

Study and Forecasting of Ring Road Development of Khargone City

Kunal Kewat¹ Dr. Sunil Sugandhi²

¹Research Scholar ²Assistant Professor

^{1,2}JIT Borawan (M.P), India

Abstract— In this work the concentration is on the work related to traffic assessment to model a ring road for the busy area of a city. Traffic assessments can be usually carried out by municipalities for new proposed projects or developments, rezoning requests, traffic congestions, future regional planning and conducting traffic surveys in order to study the traffic behavior in accordance to specific future traffic projection. Usually traffic assessment studies the provided recommendation for some improvements to the area. Here traffic survey is followed by forecasting of traffic for future year 2045 and ring road is recommended to plan with immediate effect.

Key words: Forecasting of Ring Road Development, Data Collection, Trip Distribution Models

I. INTRODUCTION

II. LITERATURE REVIEW

Muhammad Nomani Kabir, Yasser M. Alginahi, and Ali I. Mohamed, 2016. This document presents an assessment of the flow of traffic on the busiest road, ie the first ring road located in the central area of Madinah in Saudi Arabia. In this document, the traffic flow assessment is performed through the evaluation and analysis of traffic on First Ring Road. This includes the analysis of the number of vehicles entering and leaving the central area through the First Ring Road, the road layout, the percentage of incoming and outgoing traffic. The results of the simulation show a good agreement with the corresponding measurement data of the vehicles on First Ring Road. Thus, model can be used as a prediction model of vehicle movements.

Sudhir C, 2012, this paper aims at analyzing three different solutions suggested for traffic congestion relief in Port Louis, the busiest city of Mauritius. It evaluate impact of the three alternatives which are the use of Light Rail Transit (LRT) as an alternative mode of transportation, the construction of a Ring road around Port Louis, The upgrading of the current bus network into a Bus Rapid Transit system (BRTS).

Amol R.Rode, 2014, The present research primarily aims at evaluating various characteristics of traffic flow and noise pollution of Nagpur city by conducting experimentations at wider range of values for important parameters. This paper deals with experimental study of detailed traffic analysis of ring road of Nagpur city and formulating the strategies for effective traffic operation of the street.

Leni Stephen, Anjana Anna Sunny , Aravind S , Dipesh P Nath, 2016, Provision on adequate infrastructure is a pre-requisite for sustained growth of economy and inherent to such growth is the need to ensure cost effective movement of People and goods. We know that , The number of vehicles plying the road has increased dramatically. Hence, there is an urgent requirement to standardize the present inadequate road network in terms of its capacity. In kerala states Kottarakkara,

a town in Kollam district is considered. Due to high acquisition price, impossibility in widening due to dense population and due to cross traffic, Construction of ring road was considered.

Robert Bain, 2009, This paper addresses that shortcoming by reporting the results from the largest study of toll road forecasting performance ever conducted. The author has had access to the confidential commercial documentation provided to the project funders and, over a period of 4 years, has compiled a planned and effective traffic use database for over 100 international road toll projects financed with private funds. The results suggest whereas the toll traffic forecasts are characterized by large errors and a major detriment to optimism. As a result, financial engineers must ensure that the transaction structure is flexible and maintains liquidity, so that important deviations from traffic expectations can be met.

Tim Veitch, Aaron Alaimo, Lauren Walker, 2013, In this paper, previously unpublished forecasts made by the Zenith Toll Choice model for a number of recent toll roads are documented. These forecasts have proved to be encouragingly accurate, suggesting that the science of demand forecasting is in better shape than would be indicated by a survey of official demand forecasts. This paper also describes in detail, the innovative methods used by “Zenith Toll” Choice model, including the automatically generation of tolled alternatives, explicit modelling of the options between tolled alternatives, Detailed segmentation of the travel market and explicit treatment of toll stops and other price mechanisms.

S. .R. Pells, 1989, This paper presents a review of the known evidence on the various aspects of user response to new road capacity. The effects of traffic on new road capacity have important implications for the assessment of road conditions. The conventional method for long-distance roads (and increasingly for urban road projects) assumes that the volume of journeys and their destination is given between pairs of zones.

