

**TRAFFIC STUDY ON ROAD NETWORK AND  
IDENTIFY TRANSPORT IMPROVEMENT PROJECTS  
REQUIRED IN SALEM**

**T. Subramani\***

**P.K.Kumaresan\*\***

---

**ABSTRACT**

Salem is the fifth largest city with a population of 7.54 lakhs (2011) in Tamil Nadu. Fast growth in population and vehicles in these centre have caused congestion in roads for movement of passengers and goods affecting economic development. Local Authorities faced with great difficulties to identify required various road improvement projects. An efficient transportation network is the need of the present urban scenario to tackle the discussed problems. The identified road network selected for the study comprises 162 road links in Salem Corporation. Existing traffic condition, surface condition of carriageway, street lighting, footpath condition and drainage condition in the Salem Corporation area has been studied in detail. Traffic volume count survey was conducted on the identified 162 road links in Salem Corporation to identify the type of transport facilities required for the road links. In Salem Corporation area 44 road links required removal of onstreet parking and encroachment, 52 road links required widening of carriageway, 23 road links required traffic management measures with extrawidening to carry the existing traffic flow efficiently.

**Keywords:** Traffic Study, Road Network, Transport, Projects

---

\* Professor & Dean, Department of Civil Engineering, VMKV Engg. College, Vinayaka Missions University, Salem, India.

\*\* Professor & Dean, Examination, VMKV Engg. College, Vinayaka Missions University, Salem, India.

## 1. Introduction - Importance Of Transportation In Urban Development

Transportation contributes to the economic, industrial, social and cultural development of any country. It is well recognized that transport performs a key role in achieving fast economic growth of developing countries. Export and import, industry agriculture defence, social services (health, education), general administration, maintenance of law and order, exploitation of untapped resources, mobility of persons etc., are some of the many areas of activity which are very closely linked to the availability of adequate transportation. Growth of urban areas and nature extent of availability of various classes of labour force are influenced by the extent of development of transport facilities. This growth in term has a cause and effect impact on transport services. Since increase in urban population demands better transportation facilities and a services. It may be necessary in the case of a country of India's vastness to provide transportation facilities in anticipation of demand, so that the transportation acts as a catalytic agent in development of different sectors.

## 2. Problems Of Urban Transport

The problems of urban transport in India are stupendous and multidimensional and in the years to come the concentration of population in metrocentres is going to increase substantially. The population explosion and phenomenal increase in vehicular traffic coupled with spurt in commercial activities and other economic activities have placed heavy demands on the transportation system besides impeding mobility. But the urban transportation system as failed to keep paced with the growth in traffic demands.

Lack of co-ordination between land-use development land transportation planning intensifies the urban problems. As the traffic generated in an result of land-use potential and transport capacity, it is necessary to ensure an efficient balance between these tow. But the present urban scenario is entangled by the imbalance resulting from mismatching the landuse and transport components of system. This result in increased number of trips, increased journey time, travel cost and reduced accessibility.

Serious considerations are required to be given to the transportation problem of urban centres, since they are growing very fast in population, area and putting great pressure on the limited transport infrastructure facilities. An efficient transportation network is the need of the present urban scenario to tackle the discussed problems.

### 3. Objectives Of The Present Study

1. To examine the existing transport infrastructure facility like roads in the selected Salem urban centre.
2. To conduct Traffic volume survey on the selected 162 road links in Salem Corporation
3. To identify the required road improvement projects in the selected urban centre.
4. To identify the traffic congested road links in Salem Corporation.
5. To identify number of road links required removal of onstreet parking and encroachment,
6. To find the extrawidening required for the different road links to carry existing traffic volume.
7. To find the roads which require Traffic management measures with widening of carriageway.

