express line. These metro lines cover around 288 Kilometres. The Commuters who travels in Delhi Metro they went speedy and cheaper dwelling to stay is the main reason of growth of population in adjoining cities like Gurugram, Noida, Ghaziabad, Faridabad. DMRC which is responsible for every development maintenance, and services in Delhi Metro. The planning to develop a Metro Rail system in capital city of INDIA is to control the mixed transportation provides better, speedy, and convenient transportation. The length and breadth of Delhi is around 51.9 kilometres and covers 1484 km square area. So, the commuting between one place to another is very difficult by locally provided conventional public transportation.

## Literature Review

Urbanization pattern is changing its dimensions at very high pace. Urbanization is a process in which the urban landscape on any region is taking place due to migration mainly in developing nation like India. The symptoms of urbanization are transformation to modern infrastructure, developing economy, congested roads, sleepless nights, and many more. The symptoms of urbanization can be different as per the region. There are situations which leads to urban problems like development of slums, environmental problems, overcrowding, decreasing land-man ratio.

There are researches on urbanization, environmental perspective of Delhi metro by Mayank vikhona, Changing landscape of Delhi by Rashmi sadana and traffic management techniques to be used to get congestion free traffic flow while construction of metro projects by Ravi bhutani, Dr. Sewa ram, Dr. Kayitha ravinder but there is lack of researches on urbanization pattern due to Metro rail development.

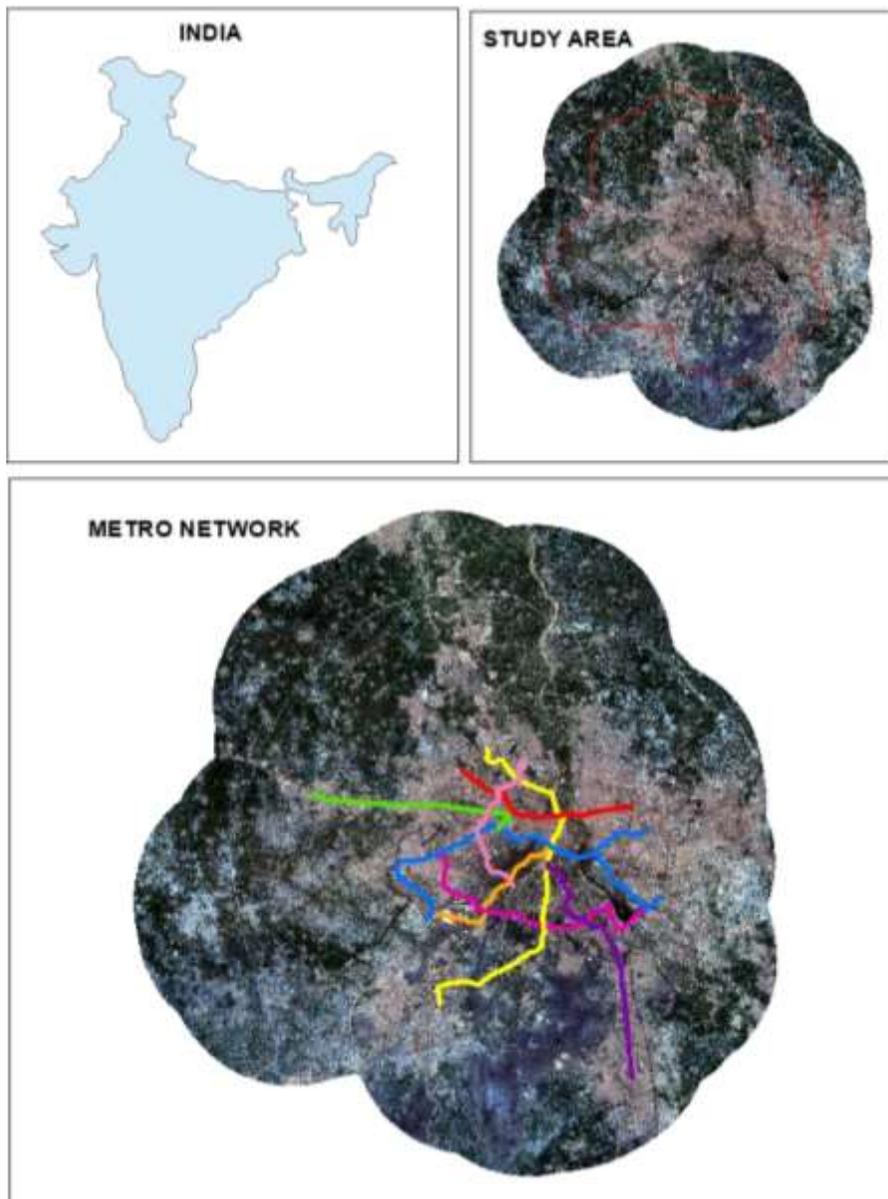
In this research, geometrical data is used to analyze the competitiveness of this research by using figures and tables. There are many metro lines in Delhi metro rail corporation but mainly two line are showing major changes in their surrounding regions. The broad objectives of the current work are follows:

1. To analyse the urbanisation in Pre-Metro and Post-metro scenario.
2. To quantify the amount of urbanisation along metro corridors
3. To demarcate buffer area influenced due to metro corridors
4. To predict the amount of urbanisation in forthcoming metro corridors

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## Study Area

The study area Delhi is the capital of India. Second largest metropolis by population in India. Delhi is located at 28.7041° N latitude and 77.1025° E longitudes. It includes NCR region Noida, Ghaziabad, Gurugram, Faridabad. The network of Delhi metro consists of 8 lines named by different colours and covers not only Delhi but also sharing a common border with satellite towns

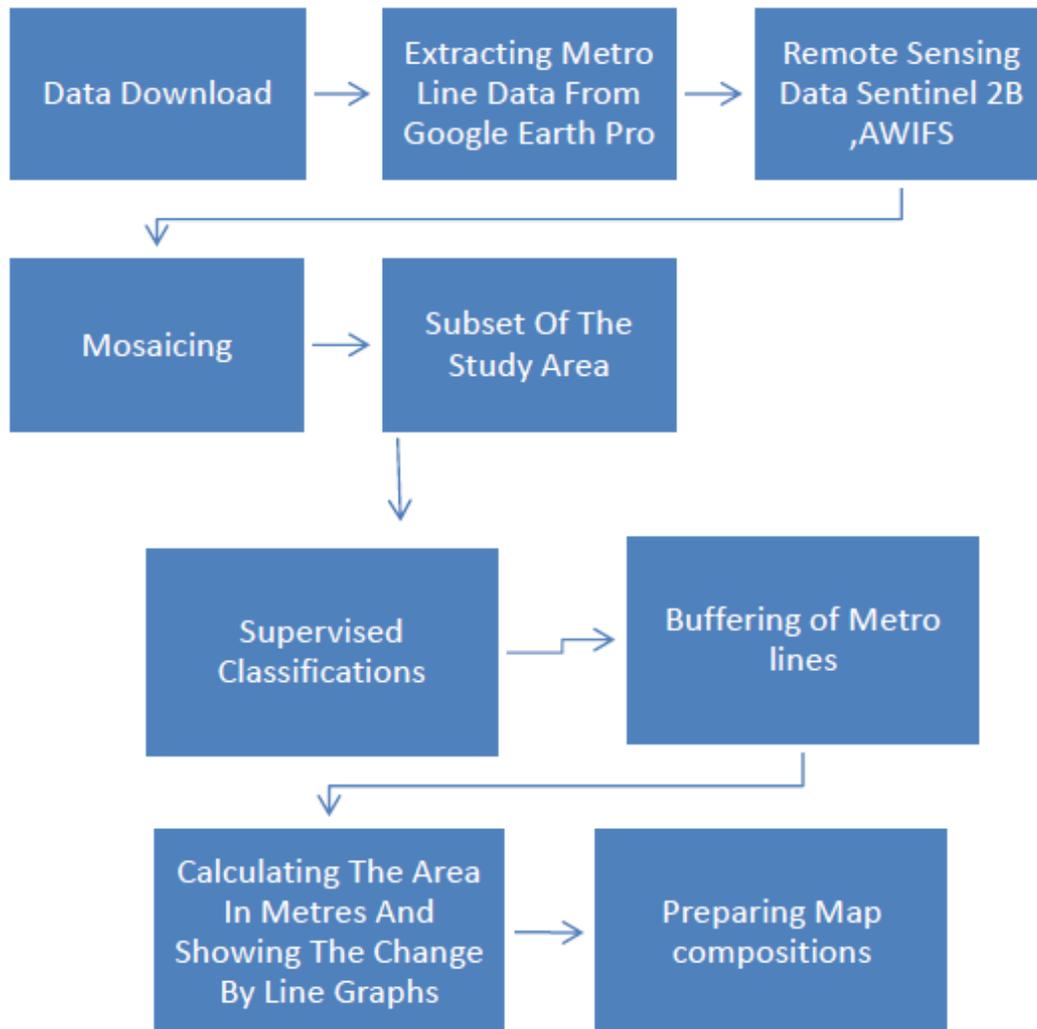


**Figure 1.** Location of Study Area and Spread of Delhi Metro networks in and around Delhi-NCR

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## Methodology

To study the impact of Delhi Metro on Urbanisation pattern of NCR- Delhi region have been present using geo-information approach which include remote sensing data and geospatial technique.



**Figure 1.** Flowchart showing Methodology Framework

### Data Used

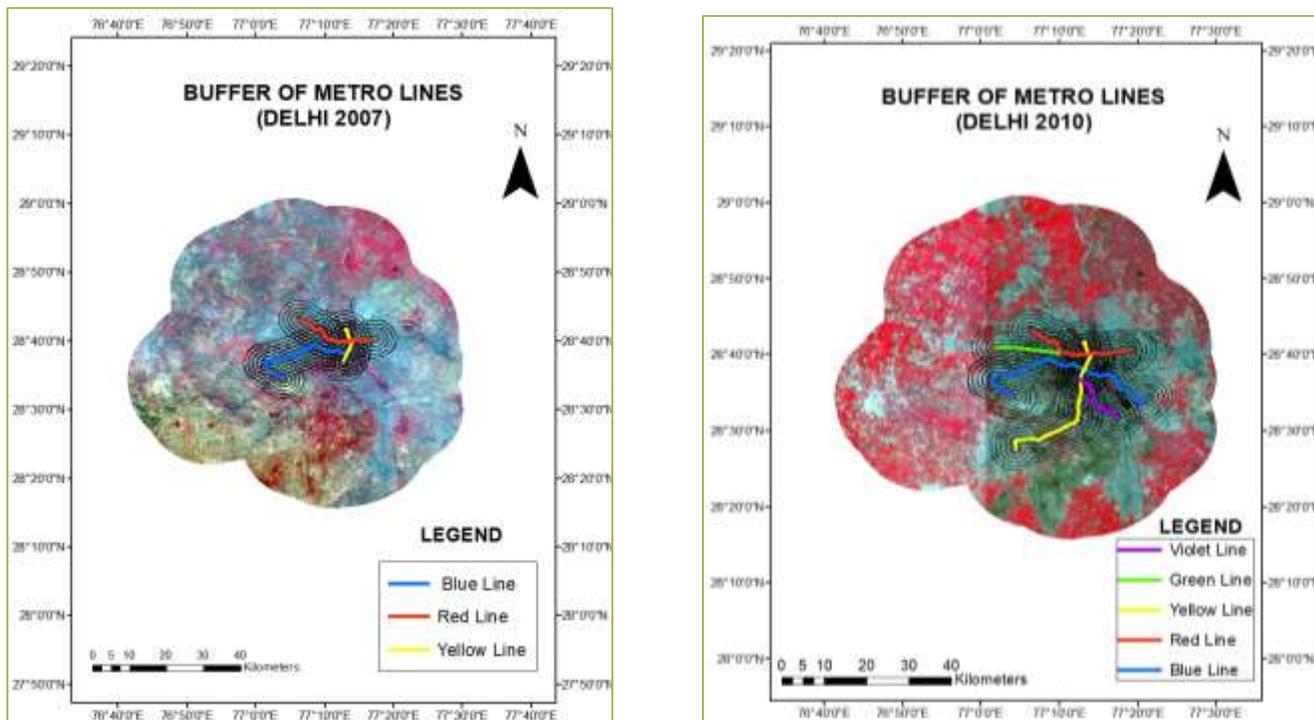
A Resourcesat-1 data of sensor AWIFS with resolution 56 metre and also Sentinel-2 data is used with 10 metre resolution.