Jason D. Lemp, 2009, This paper represents a review of many key studies and reports dealing with uncertainty in traffic and revenue forecasts for highway projects. These studies have found that toll projects tend to suffer from substantial optimism in forecasts, with expected traffic volumes higher than actual volumes of 30% or more, about half the time.

Peter Headicar, 2015, Paper presents insightful paper reflecting on the seminal Buchanan report and exploring what the future holds for traffic and our towns. When the Colin Buchanan report was published in 1963, it was at a time when it seemed that the car would dominate our lives and our built environment. This document offers a series of conclusions to which policymakers would do well to pay attention in an election year. In the context of movements to transfer decision-making powers to cities and cities, an

opportunity is identified to adopt a far more ambitious position than has been possible up to now.

Artur Hołuj, Jarosław Frączek, 2015, The aim of this study is to analyse the intensity of traffic in the village of Bysina taking into account, that local municipality is planning to build ring road of Bysina nearby. Conducted traffic measurements confirmed that existing transit route – the county road No. K1935 is characterized by allow transit traffic with a relative stabilization of its level in the various periods of the year. In addition, there is no increased arduousness at night and during all the days off from work.

S.P. Sekar and S. Kanchanamala, 2011, Chennai Metropolitan Area is experiencing a differential growth among the villages. The dynamics in the growth trends are attributable to various factors of influence. This article attempts to study the growth dynamics of CMA to discover the factors that influence it. The policies and guidelines for future development and their impact on the growth trend of the CMA are also examined. It is concluded that in the context of rapid urbanization, planning for development of the metropolitan area deserves utmost importance on par with the city area.

III. PROBLEM

Problem is taken as the route optimization of Ring Road which is taken under consideration from Khargone development authorities.

Ring road running parallel to canal starting from Bistan Road crossing Khandwa Road, Sanawad Road, terminating at St. Jude Higher Secondary School; Rs 1331.62 Lac is planned to invest for this ring road. The length of this road is 5.65 kms.

IV. ISSUES & FINDINGS

Identification of key issues help in resolving the problems in a focused manner related to traffic and transportation. Major issues related to traffic and transportation sector in Khargone town are as follows:

- Due to the development of shops on footpaths, pedestrians walk on roads reducing the effective space available for traffic movement;
- Due to the lack of organized off- street parking facility, vehicles parked along the main roads particularly in commercial areas are creating congestion and increases the chances of accidents;
- All major roads of the town are of varying widths creating bottlenecks. Khandwa Road, Bistan Marg, Julwania Marg, Kasrawad Marg, Sanawad Marg, Umarkhali Marg etc. connecting to regional roads needs to be widened uniformly on priority due to high traffic volume and to reduce the bottlenecks;
- In absence of any bypass various State Highways pass through the town, forcing through traffic to enter into the town creating pressure on town roads and increases the accident cases;
- Some of the dense built up colonies of Mullawadi, Gurwa Darwaja Marg, road from Jhanda Chowk to

Bawadi bus stand, roads leading to localities like Baniyawadi, Mominpura etc. are inaccessible by vehicle due to extremely narrow width of lanes.

- Several road intersections viz. Bistan Naka, Bawadi bus stand, Post Office Chauraha, Navgraha Chowk etc. are inconvenient due to faulty road geometrics, absence of signalization and proper lightening. Due to lack of space available in existing bus stand, it needs to be shifted to a comfortable location;
- Khargone being regional service center, commercial and industrial activities necessitate inflow and outflow of huge goods transport vehicles. In absence of Transport Nagar, truck parking, loading and unloading, repairing workshops, etc. are concentrated along the roads creating congestion and pollution;
- Absence of rail connectivity, puts huge pressure on road infrastructure;
- Projects like bypass and ring road will directly save time, energy and reduce pollution particularly within the dense built- up inhabited area of the city.

V. OBJECTIVES

- 1) To Plan future as per traffic study.
- 2) To highlight peak hours of traffic load.
- 3) To find types of transportation vehicles and there density in peak hours.
- 4) To find Incoming and outward vehicles from all entrances of Ring Road.
- 5) To develop prediction model of vehicle movements.
- 6) The analysis and the outcome will substantially replicate the traffic behavior on Ring Road.

VI. METHODOLOGY

Various parameters such as peak hour traffic volume, traffic composition, average speed of vehicles, signal timings, coordination or lack of it, delays, fuel consumption from the vehicle etc., will be considered.

