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Travel Behaviour Analysis of Colony Roads For RTS-B Ramagundam

Annapragada Raghava Lakshmi Rajeswari
M.Tech scholar,
Nalanda Institute Of Engineering And Technology

T.Ramprasanna Reddy
Assistant Professor, Nalanda Institute Of Engineering And Technology

ABSTRACT

In India Power Generation sector is experiencing tremendous growth with the increase in both development and environmental deterioration. Development is taking place in income levels, living standards in all respects of socio economic characteristics. Consequently this leads to increases in the demand for new transportation facilities as well as upgrading of the existing facilities.

Keeping this in view an attempt is now made in the present study to estimate demand for transportation facilities for an area where the power generation sector is expanded. Assuming that the system will have an effective influence only within the premises of colony and industrial area, new zoning scheme has been proposed to identify the travel characteristics among the study area. The traffic volume count has been carried out to know the trips which are going from internal to external at central office and at entrance and exit of the area. The home interview survey was carried out to develop the origin and destination matrix of the trips carried out by the residents of the study area. Travel demand model has been developed using the O-D matrix and is calibrated in which Gravity model is used to develop future traffic O-D matrix. Model validation and sufficiency of lane width is done by loading the traffic volumes of present and forecasted on to the network. Improvements in transportation facilities like design of Mini round about providing of parking spaces in the industries premises are proposed.

1. INTRODUCTION

Transportation plays an important role in the political, economic and social development of any society. As a society grows in terms of population and functions, the need for various components also grows thereby requiring quality and effective transportation systems. In the words of there is no escape from transport even in the most remote and least developed of inhabited regions. It is also opined that "there seems to be no other types of development which can effect so speedily a change in the economic and social conditions of backward nations except transport".

DEVELOPMENT OF POWER GENERATION SECTOR IN INDIA

Power, being considered as an engine of growth, has always been a focus area for most of the developing countries, including India. The power generation in India has increased from 1362 MW in 1947 to 1, 20,000 MW during 2004-05 and at present total installed capacity is 2,28,722MW and planned to increase 3,00,000 MW by 2017. Global Coal reserves are expected to last another 200 years. India also has a vast coal reserve of 211 billion tones making coal one of the most extensively used fossil fuel for generating power. Hence there is a rapid growth in areas surrounding areas with an increase in power generations.

TSGENCO

Telangana Power Generation Corporation (TSGENCO) is the third largest power utility in the country and it is the largest power generating company of T.G. State with installed capacity of 4365.3 MW comprising 2282.5 MW Thermal, 2081.80MW Hydel and 1 MW from Renewable Energy Sources.

In view of proposed projects like Lift Irrigation and Drinking water supply schemes by T.G. government. To meet the needs of demand as a part of it Ramagundam thermal power station with installed capacity of 62.5MW which is increased to 500 MW.

DEMAND FOR TRANSPORTATION FACILITIES

The demand for transportation is known as a "derived demand". This demand is derived from economic activity that is the result of peoples' requirements to

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earn a living, enjoy leisure activities, and consume goods and services. The production, supply, and distribution of goods and services create the demand for freight movements. Thus, the social, demographic, and economic factors that create the demand for transportation will also determine the type of transportation system that will be necessary in the future. This means that these factors must be considered when developing transportation plans. Some of the major social, demographic, and economic trends that will affect transportation demand and, therefore, future transportation system needs are presented in subsequent chapters.

NEED FOR THE STUDY

By the growth of the industries, urbanization takes place with an increase in demand for transportation facilities especially the road network. To arrive at a better picture for decision making for selection among various transportation alternatives in systems, there is a need to quantify benefits and costs. Travel demand estimation is must for future traffic distribution. This can be used for design of improvements and view its viability. The case study of the existing road network with the proposed improvements gives a better picture about the future road network condition and can view its viability.

OBJECTIVES OF THE STUDY

The present dissertation work is taken up with the following objectives:

1. To review literature on travel demand estimation so as to select appropriate methodology.
2. To evolve a methodology for traffic demand estimation with minimum primary needs.
3. To propose rotary at the junctions and provide parking spaces in the industries.

