

# Impact Of Outer Ring Road Chennai On Land Use And Environment Using GIS

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## Abstract

The Roads are the important furniture's of the urban area's and they determine the economic growth of a city. The Outer Ring Road of Chennai is a major leap in Chennai's development. The Road connects Vandalur to Minjur Via Poonamalle, runs for a length of 62.4 Km. The ORR is a Greenfield Corridor which cut across the vacant Lands on the periphery of the city. The Construction of ORR has a huge impact in the lands on the either side of the Corridor. The impacts can be studied in different heads; we have restricted our study in concern with Land use and Environment. The Impact on Land use is studied in basis of transformation of Land use. The Change in land Use before and after the construction of ORR is studied. The land use Change is studied with the Help of satellite Imagery and Arc GIS. As Per the Environment impact is Concerned we have studied the noise level and water quality along the corridor.

*Keywords: Impact Analysis, Land Use Change, Environmental Impact, Outer Ring Road.*

## 1. Introduction

A road is a thoroughfare or a route between two places that has been paved or improved to allow travel by some conveyance. The first and foremost purpose of a roadway is to facilitate carriage of goods or persons between two places. When a new roadway is constructed there is a drastic change in the standard of living of the people in the locality and land use of the region. These changes are due to the facilitation of exchange of goods and services.

Chennai's Outer Ring Road (ORR) is a 62.3km project being built in two phases around the Chennai Metropolitan Area (CMA) in Tamil Nadu, India. The project will connect the GST Road from Vandalur to the Tiruvottiyur Ponneri Pancheti (TPP) Road in Minjur.

The key objective of the ORR is to allow heavy vehicles to travel outside of the city, which will minimise traffic congestion within the central city areas.

In this paper we shall study the impacts of the ORR on land Use and Environment. The land Use Change is studied with base year of 2009 and in 2016. The Environment impact is studied on Quality of noise and Water Pollution.

## 2. Study Area

The impact study is limited to a stretch of 12 km from Ponnammallee to Nimmilicherry. A buffer of 300 m on either side of the corridor were considered for impact study. About 16 Villages which are covered under the study area as per the above said condition. The total extent of study area is 30.101 Sq.km. with a total population of 1.18 lakhs.

The 16 village's falls under the study area are Amudurmedu, Ariyappancheri, Anaikattucheri, Chokkanallur, Karunakaracheri, Kavalcheri, Kolappancheri, Nazarathpettai, Nemilicheri, Thandarai, Thirumanam, Thirumazhisai Thukkanampattu, Udayavarkoil, Varadharajapuram and Vayalanallur.

## 3. Impact Assessment

Impact assessment is the process of identifying the future consequences of a current or proposed action. It is used to ensure that projects, programmes and policies are economically viable, socially equitable and environmentally sustainable. Work under the Convention seeks to support efforts to adequately reflect biodiversity considerations in impact assessments. Guidance developed under the Convention helps to decide which aspects of biodiversity may need to be monitored and how to carry this out in a cost-effective way. The impact assessment is studied in two categories for this paper; they are land use change and Environmental Impact. The land use change is

Analysed using Arc GIS, and Environmental impacts were studied on quality of water and noise pollution.

#### 4. Land Use Impact assessment

The purpose of land use impact assessment is to assess both long term and short term implication on the land uses in the vicinity of the proposed alignment and to recommend appropriate cost effective mitigation measures to minimize the adverse effects caused by the proposed alignments. The boundary of the study area for the land use impact assessment is in general, 300 m from either side and along the study area. The entire village is considered which falls under the 300 m buffer.

The Base line year is considered as 2009, the time of start of project and the comparison year is considered as 2016. The land Use change is detected and analysed using Google Earth Imagery. The change in land use is tabulated in Table -I.

Table: 1- Land Use comparison

Land Use	In 2009 (Sq.km)	% of 2009	In 2015(Sq.km)	%of 2016
Agricultural land	12.725	42.28	9.536	31.68
Industry	4.800	15.95	5.115	16.99
Institutional	0.325	1.08	0.474	1.57
Mixed Residential	0.000	0.00	2.003	6.65
Primary residential	5.357	17.80	7.373	24.50
Railways	0.042	0.14	0.104	0.34
Roadways	0.110	0.36	0.849	2.82
Vacant land	5.437	18.06	3.771	12.53
Water body	1.305	4.34	0.877	2.91
<b>Total</b>	<b>30.101</b>	<b>100.00</b>	<b>30.101</b>	<b>100.00</b>

The Fig.1 Shows a comparison chart of Land use Change from the year 2009 to 2016.