The Experts recommend the factors for accurate and comprehensive congestion evaluation follow as:

- Evaluate the performance of the transport system based on general accessibility (the general ability of people to obtain the desired services and activities)
- Recognize changes in travel time values, And therefore the efficiency gains provided by policies, that favor higher value trips over lower-value trips.
- Recognize that congestion tends to maintain a self-limited balance: it increases to the point that delays limit further peak-period vehicle travel.
- when evaluating roadway expansions thus the account for generated and induced vehicle travel (additional vehicle travel resulting from reduced congestion) when evaluating roadway expansions.

A. Data Collection

1) Vehicle Type Wise O-D Survey for Peak Hrs

Survey is performed for 9 days in continue. First day survey data is presented in below table:

Sr. No.	Origin	Destination	Vehicle Type	Peak Hours Vehicle Flow
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1	Chittorgarh - Bhusawal Highway	Barwani - Khargone Highway	Car / 3 Wheeler	189
			Bus	8
			LCV / Trolley	423
		Indore - Khargone Highway	MCV	176
			Car / 3 Wheeler	173
			Bus	6
		Khandwa - Khargone Highway	LCV / Trolley	397
			MCV	167
			Car / 3 Wheeler	169
2	Barwani - Khargone Highway	Chittorgarh - Bhusawal Highway	Bus	9
			LCV / Trolley	448
			MCV	137
		Indore - Khargone Highway	Car / 3 Wheeler	197
			Bus	5
			LCV / Trolley	386
		Khandwa - Khargone Highway	MCV	164
			Car / 3 Wheeler	184
			Bus	7
Chittorgarh - Bhusawal Highway	LCV / Trolley	464		
	MCV	185		
	Car / 3 Wheeler	176		
3	Indore - Khargone Highway	Barwani - Khargone Highway	Bus	9
			LCV / Trolley	408
			MCV	174
		Chittorgarh - Bhusawal Highway	Car / 3 Wheeler	209
			Bus	7
			LCV / Trolley	394
		Khandwa - Khargone Highway	MCV	143
			Car / 3 Wheeler	202
			Bus	6
Chittorgarh - Bhusawal Highway	LCV / Trolley	437		
	MCV	174		
	Car / 3 Wheeler	167		
Khandwa - Khargone Highway	Bus	8		
	LCV / Trolley	447		
	MCV	146		
4	Khandwa - Khargone Highway	Indore - Khargone Highway	Car / 3 Wheeler	173
			Bus	5
			LCV / Trolley	418
		Barwani - Khargone Highway	MCV	127
			Car / 3 Wheeler	188
			Bus	6
		Chittorgarh - Bhusawal Highway	LCV / Trolley	428
			MCV	164
			Car / 3 Wheeler	160
Chittorgarh - Bhusawal Highway	Bus	7		
	LCV / Trolley	432		
	MCV	137		

Table 1:

2) Total Trips Purpose Wise for Peak Hours

Sr. No	Origine	Destination	Work	Business	Education	Social	Goods	Total Trip Junction Wise
1	Chittorgarh - Bhusawal Highway	Barwani - Khargone Highway	20	26	11	62	147	266
		Indore - Khargone Highway	16	28	13	59	132	248

		Khandwa - Khargone Highway	22	15	7	49	161	254
2	Barwani - Khargone Highway	Chittorgarh - Bhusawal Highway	11	14	5	68	154	252
		Indore - Khargone Highway	15	13	11	83	159	281
		Khandwa - Khargone Highway	36	29	10	51	129	255
3	Indore - Khargone Highway	Chittorgarh - Bhusawal Highway	38	21	17	60	138	274
		Khandwa - Khargone Highway	30	24	14	53	135	256
		Barwani - Khargone Highway	19	36	8	40	148	251
4	Khandwa - Khargone Highway	Chittorgarh - Bhusawal Highway	27	30	4	44	141	246
		Barwani - Khargone Highway	15	21	7	63	157	263
		Indore - Khargone Highway	22	26	11	51	132	242
		Total Trip Purpose Wise	271	283	118	683	1733	3088

Table 2:

B. Data Analysis

1) Correlation Regression Analysis for Peak Hours

Y = Number of Trips

X_i = Income growth

2) Business Purpose

X_p = Population growth

X_v = Vehicle growth

a = $\sum Y/n$

b = $\sum xY / \sum x^2$

n = Number of years

Year	Y Trip	X Income growth	X	x2	xY
2008	122.0015574	2354.4479488	-1018.1019316	1036531.5432136	-124210.0212065
2009	133.9577100	2575.7660559	-796.7838245	634864.4629199	-106735.3364704
2010	147.0855656	2817.8880652	-554.6618152	307649.7292421	-81582.7467798
2011	161.4999510	3082.7695433	-289.7803371	83972.6437539	-46799.5102315
2012	177.3269462	3372.5498804	0.0000000	0.0000000	0.0000000
2013	194.7049869	3689.5695692	317.0196888	100501.4830598	61725.3143461
2014	213.7860756	4036.3891087	663.8392283	440682.5209741	141919.5834483
2015	234.7371110	4415.8096849	1043.2598045	1088391.0196260	244891.7925500
2016	257.7413479	4830.8957952	1458.3459148	2126772.8073575	375876.0418054
2017	283.0000000	5285.0000000	1912.4501196	3657465.4599674	541223.3838475
	1926	36461.0856515	2735.5868476	9476831.6701143	1006308.5013091
	a=	192.5841251			395.6598872
	b=	0.106186174			

Table 3: Income Growth vs Business Trip Generation Peak Hrs

Year	Y Trip	X Population growth	X	x2	xY
2008	122.0015574	198136.1422166	-18697.4577834	349594927.5629510	-2281118.9681583
2009	133.9577100	202653.6462591	-14179.9537409	201071088.0936910	-1899514.1306928
2010	147.0855656	207274.1493938	-9559.4506062	91383095.8919775	-1406057.1987905
2011	161.4999510	212000.0000000	-4833.6000000	23363688.9599998	-780626.1630460
2012	177.3269462	216833.6000000	0.0000000	0.0000000	0.0000000
2013	194.7049869	221777.4060800	4943.8060800	24441218.5566448	962583.6980354
2014	213.7860756	226833.9309386	10000.3309386	100006618.8819990	2137931.5062158
2015	234.7371110	232005.7445640	15172.1445640	230193970.6716610	3561465.3830105
2016	257.7413479	237295.4755401	20461.8755401	418688350.6179010	5273871.3823715
2017	283.0000000	242705.8123824	25872.2123824	669371373.5599200	7321836.1042187
	1925.8412515	2197515.9073746	29179.9073746	2108114332.7967500	12890371.6131644

a=	192.5841251		350.7835296
b=	0.0061146		

Table 4: Population vs Business Trip Generation Peak Hrs

Year	Y Trip	X Vehical growth	X	x2	xY
2008	122.0015574	47574.4421110	-22003.3437643	484147136.8081870	-2684442.2062584
2009	133.9577100	52317.6139895	-17260.1718858	297913533.5271550	-2312133.0996106
2010	147.0855656	57533.6801042	-12044.1057710	145060483.8241270	-1771514.1089202
2011	161.4999510	63269.7880106	-6307.9978647	39790837.0605066	-1018741.3459096
2012	177.3269462	69577.7858752	0.0000000	0.0000000	0.0000000
2013	194.7049869	76514.6911270	6936.9052518	48120654.4719285	1350650.0461609
2014	213.7860756	84143.2058324	14565.4199571	212151458.5274290	3113883.9723127
2015	234.7371110	92532.2834539	22954.4975786	526908959.0865620	5388272.4466305
2016	257.7413479	101757.7521142	32179.9662390	1035550227.1408200	8294107.8739769
2017	283.0000000	111903.0000000	42325.2141248	1791423750.7059700	11978035.5973044
Total	1925.8412515	757124.2426180	61346.3838655	4581067041.1526900	22338119.1756865
a=	192.5841251			Y = a + bx	398.9695958
b=	0.0048762				

Table 5: Vehicle growth vs business trip generation Peak Hrs

Similarly income growth, population and vehicle growth is tabulated with education trip, goods trip, social trip and work trip.