### 4. Methodology

1. Summarize the findings and recommendations of various previous studies.
2. Identify and collect an relevant information required from local agencies such as demographic trends, map showing the existing land-use and growth trends, income and expenditure, road network details – physical condition, traffic information.
3. Critically evaluate the data to understand the overall conditions of existing infrastructural facilities in the Salem urban centre.
4. Conduct traffic volume survey on identified 162 road links.
5. Analysis the data to identify the magnitude and complexity of the problems.
6. Finally identify the type of road improvement projects required to meet the existing traffic.

### 5. Study Of Past And Present Conditions In Salem City

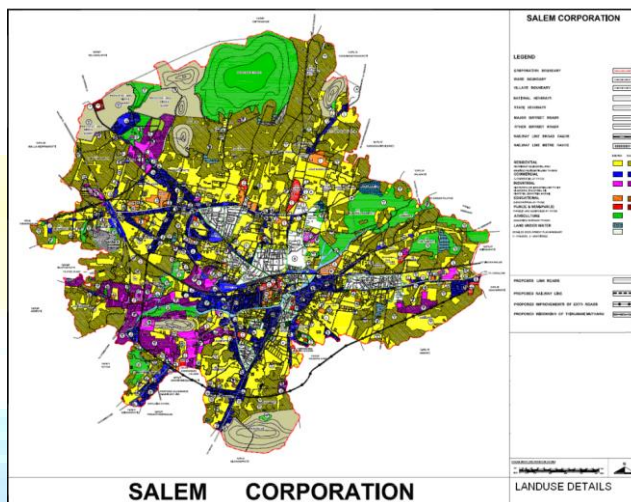
#### 5.1 Salem – General

Salem is the fifth largest city in Tamil Nadu over an area of 91.34 Sq.kms. Salem city is located at distance of 350 kms from a Chennai on the west, and 160 kms from Coimbatore and it got the fifth largest population of 7.54 lakhs as per 2011 census in Tamil Nadu.. It is situated at the trijunction of Bangalore, Trichirappalli and Chennai roads. The City is located at 11 40' North and 78 10' on the East. The general topography is plain The city is surrounded by the hills viz. the shervarous and Nagarmalai on the North, The Kanjamalai on the west, the Goodamalai on the East.

### 5.2 Population Growth

The population in Salem has grown at a rate of 23 percent per decade between 1951 and 1971, the rate has been lower for the decade 1971 – 1981 at 17 percent and 14 percent per decade between 1991 and 2011.

### 5.3 Existing Land-Use Structures

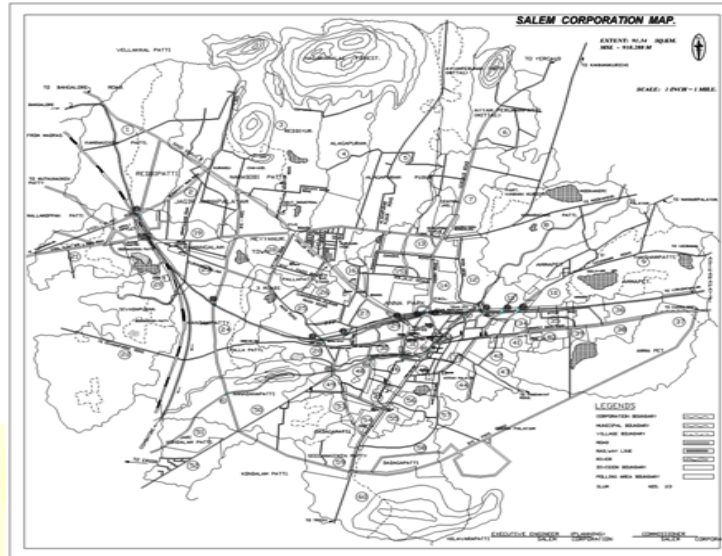


**Figure.1. Existing land-use details of salem city corporation**

The extent of Salem town is 91.34 Sq.km of this the developed area is 4648 Hectares i.e. 48.71 percent of the total area and undeveloped area is 4894 hectares i.e. 51.29 per cent of the total area. Figure. 1. is showing the existing land use details of Salem City Corporation area.