2. LITERATURE REVIEW

Watton H.J and Pick G.W (1967)[2] developed category analysis or cross classification technique which is based on determining the average response or average value of dependent variable for certain defined categories of independent variables. A multi-dimensional matrix defines categories, each dimension in the matrix representing one independent variable. Since the data is directly taken from census, it saves considerable effort, time and money spent on home interview survey. But it cannot test the statistical significance, cannot add new variables and the assumption of income and car ownership changes in future.

T.J Fratar (1954) , K.P. Furness (1965)[3] proposed some of the growth factor methods which are based on assumption that present travel pattern can be projected to the design year in future by using certain expansion factors. Whereas synthetic models utilise the existing data to discern a relationship between trip making, resistance to travel between zones and relative attractiveness of zone for travel.

Voorhees A.M (1955)4 proposed gravity model which assumes the interchange of trips between zones in an area is dependent upon the relative attraction between zones and and indirectly proportional to some decreasing function of the cost (in time, distance or monetary terms) of travelling between them. This decreasing function is usually called the impedance function of the model.

Low (1972) has used gravity formulation approach in which it is assumed that a gravity model is capable of explaining most of the travel behaviour in the study area. Traffic counts are then used to calibrate the parameters of such model. Largest number of practical applications is reported under this category. Both linear and non-linear models are reported with proportional and capacity restraint for traffic assignment under this technique.

Gur et al (1978)14 has attempted to overcome the problem on non-uniqueness of the Nguyen's approach by setting out a target matrix. Kurth et al (1979)15 report the development of computer program called SMALAD for predicting trip tables for small areas based on access and land development travel functions.

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MARWAH et al. (2000)18 attempted to provide a level of service classification for a Kanpur metropolis under heterogeneous traffic conditions. A traffic simulation model, which can replicate the movement of heterogeneous traffic, has been developed to analyze the various environmental conditions of the road system. Traffic studies have been conducted on different roads of Kanpur metropolis. The operating characteristics considered to define the LOS are: journey speeds of cars and motorized two-wheelers; concentration; and road occupancy. Based on the simulation results of benchmark road and traffic composition, levels of service are classified into the four groups (LOS I, II, III, and IV). LOS classification evolved in this study will be helpful to identify deficiencies of an urban road system and to plan for alternative improvement measures to attain a desired level of service.

3. METHODOLOGY

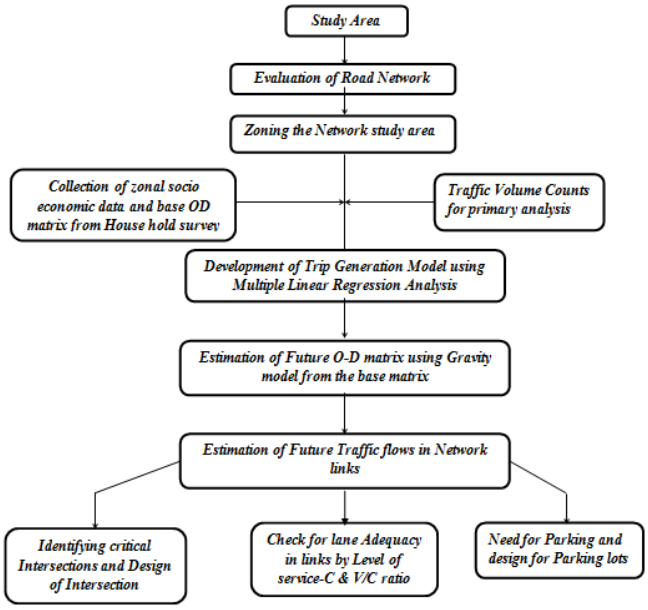

Fig : Study Methodology

DEVELOPMENT OF TRIP GENERATION MODEL

This is the first of sub models in the study process which predicts the number of trips starting and finishing in each zone. The objective of trip generation stage is to understand the reasons behind the trip making behaviour and to produce mathematical relationships to synthesise the trip making pattern on the basis of observed trips, land use data and household characteristics.