3) Trip Distribution Models

Trip Distribution Models Helps in the Separating the Number of Trips in Region or Zone wise Distribution of Total Number of Trips in Particular Region or Purpose. For a Zone the total Number of Trips Is generated by Trip generation Models but the percentage of Number of Trips in Different Purposes will identified with the trip Distribution Models. In General there are two technique First One is Growth factor Method and second is Synthetic Methods. Trip distribution models will

give the details of Percentage of Number of Trips in Particular purpose. Growth Factor Method are based on the assumption that the present travel pattern can be projected to the Design year in the future by using certain expansion factors. This can be represented by Formula:

$$T_{i,j} = t_{i,j} \times E$$

Where,

$T_{i,j}$ = Design year, Number of Trips from Zone i To Zone j.
 $t_{i,j}$ = Observed Base year , Number of Trips From Zone i To Zone j.

E = Growth Factor.

Trip Distribution Purpose Wise

	Barwani – Khargone	Indore - Khargone	Khandwa - Khargone	Chittorgarh - Bhusawal	t
Chittorgarh – Bhusawal	20	16	22	0	58
Barwani – Khargone	0	15	36	11	62
Indore - Khargone	19	0	30	38	87
Khandwa – Khargone	15	22	0	27	64
	54	53	88	76	271
E=		61.391			

Table 6: Present Trip Work Purpose Wise

	Barwani - Khargone	Indore – Khargone	Khandwa - Khargone	Chittorgarh - Bhusawal	T
Chittorgarh - Bhusawal	1174.809584	939.847667	1292.290542	0	3406.948
Barwani - Khargone	0	881.1071878	2114.657251	646.1452711	3641.91
Indore - Khargone	1116.069105	0	1762.214376	2232.138209	5110.422
Khandwa - Khargone	881.1071878	881.1071878	0	1585.992938	3348.207
	3171.985876	2702.062043	5169.162169	4464.276418	15507.49

Table 7: Year 2045 Trip Work Purpose Wise

	Barwani - Khargone	Indore - Khargone	Khandwa - Khargone	Chittorgarh - Bhusawal	T
Chittorgarh – Bhusawal	26	28	15	0	69
Barwani – Khargone	0	13	29	14	56
Indore – Khargone	36	0	24	21	81
Khandwa - Khargone	21	26	0	30	77
	83	67	68	65	283
E=		58.787			

Table 8: Present Trip Business Purpose Wise

	Barwani - Khargone	Indore - Khargone	Khandwa - Khargone	Chittorgarh - Bhusawal	T
Chittorgarh - Bhusawal	1528.486	1646.062	881.8188	0	4056.366
Barwani - Khargone	0	764.243	1704.85	823.0309	3292.123
Indore - Khargone	2116.365	0	1410.91	1234.546	4761.821
Khandwa - Khargone	1234.546	1234.546	0	1763.638	4232.73
	4879.397	3644.851	3997.579	3821.215	16343.04

Table 9: Year 2045 Trip Business Purpose Wise

	Barwani - Khargone	Indore - Khargone	Khandwa - Khargone	Chittorgarh - Bhusawal	t
Chittorgarh - Bhusawal	11	13	7	0	31
Barwani - Khargone	0	11	10	5	26
Indore - Khargone	8	0	14	17	39
Khandwa - Khargone	7	11	0	4	22
	26	35	31	26	118
	E=	140.99			

Table 10: Present Trip Education Purpose Wise

	Barwani - Khargone	Indore - Khargone	Khandwa - Khargone	Chittorgarh - Bhusawal	T
Chittorgarh - Bhusawal	645.9305	763.3724	411.0467	0	1820.349
Barwani - Khargone	0	645.9305	587.2095	293.6048	1526.745
Indore - Khargone	469.7676	0	822.0933	998.2562	2290.117
Khandwa - Khargone	411.0467	411.0467	0	234.8838	1056.977
	1526.745	1820.349	1820.349	1526.745	6694.188

Table 11: Year 2045 Trip Education Purpose Wise

	Barwani - Khargone	Indore - Khargone	Khandwa - Khargone	Chittorgarh - Bhusawal	t
Chittorgarh - Bhusawal	62	59	49	0	170
Barwani - Khargone	0	83	51	68	202
Indore - Khargone	40	0	53	60	153
Khandwa - Khargone	63	51	0	44	158
	165	193	153	172	683
	E=	24.358			