**Table 1: Extract Of Dataset And Properties**

DATA	SOURCE LINKS	RESOLUTION(m)	TIME
Sentinel-2	earthexplorer.usgs.gov (ESA)	10	19/06/2018
Sentinel-2	earthexplorer.usgs.gov (ESA)	10	21/03/2017
AWIFS	bhuvan-noeda.nrsc.gov.in	56	06/02/2010
AWIFS	Bhuvan-noeda.nrsc.gov.in	56	12/11/2007

**Software used**

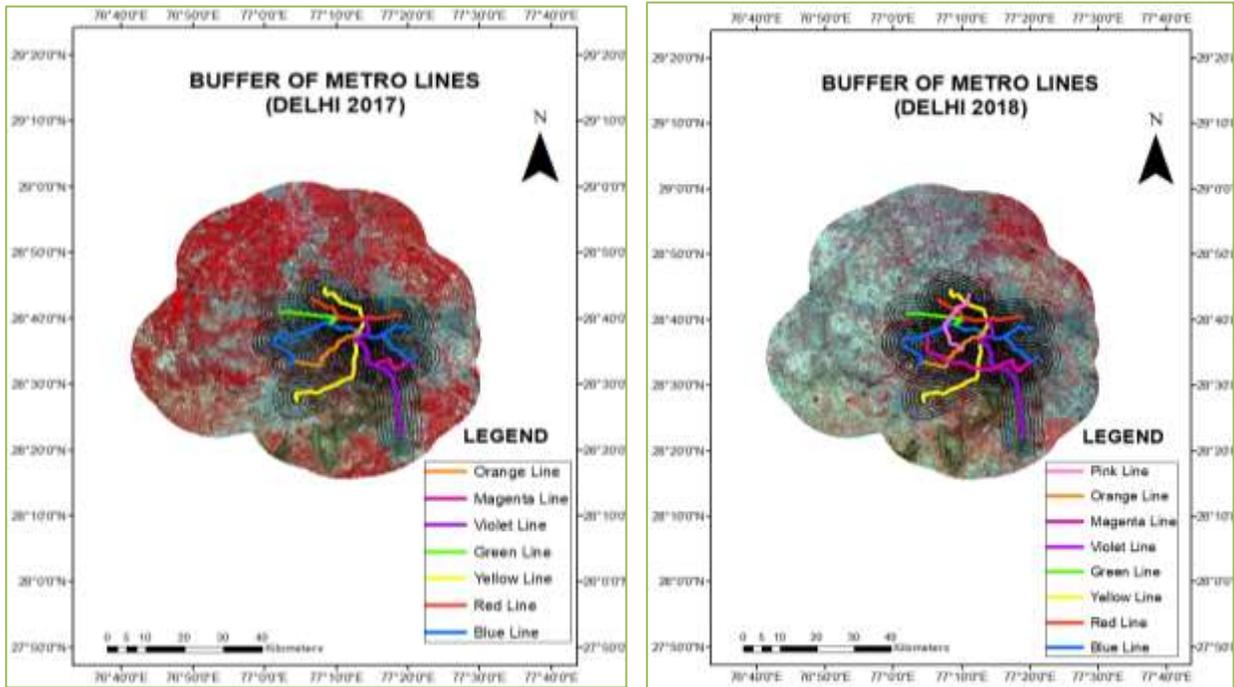
The current used various geostatistical and mapping tools from ArcGIS Desktops software for making land use and landcover maps to visualise the extend and to vectorise the spread of the metro network in Delhi. Various additional tools like buffer and extract tools from ArcGIS Desktop were used for making buffer and layers.