ESTIMATION OF FUTURE OD-MATRIX

After having obtained an estimate of the trips generated from and attracted to the various zones, it is necessary to determine the direction of travel. Trip distribution stage determines number of trips from each zone to zone. As mentioned earlier for the purpose of present study, synthetic or inter area travel formulae methodology has been adopted i.e. gravity model.

TRAFFIC ASSIGNMENT USING ALL - OR - NOTHING ASSIGNMENT

This is the simplest technique and is based on the premise that the route followed by the traffic is the one having the least travel resistances. Here the parameters like the travel time, travel distance and type of pavement is taken in to the consideration. The procedure commonly employed in assignment studies is the Moore's Algorithm, basic principle is based on the shortest path considering all the parameters.

LANE CAPACITIES AND ESTIMATION OF LEVEL OF SERVICE

In analysis, based on the Road condition, level of service – C has been adopted, Level of service – C is defined as zone of stable flow but speeds and manoeuvrability are more closely controlled by higher volumes. Most of the drivers restricted in the freedom to select their own speeds, lane changing or overtaking manoeuvers. A relatively satisfactorily operating speed is still obtained with service volumes perhaps suitable for urban design practice

INTERSECTIONS AND DESIGN OF ROTARY

An intersection is defined as the area where two or more roadways join or cross. The importance of design of the intersection stems from the fact that efficiency of operation, safety, speed, cost of operation and capacity are directly governed by the design.

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4. DATA COLLECTION AND PRELIMNARY ANALYSIS

DESCRIPTION OF THE STUDY AREA

The Present study is done in Ramagundam B Super Thermal Power Plant colonies, which is located at Ramagundam in Telangana. The power plant is one of the coal based power plants of TSGENCO with an installed capacity of 62.5 MW (single unit). The plant was established in the year of 1971. Now the surrounding Rural population is settled in and around the colony premises.

Due to availability of land, water resources and fuel material (Coal) in the near vicinity TSGENCO has proposed for extension of power plant from an installed capacity of 62.5 MW to 500 MW within the next two years. However the existing road network and transportation facilities are designed in 1970 modified and developed in the 1990's. Hence the present area is being selected for study purpose. The present study area is as shown in the figure 4.1

ZONING THE STUDY AREA

The entire region of Ramagundam TSGENCO power plant and the surrounding area is sub divided in to seven zones based on the land use characterises. These zones are as shown in the figure 4.1

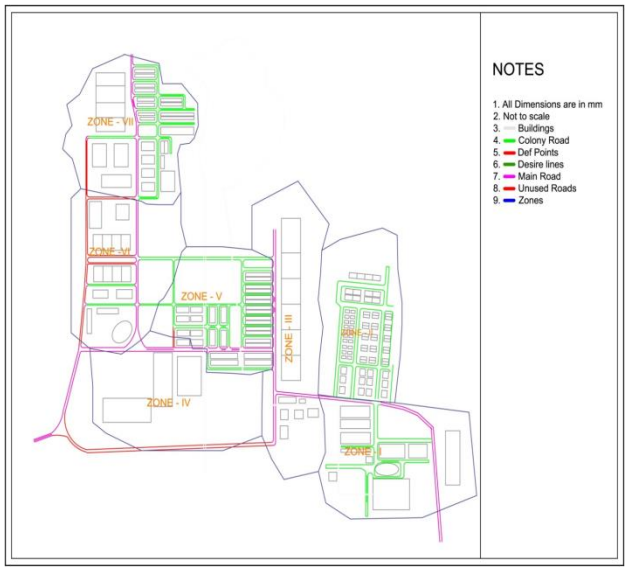

Figure 4.1 Study area indicating zones and road Network

Study area Analysis

Two approaches can be used to study a corridor. First one is based on developing OD matrix on a regional basis. Second one is to develop a new OD matrix on the specific problem to be solved. If an OD matrix is already available for a region, a proportioning process can be easily used to develop trips between smaller analysis zones in the corridor study. Another alternative procedure is to develop a completely new trip distribution employing revised set of analysis zones. As the OD matrix and actual travel patterns are analysed for the year i.e.2015 and 2021.