## 6. Identified Road Network For The Present Study

Salem district as a whole has only 10,133.7 km. of road, out of which 214.6 km are cement concrete roads, 5098.1 kms. are bituminous surfaced road and the remaining 4821 kms. are water Bound Macadam roads. The unsurfaced road of 2352.7 kms. also exist in the district. Salem Corporation a has about 748.13kms. of surfaced roads under its control and maintenance as detailed below. The width of road ranges from 3.5 m to 14.0m in the major road network excluding the lanes and small roads. Identified road network of salem city corporation selected for the study is shown in Figure.2. .



**Figure.2. Identified road network of salem city corporation**

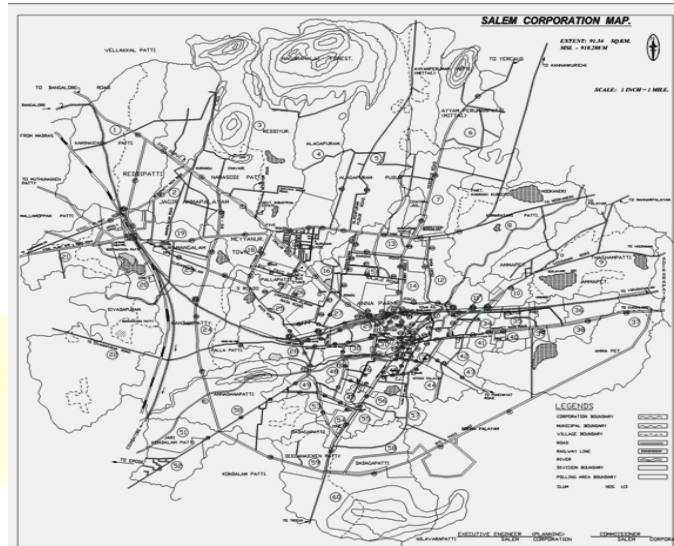
## 7. Field Studies Traffic Volume Survey

One of the fundamental measures of traffic on a road system is the volume of traffic using the road in a given interval of time. It is also termed as flow and is expressed in vehicles per hour. When the traffic is composed of number of types of vehicles, it is the normal practice to convert the flow into equivalent passenger car units (PCU), by using certain equivalence factors. The flow is then expressed as PCU per hour.

A knowledge of the vehicular volume using a road network is important for understanding the efficiency at which the system works at present and the general quality of service offered to the road users knowing the flow characteristics, one can easily determine whether a particular section of a road is handling traffic much above or below its capacity. If the traffic is heavy, the road suffers from congestion with consequent loss in journey speeds. Lower speeds cause economic loss to the community due to time lost by the occupants of the vehicles and the higher operational cost of vehicles. Congestion also leads to traffic hazards. Volume counts are, therefore, indicators of the need to improve the transport facilities and are in an invaluable tool in the hands of transport planner.

In order to update the data base of the present existing traffic conditions, Traffic volume counts on selected road links in the urban centre were conducted. The detailed field survey programme was organized for 14 hours between 6 AM -8 PM. The block period is 15 minutes.

Traffic volume count survey was conducted on the 162 road links and shown in Figure 3. With the help of these data the peak hour of traffic flow on each road link has been identified.



**Figure 3. Traffic volume count survey points on the 162 road links**

## 8. Physical Characteristics

Physical Characteristics of road links in the network studied by field visits during the study and updated to the present existing condition. The study of physical characteristics comprises of surface condition, lighting condition footpath condition and drainage condition.

## 9. Road Network Details

Road network details collected from directorate of Town and Country Planning, Salem Corporation & Salem Local Planning Authority.

### List Of Data Collected

The following data have been collected for Salem city

#### i. Linkwise – road name details

The arterial road network which has been studied is broken into number of links. A link is defined as one-way part of the route between two intersections. The number of road links analyzed in the study is 162. The road links studied in the urban centres are given in Fig.3.

#### ii. Linkwise – Physical informations.

Following Physical information are collected for 162 road links. The following details of overall road links were collected for the study

Length of road links

Carriageway width

Footpath width

Right of way

Onstreet parking and width covered

Encroached area.