**Figure 2.** Buffer Around Various Metro Network Lines in the Year 2007 and 2010

Figures 2 visualizes the extent coverage by metro network lines in the year 2007 and 2010. There is growth in metro network coverage in the year 2010 with two new lines namely Violet and Green Lines in the year 2010 in compared with the earlier year 2007.

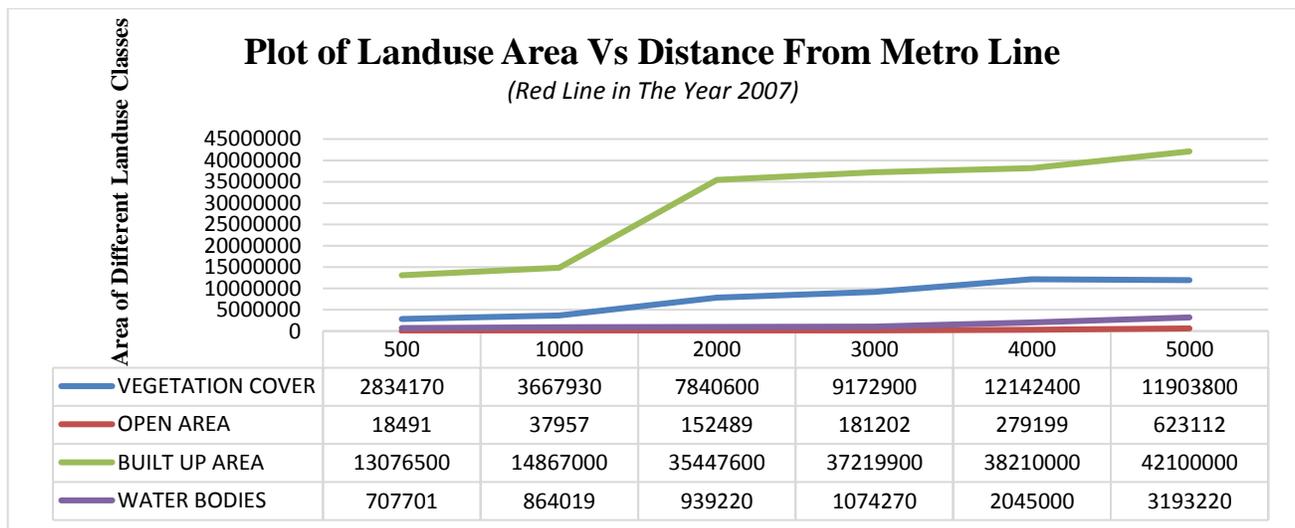
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**Figure 3.** Buffer Around Various Metro Network Lines in the Year 2017 and 2018

Figure 3 visualizes the extent coverage by metro network lines in the year 2017 and 2018. There is ample development in metro network coverage within one year itself with one new line namely Pink Line in the year 2018 in compared with the earlier year 2017.

**Result and Analysis**



**Figure 4.** Land use Area with respect to distance from Metro Lines (Blue Line 2007)

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Figure 4 infers that built-up area near the metro line is less as curve showing but drastically increasing when we are moving away from metro line and it also shows that negligible change in open area and water bodies.