The surveys conducted for the present study are

1. Traffic volume count for Preliminary Analysis of Data
2. Home Interview Survey

Table 4.2 Equivalent PCU value factors by Vehicle type

Vehicle type	Equivalent PCU value
Bus	3
Mini bus/van	1.5
Car	1
2 Wheeler	0.5
Auto Rickshaw	1
2 Axle Truck	3
3 Axle Truck	4.5
MAV	4.5
LCV	1.5
Tractor	4.5
Cycles	0.5
Hand/Animal drawn carts	4

Table 4.3 Total traffic volume count for 16 Hours.

	Traffic Volume (16 Hours) (vehicles/day)			Traffic Volume (16 Hours) (PCU/day)		
Location	External to internal	Internal to external	Total Volume	External to internal	Internal to external	Total Volume
Entrance near plant	5130	5879	11009	5194	5747	10941
Central office	6547	6634	13181	6103	5812	11915
Exit from study zone	7976	8226	15709	7573	7403	14476

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Preparation of Questionnaire

The questionnaire has been prepared to meet the data requirements of the study. The main aspect of this survey was to identify the personal trips. The questions are very useful for obtaining information about travel origination and destination. The purpose of the trip and all other socio economic characteristics are included in the questionnaire.

Table 4.4 Primary analysis of Home Interview Surveys

Classification based on purpose of trip

Work trips	56.2 %
Education trips	21.6 %
Business trips	12.4 %
Recreational trips	7.7 %
Others	2.7%

Classification based on Income Groups

< 10,000	4%
10,000 – 25,000	35%
25000 – 50,000	56%
>50,000	5%

The base year persons trip O-D matrices is obtained from this Home interview survey and it is divided by the average vehicle occupancy factor of 1.2 to obtain the Passenger Car units O-D matrices. The base year O-D matrix is shown as below.

Table 4.5 Base O-D Matrix from Home Interview Surveys

O/D	1	2	3	4	5	6	7	P_i
1	0	1329	569	759	524	176	154	**3510**
2	1501	0	111	165	63	25	62	**1927**
3	578	100	0	1423	438	126	2	**2667**
4	718	139	1327	0	2083	790	323	**5379**
5	462	49	380	1936	0	312	128	**3267**
6	169	21	120	805	342	0	303	**1761**
7	173	20	95	384	163	354	0	**972**
A_j	**3601**	**1658**	**2602**	**5472**	**3613**	**1782**	**972**	

5. ESTIMATION OF FUTURE TRAFFIC DEMAND

TRIP GENERATION

This is the first of sub models in the study process which predicts the number of trips starting and finishing in each zone. Multiple linear Regression analysis is a well-known statistical technique for fitting mathematical relationships between dependent and independent variables. Since this technique exploited fruitfully in many of the transportation studies, this method is used in the present study.

TRIP DISTRIBUTION

After having obtained an estimate of the trips generated from and attracted to the various zones, it is necessary to determine the direction of travel. Trip distribution stage determines number of trips from each zone to zone. The output of trip generation model is used as input for trip distribution model.

MODEL VALIDATION BY TRAFFIC ASSIGNMENT FOR O-D MATRIX 2015

To validate the matrices, the combined O-D matrix of all person trips is loaded on to the base year network using user All or nothing approach. While assigning the O-D