### iii. Linkwise Traffic Informations

Linkwise peak hour traffic flow in road links are calculated from the Traffic volume count survey

### iv. Linkwise – Existing physical conditions

Linkwise existing physical conditions, surface condition, lighting condition, footpath condition and drainage condition in 162 road links are collected. Surface condition, lighting condition, drainage condition and footpath conditions are graded as very poor, poor and fair. Details of existing landuse along the roadside, type of encroachment and onstreet parking on all road links are observed.

## 10. Procedure Adopted To Identify The Conjested Road Links

The extent of the traffic volume on the road links determined from the traffic volume survey conducted at different locations. The equivalent PCU value of the peak hour traffic

**Table.1 The Equivalent Pcu Factors Adopted For Various Vehicles**

Vehicle	PCU
Bus, Lorry/Truck	3
Car / Van	1
Two wheeler	0.5
Auto rickshaw	0.6
Cycle	0.4
Cycle rickshaw	1.5
HD cart	4.5
BD cart	8

volume on the road links has been calculated. The equivalent PCU factors adopted for various vehicles are shown in Table.1

### 11. Road Link Capacity

The step by step procedure adopted for calculating road link capacity is as follows.

1. The absolute capacity of a road link is assumed to be between 1300 and 1500 PCU Per hour per lane. Adopting the average of 1400 PCU per land width of 3.5 m, the absolute capacity is taken as 400 PCU per hour per metre width of carriageway.
2. The absolute capacity (400 PCU per metre) multiplied by the “effective” carriageway width gives the actual capacity of the road link. The effective carriageway width has been calculated by reducing the actual width of the carriageway due to different factors affecting the capacity.
3. The factors affecting the capacity are parking, encroachment and landuse. The reduction due to parking and encroachment is shown in Table .2. Land use along the road link affects the capacity and the reduction in capacity due to this factor is shown in Table.3.

**Table.2 The Reduction Due To Parking And Encroachment**

Reduction due to parking and encroachment	
Type of parking \ Severity of Encroachment	Reduction (m)
Parking prohibited on either side	0
Parking permitted on one side	2.5
Parking permitted on either side	5
No Encroachment	0
Marginal Encroachment	1
Substantial Encroachment	2

**Table.3. Reduction in capacity due to land use**

Predominant land use	Reduction (per cent)
Open space	0
Residential	5
Institutional	10
Industrial	15
Commercial	30



Calculated the effective width of carriageway considering the above three factors (Parking, encroachment, landuse). The capacity of each road link has been calculated by using the physical information's (width of carriageway, parking space, encroachment) is follows.

$$\text{Effective width of carriageway} = \text{Actual width of carriageway} \times (1 - \text{landuse} / 100) - \text{Parking space} - \text{Encroachment.}$$

$$\text{Capacity of road link} = \text{Effective width of carriageway} \times 400 \text{ PCU}$$

## 12. Level Of Service Of Road Links

Comparison of updated traffic volume and capacity of road link give a volume capacity ratio. According to the volume capacity ratio the level of service of the road links are identified. It led to the identification of the degree of congestion in each road link

**Table 4. Level of service adopted in this study**

Volume capacity ratio	Level of service
< 0.6	A
0.6 - 0.7	B
0.7 - 0.8	C
0.8 - 0.9	D
0.9 - 1.0	E
1.0 <	F

Table.4. Shows the Level of Service adopted corresponding to the volume capacity ratio. For design purpose Level of Service "C" is suitable for urban streets (Kadiyali L.R 2007). The road link with Volume Capacity ratio more than 0.8 are classified as congested links. The effective width of carriageway, capacity, volume capacity ratio and Level of Service of all road links in Salem City corporation area calculated

## 13. Identify The Type Of Improvements Required For Road Links To Carry Existing Traffic Flow

Road links which are having volume capacity ratio more than 0.8 are considered as a congested links and these road links required improvements to carry existing traffic volume. The following procedure is adopted to identify the required improvement.