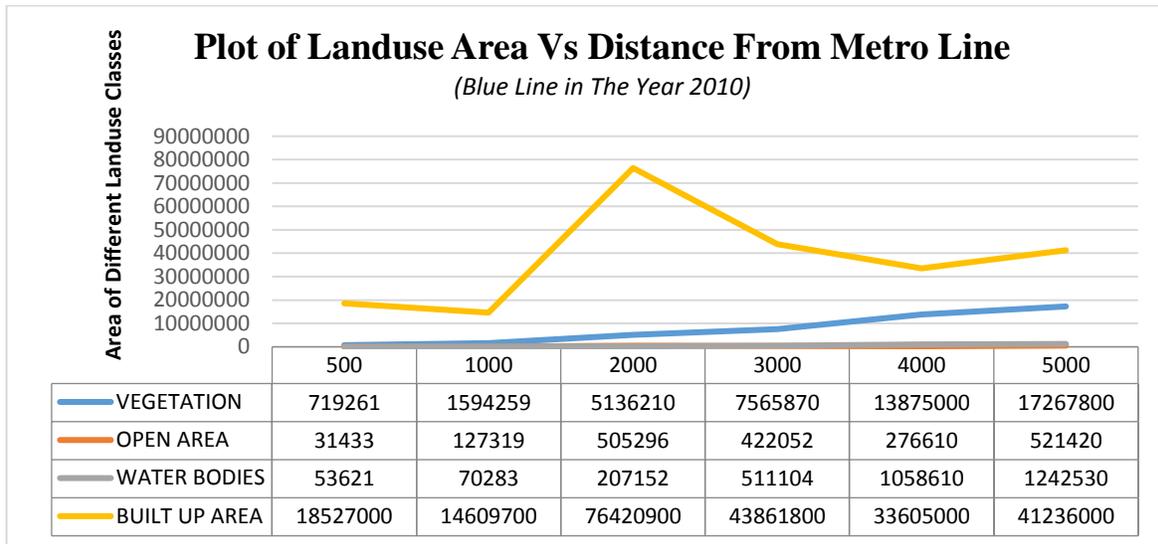


Figure 5. Land use Area with respect to distance from Metro Lines (Blue Line 2010)

Figure 5 infers that built up area near the metro line is less as curve showing but as we are moving little further it increase but declined at the end and also it shows that open area is negligible.