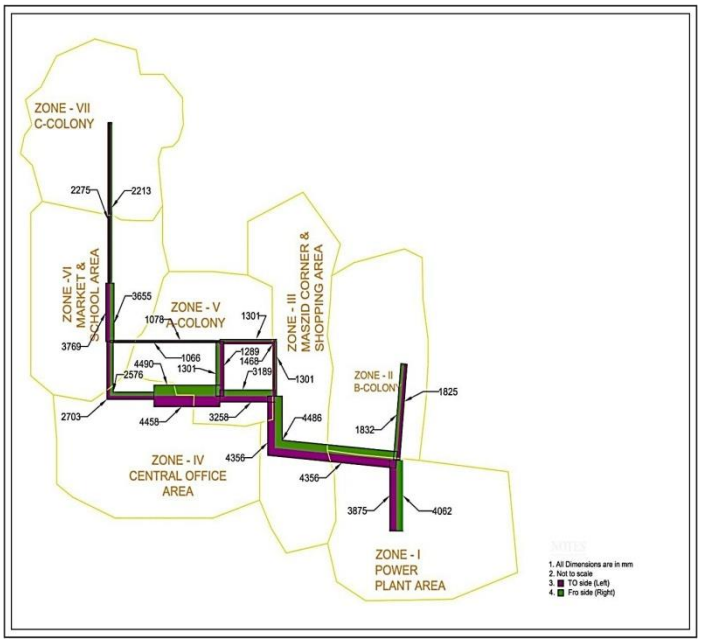

Figure: 5.1 Traffic volumes for the year 2015

flows, the capacity of links is used in terms of passengers per hour per direction (pphpd), which can

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be obtained by multiplying the capacity of each link in PCU per hour by the average car occupancy rate. The Map showing the traffic flow in the link with varying line thickness is as shown in the figure 5.1

5 TRAFFIC ASSIGNMENT FOR O-D MATRIX 2021:

Similar to the above traffic assignment, the combined O-D matrix of all person trips is loaded on to the base year network using user All or nothing approach. While

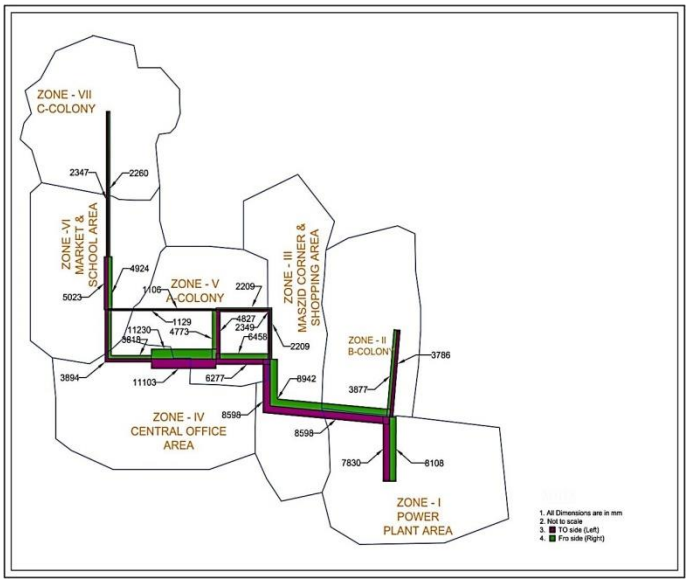

Figure: 5.2 Traffic volumes for the year 2021

assigning the O-D flows, the capacity of links is used in terms of passengers per hour per direction (pphpd), which can be obtained by multiplying the capacity of each link in PCU per hour by the average car occupancy rate. The Map showing the traffic flow in the link with varying line thickness is as shown in the figure 5.2

DESIGN OF MINI ROUNDABOUT

The future forecasted volumes are assigned on the junction and are as shown in the figure. As the pear Hour may be assumed as 8 to 10% of the day volume, we obtained the following values. These are more than 500 pcu/hr, Design of rotary is suggested.

As per the space constrain in the study area mini round about is selected as mentioned in section 3.2, diameter is one third the hypothetical circle inscribed in the area. The circle inscribed is of 14 meters

Therefore, diameter of mini round about = 14 x 1/3 = 4.6 meters

Practical capacity = sum of all capacities in all the directions

= 188+688+175+715+502+517 pcu/hour

= 2335 Pcu/ hour.

The proposed and designed road is of two lane, as per the standard conditions and as mentioned in section 3.7, the two lane road is tapered to 4 lane at the entrance and again from four lane to three lane and then to two lane in a distance of 100 meters.