Table 12: Present Trip Social Purpose Wise

	Barwani - Khargone	Indore - Khargone	Khandwa - Khargone	Chittorgarh - Bhusawal	T
Chittorgarh - Bhusawal	3644.115	3467.787	2880.026	0	9991.928
Barwani - Khargone	0	4878.412	2997.578	3996.771	11872.76
Indore - Khargone	2351.042	0	3115.131	3526.563	8992.735
Khandwa - Khargone	3702.891	3702.891	0	2586.146	9991.928
	9698.048	12049.09	8992.735	10109.48	40849.35

Table 13: Year 2045 Trip Social Purpose Wise

	Barwani - Khargone	Indore - Khargone	Khandwa - Khargone	Chittorgarh - Bhusawal	t
Chittorgarh - Bhusawal	147	132	161	0	440
Barwani - Khargone	0	159	129	154	442
Indore - Khargone	148	0	135	138	421
Khandwa - Khargone	157	132	0	141	430
	452	423	425	433	1733
	E=	9.60			

Table 14: Present Trip Goods Purpose Wise

	Barwani - Khargone	Indore - Khargone	Khandwa - Khargone	Chittorgarh - Bhusawal	T

Chittorgarh - Bhusawal	8296.882	7450.262	9087.062	0	24834.21
Barwani - Khargone	0	8974.179	7280.938	8691.972	24947.09
Indore - Khargone	8353.324	0	7619.586	7788.91	23761.82
Khandwa - Khargone	8861.296	8861.296	0	7958.234	25680.83
	25511.5	25285.74	23987.59	24439.12	99223.94

Table 15: Year 2045 Trip Goods Purpose Wise

C. Pie Chart Presentation of Present & Future Trips Purpose Wise

capacity to bypass the traffic without affecting city traffic and avoiding congestions.

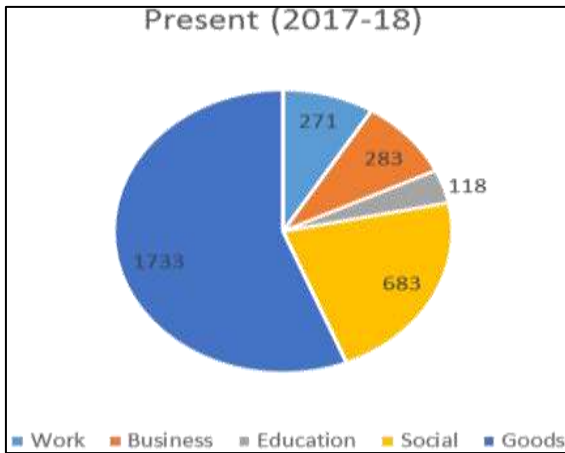


Fig. 1:

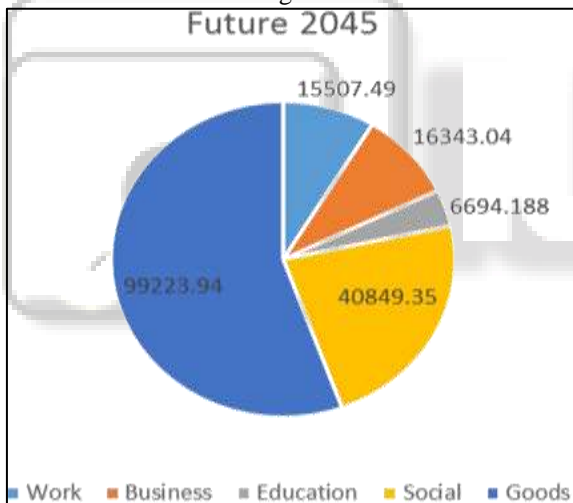


Fig. 2:

VII. CONCLUSION

The study is performed to analyze the future load of vehicles passing through Khargone, Madhyapradesh. The problem is to notice and analyze present traffic load and to calculate the increasing traffic load due to various reasons like population, business, works, goods and social purposes. It is found that in present state the traffic congestion is reached to upper tolerance limit. In next couple of years in the absence of ring road or a bypass the traffic will jam for hours and will cost high to transport and maintain the business and public convenience. The forecasting for 2045 in present study concluded that there is scope of growth as per trend for all purposes and the city is growing towards a hub for number of sectors. It is recommended to immediately plan and implement construction of ring road with well enough

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