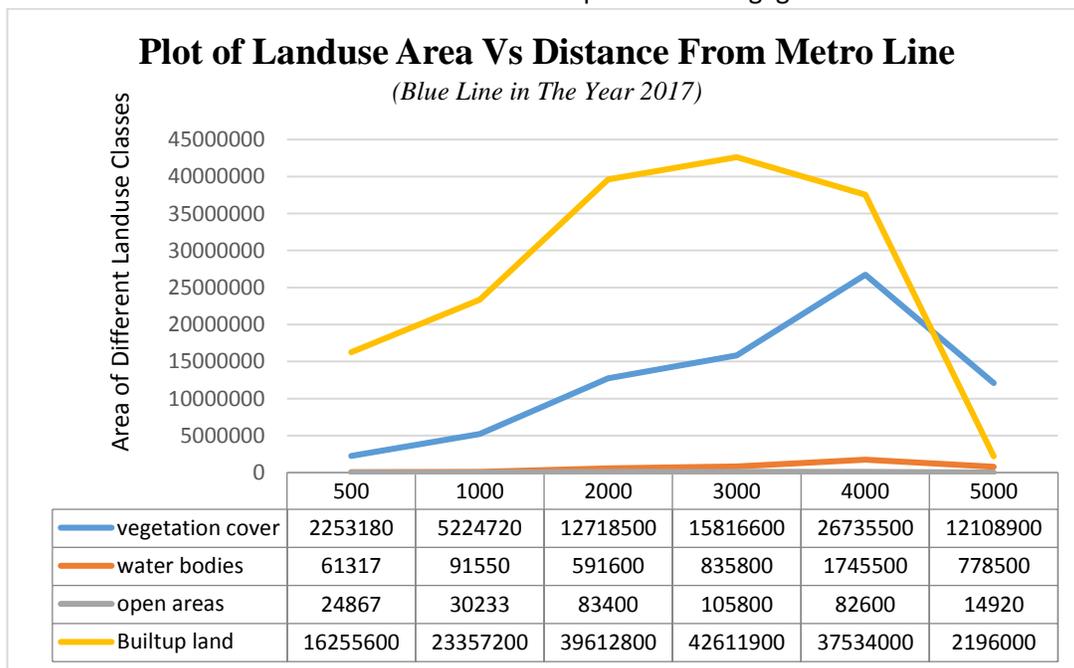
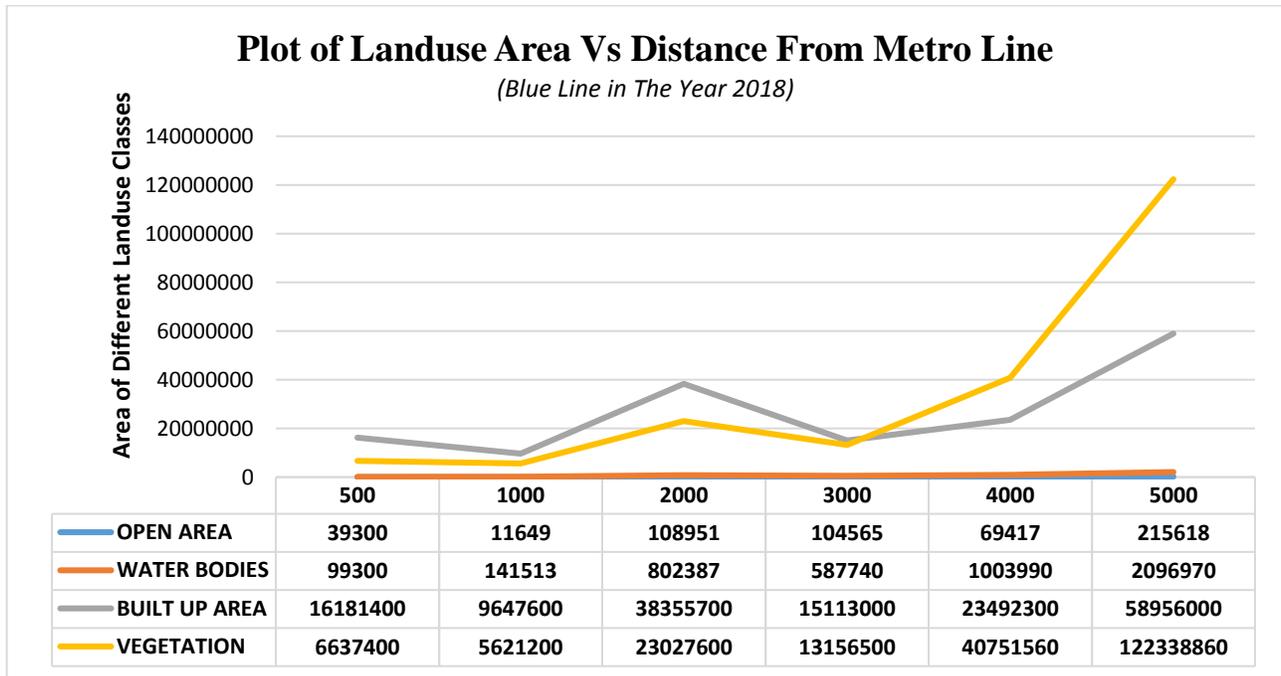


Figure 6. Land use Area with respect to distance from Metro Lines (Blue Line 2017)

Figure 6 infers that built-up area near the metro line is increasing as curve showing and as we are moving away from the metro line it increasing and open area is negligible.



**Figure 7.** Land use Area with respect to distance from Metro Lines (Blue Line 2018)

Figure 9 shows that built-up area is increasing constantly near the metro line as curve showing and away as well. Water bodies and open area is negligible. The data analysis was done for every single metro line, but here only the data showing maximum variation in the LULC is depicted.

### Conclusion

Delhi Metro Rail is going through rapid growth in its coverage area and providing faster transportation system to the commuters. Urbanisation landscape is increasing as Metro is developing its network through the Delhi. The parallel region situated with the Metro lines showing swift infrastructural development. The push factors and developing economy of this region showing the increasing urbanisation. The commuters travelling by Delhi Metro using this system due to its reliability and speedy transportation. Commuters are mainly from the peripheral regions of NCR and are observant of economical home resulted in unstructured development in outskirts of Delhi as well. So, these unwanted growths can be seen in rural area of Delhi, which is not planned. Many regions are crossing its potential to hold people. The DMRC needs to develop its network and plan in a manner which not impacts the development in certain region which are not ready to hold force of migration.

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