As the junction is a 3 way junction, K = 80

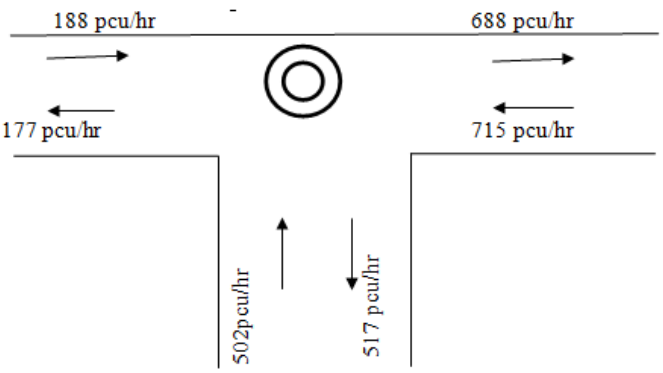

Figure: 5.3 three way intersection with the capacities.

Hence capacity,

$$q = K (\sum w + a^{1/2})$$

$\sum w$ = sum of the basic road width used by traffic in both the directions to and from the intersections, in meters.

= 7+7+7 =21 M

a = area of junction widening, i.e. the area within the intersection outline which lies outside the area of basic cross-roads in sq.m.

a = (0.5 x 100 x 7) x 2 …….. (Both the sides)

= 700 sq.m.

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Now,

q = 80 x (21 + √700) = 3796.60 Pcu/hour

Practical capacity = 80% of estimated Capacity

= 3796.60 x 0.8 = 3037. 28 Pcu/ hour.

Therefore, 2335 ≤ 3037 Pcu/hour

Hence safe.

DESIGN OF PARKING LOTS

Parking space is provided in zone 1 i.e. in power plant area for the future trips. Based on the IRC specifications the space provided for community car parking is 2.5mX5m. For two wheeler a stall of 0.8 m x 2.5 m is provided. Parking area required per bicycle is 1.4 to 1.8 sq.m

As per the standard specification provided in the table 5.8, for the built up area in the industries premises the parking spaces are calculated.

Table 5.8 Indicative values of Parking space standards as per the land use.

S.No.	Land use	parking Space Standard
1	Industrial Premises	One space for up to 200 sq. of initial floor area. Additional spaces at the rate of one for every subsequent 200 sq. of fraction there of

Industrial premises area in the power plant = 541 m x 142m = 75740 sqm

Therefore,

No. of spaces requires = 75740/200 = 378.7 or say 380 parking lots.

As per the past studies and the Employment and vehicle owner ship details collected for the Ramagundam Thermal power plant TSGENCO, only 7 % of the employees are using four wheelers, so car parking spaces to be provided are

= 380x0.07 = 26.6 or say 28 spaces.

Typical layout of parking areas with 31 cars is shown below in the figure 5.4

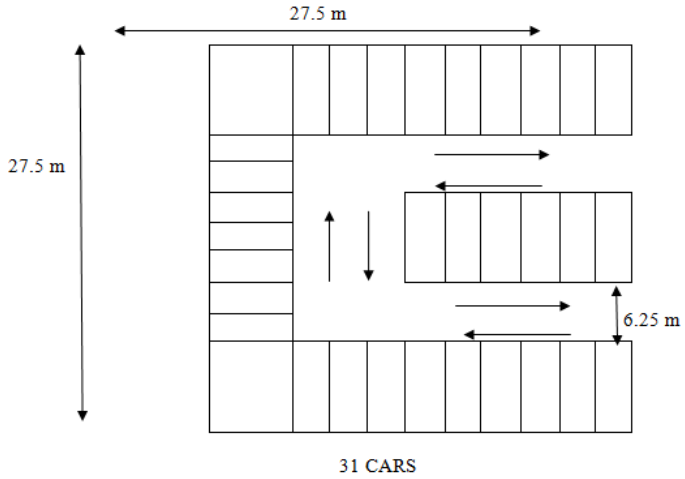

Figure: 5.4 Typical layout showing parking space with 31 cars

SUMMARY

Due to the tremendous growth of vehicle population, the limited lane width, right of way, congestion, inadequate facilities at intersections, parking are the problems to be faced in the near future. To solve all above problems there is a need to develop improvements in the transportation system. In order to plan such system, it is necessary to establish the demand for the transportation System.