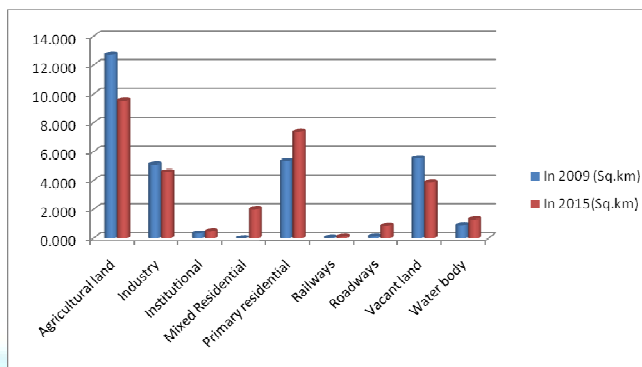


Fig. 1- Land Use Comparison

The land use has shown a transformation in two categories. There is an up gradation of higher land use from agricultural, Vacant to Residential and Industrial use. It has been observed that there is a significant decrease in Agricultural and Vacant use for about 16.12% from 2009 to 2016. There is also a decrease in water bodies 2009 to 2016, in a significant amount. It also absorbed that there is an increase in brick Kilns in the area.

Also there is notable increase in the Primary Residential area by about 6.7% from 2009 to 2016. As the ORR ease the connectivity with nearby villages from the city there is a drastic increase in residential area. There is a also a proposal for commercial area along the eastern side of ORR, there is a good potential for development in these areas.

The Construction of ORR has also has blocked many drainage line. The Water bodies has also been perished due to construction of ORR

#### 5. Environmental Impact

The purpose of the Environmental Impact assessment is to analyze the positive / negative impacts caused by the laying and usage of the ORR. In case of negative impact be found, preventive measures to be taken to control or minimize the extent of damage to the environment. Environmental impact assessment is done under two divisions, viz Noise Quality and Water Quality.

Noise quality / noise levels in the stretch can be calculated based on the Traffic volume in the given region. The traffic volume study is done by conducting an Origin and Destination survey in the study stretch. From the primary survey, the annual average daily traffic is calculated as :

Table :2 Annual Average Daily Traffic

Duration	Cars	Bikes	Lorry	Others
AADT	760	500	840	50

Source: Primary survey

Table :3 Estimated traffic volume be (without generated traffic)

Duration	Cars	Bikes	Lorry	Others
AADT(2015)	2169	1450	429	29

Source: Government of Tamil Nadu, Highways Department

By comparing the tables obtained from our Primary survey and the proposed traffic volume by the Tamil Nadu Highways Department, it is evident that the traffic volume is higher than the expected volume.

The current noise level in the study area is found to be 80dBs which is likely to increase in the near future as the traffic volume is likely to increase when the entire stretch is open to public. Hence it is advisable to create a buffer between the road and the residential / commercial area. A 100-foot wide planted buffer will reduce noise by 5 to 8 decibels (dBA). Using a barrier in the buffer such as a landform can significantly increase buffer effectiveness (10 to 15 dBA reduction per 100-foot wide buffer with 12-foot

Buffer Guidelines for Noise Reduction Along Roads	
<b>Moderate Speed Road (&lt;40 mph)</b> Plant a 20 to 50-foot wide buffer with the near edge of the buffer within 20 to 50 feet of the center of the nearest traffic lane	<b>High Speed Road (≥40 mph)</b> Plant a 65 to 100-foot wide buffer with the near edge of the buffer within 50 to 80 feet of the center of the nearest traffic lane

high landform).

Table: 4 Buffer Guidelines

Source: Plants and Environmental Noise Barriers. Acta Horticulture. 643: 265-275.

Water Quality testing is done by collecting samples from the study area and water testing (pH, turbidity, total hardness, chlorine, fluoride and Dissolved Oxygen). From the results obtained it is found that the pH and turbidity. This may be due to pollution caused due to the laying of roads. The chloride and fluoride contents are within the desirable limit and hence safe for domestic usage.

Table:5 Water Quality Test

Sample	pH	Turbidity	Total hardness	Chlorine	Fluoride	Dissolved Oxygen
1	9.05	22.5	55	255.08	0.15	8
2	8.75	8.4	60	110.17	0.12	4.4
3	7.35	2.8	145	232.26	0.136	8
4	6.9	6.1	120	162.48	0.818	30.4
5	7.0	2.4	50	182.63	0.07	31.6
6	7.69	3.2	155	137.23	0.14	17.6
7	7.5	20.5	170	245.08	0.25	5.6
8	8.1	13.2	190	210.17	0.17	9.2
9	7.4	9.2	70	132.26	0.13	19.2
10	6.95	16.4	120	242.48	0.8	12.2
11	8.92	12.1	165	112.63	0.5	7.4
12	7.45	10.8	105	187.23	0.11	11.2
13	9.2	13.5	125	210.56	0.14	10.5
14	8.75	2.1	130	137.89	0.19	20.5
15	9.0	3.8	95	285.7	0.21	25.5
16	7.5	7.1	85	112.2	0.4	17.5

## 6. Conclusion

The Impact Study is Limited to a Land Use and Environmental Impact Assessment as the time for study is

limited. As per Land Use change is concerned we can see a transformation of land use is taking place in the study Area. The Land for development are enormous and there is significant increase in Industrial activities in these area. Since the land is considered as a resource for development, it has to be utilized in a planned manner. As per environmental impact is concerned we need to monitor the water quality and noise quality periodically. There is also a necessary to provide a enough buffer from the residential areas.

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