Road links which are having volume capacity ratio more than 0.8 reflect that road link will have insufficient width of carriageway to carry existing traffic. Instead of providing extra widening of carriageway it has been assumed that to prohibit the existing on street parking and remove the encroachment. After removing on street parking and encroachment the effective width of carriageway, capacity and volume capacity ratio have been calculated. If the volume capacity ratio is less than 0.8 then that road link required only removal of on street parking and encroachment to carry existing traffic flow.

If the volume capacity ratio after removing the on street parking and encroachment is more than 0.8 then that road links required a widening of carriageway. For providing extra widening the available extra width has been calculated from right-of- way. If the right of way is not available to widen the carriageway then that road link required traffic management measure.

If right of way have space then widen the carriageway up to its full width leaving one metre on each side for pedestrian movements. Again the effective width of carriageway and volume capacity ratio has been calculated. If the volume capacity ratio more than 0.8 then that road link required traffic management measure with extra widening. If the volume capacity ratio less than 0.7 than it reflect that extra widening width has been calculated by assuming average volume capacity ratio of 0.75.

#### 14. Conclusion

An important product of the analysis is the development of a program which outlines the improvements to be carried out. From the study made, the type of improvement required to the road links to carry the existing traffic flow has been identified. Total number of road links requiring various types of improvements in Salem city corporation area to carry existing traffic flow is shown in Table.5.

**Table.5. Types of improvements required to carry existing traffic flow**

Sl.No	Type of Improvement Required	Total Number of Road links
1.	Removal of onstreet parking and encroachment	44
2.	Widening of carriageway	52

3.	Traffic Management Measure required with extrawidening of carriageway	23
----	---	----

## 15. References

- DTCP (1986), 'Short term improvement program ME – Traffic and Transportation study for Coimbatore, Madurai, Trichy and Salem', DTCP, Tamil Nadu
- Hanspeter Georgi (1973), 'Cost- Benefit Analysis and Public Investments in Transport: A Survey', First Edition, Butter Worths (Publishers), London.
- Kadiyali.L.R.(2007), 'Traffic Engineering and Transport Planning', 7<sup>th</sup> edition, Khanna publishers, Delhi.
- Khanna S.K – Justo C.E.G (2010), 'Highway Engineering', 9<sup>th</sup> edition, Nem Chand and Bros. publishers, Roorkee(U.P)
- Lindsay R. Peat (1982), 'Practical Guide to DBMS selection', Walter de Grawyter, New York.
- Meyer M.d.Miller E.J (1984), 'Urban Transportation Planning', Mcgraw – Hill series, New Delhi.
- Subramanian P. (1990) , 'Capacity restrained trip assignment model for Madras City', ME Urban Engineering Thesis, Madras – 600025.
- V.N.Vazirani & S.P.Chandola, 'Transportation Engineering Vol.I ', 5<sup>th</sup> edition, Khanna Publishers, New Delhi
- Dr.L.R.Kadyali & Dr.N.B.Lal, 'Principles and Practices of Highway Engineering, 5<sup>th</sup> edition, Khanna Publishers, New Delhi
- B.L.Gupta & Amit Gupta 'Highway and bridge Engineering' 3<sup>rd</sup> edition Standard Publishers Distributers, New Delhi
- C.Jotin Khisty & B.Kent Lall, 'Transportation Engineering' 3<sup>rd</sup> edition, PHI Learning Private Limited, New Delhi
- Gurcharan Singh, 'Highway Engineering' 5<sup>rd</sup> edition Standard Publishers Distributers, New Delhi
- R.K. Khitoliya, 'Principles of Highway Engineering' 1<sup>st</sup> edition , Dhanpat Rai Publishing Company, New Delhi.
- DTCP (1999), 'Comprehensive Traffic and Transportation Study for Salem', Pallavan Transport Consultancy Services Ltd., Chennai, Tamil Nadu.