The estimation of travel demand for the colony, methodology is proposed. As per proposed methodology, the data collection through preliminary surveys was carried out through traffic volume counts from external to internal and internal to external at entrance and exit and central office of RTS-B Ramagundam and Home interview survey carried out to prepare the origin and destination matrix trips carried out by the residents of the study area. The model development for estimation of O-D matrix for future growth i.e. for 2021 is done and model validation is carried out for the year 2015. Capacity and Level of service for the lanes is estimated and Detailed design of the intersection i.e., mini roundabout and parking spaces required in power plant area are explained.

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6.CONCLUSIONS

Conclusions drawn from the present study are listed below:

1. From the present study of Ramagundam Thermal plant, it is observed to be a rapid growing industrial area which in turn raised the need to upgrade the existing transportation facilities.
2. From the estimated probability matrix for future 2021, one can conclude that the Traffic volume is increased. Are high and the existing system can hold the forecasted traffic hence new designs were proposed based on their capacity.
3. The Intersection is designed for mini roundabout of 4.6 m diameter with a designed capacity of 3797 Pcu/hour. And parking facilities are provided in the power plant area which requires 308 spaces.

LIMITATIONS OF THE STUDY

1. The following are the limitations of the present study:
2. The present study is limited to the internal area of the Ramagundam Thermal Power plant and analysed by isolation from the external area.
3. While developing Trip generation model only population and employment variables are considered due to lack of data. However other variables like vehicle ownership etc can be considered.

SCOPE OF THE FUTURE WORK

The present study can be further extended by incorporating the following aspects.

1. To estimate the travel demand from all the surrounding areas, there is a necessity to develop new transport demand models. Whereas the present study was carried out through based on internal zone criteria.
2. To predict the actual travel pattern on the existing road network, there is a necessity to consider diverted and generated traffic which will actually predict the decrease in volume and increase in speeds of traffic. Whereas the present study considered existing traffic.

7. REFERENCES

1. Abrahamsson, T., (1998). "Estimation of origin-destination matrices using traffic count. international institute for applied systems", *Austria*
2. Anil,A.,(2005)."Estimation of Passenger Travel Demand for Chennai*.",START 2005Conference proccedings, IITKharagpur,PP.646-652.*
3. AvishaiCeder, "New Urban Public Transportation Systems: Initiatives, Effectiveness, and Challenges*"J. Urban planning & development © asce / march 2004*
4. IRC: 106-1990, Guidelines for Capacity of Urban Roads in plain Areas (FirstRevision), Indian Road Congress, New Delhi, 1990.
5. IRC: SP:41-1994, Guidelines on Design of At-Grade Intersections in Rural &Urban Areas, Indian Road Congress, New Delhi, 1994.
6. IRC:65-1976, Recommended Practice for Traffic Rotaries, Indian Road Congress, New Delhi, 1976.
7. IRC: SP-12-1988,Tentative Recommendations on the provision of parking spaces for urban areas. Indian Road Congress, New Delhi,1988.
8. Marwah,B.H., and Buvanesh, S. (2000). "Level of Service Classification for Urban Heterogeneous Traffic: A Case Study of Kanpur Metropolis." *Presented at Transportation Research Circular E-C018: 4th International Symposium on Highway Capacity proceedings June 27–July 1, .Maui, Hawaii*.
9. Ramanayya, T.V. (1988). "Highway Capacity under Mixed Traffic Conditions." *Traffic Engineering and control, Vol. 29, No. 5, United Kingdom, pp 284-300*.
10. RajatRastogi, "Willingness to Shift to Walking or Bicycling to Access Suburban Rail: Case of Mumbai, India*",J.urban planning and development © asce / march 2010*

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

11. Ron Johnston,Charles Pattie, "Entropy-maximizing models (Ms. No. 426)" *Cambridge University Press*.
12. S. Afandizadehzargari** and M. Yadihamedani," Estimation of freight o-d matrix using waybill data and traffic counts in Iran roads", *Iranian Journal of Science &Technology, Transaction B, Engineering, Vol. 30, No. B1*