Traffic Study on Road Network and Programming for Fixing Priority to the Identified Transport Improvement Projects In Salem City, Tamilnadu, India

T Subramani, R Elangovan, 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. Local authorities have inadequate funds to improve these road networks from all angles at any point of time. Repair or improvement works may have to be under taken on a basis which has to be decided based on socio-economic, administrative, technical, political factors etc.,   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 idendified 162 road links in Salem Corporation. Identify the type of transport facilities required for the road links.   In programming process, priorities are set for project implementation. Even in cases where a formal process of priority setting does not exist, the allocation of organizational and financial resources for the development of some projects over others is an implicit setting of priorities. In programming process, priorities are set for project implementation. Even in cases where a formal process of priority setting does not exist, the allocation of organizational and financial resources for the development of some projects over others is an implicit setting of priorities. The important technique devised in this study is working out priority indices based on measures of current conditions of the facilities. There are two approaches for fixing the priorities to select road links to improve existing conditions. In the first approach priorities are fixed mainly based on hierarchy of road net work and considering location of road links with weightages assigned to the road links In the second approach priorities are fixed mainly based on location of road links   and considering hierarchy of road net work with weightages assigned to the road links.

Index Terms -- Traffic study, programming, transport projects, expert system, Salem city

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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 dev eloping 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 i9mpact on transport services. Since increase in urban

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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   DEFINITION FOR PROGRAMMING

Programming is a technical and political process that established priorities for projects by assessing current and future resource availability in order to stage projects over time. Technical analysis and political considerations are elements of programming that are closely interrelated, with the relative impact of each on any one project decision varying greatly as decision makers seek to satisfy both the relevant transportation policies and the many interest groups involved. There are two tasks which play in important role in the programming process and which are critical to its success – setting priorities for project selection and determining the availability of funds (Meyer M.D., Miller E.J. 1984).

3 NEED FOR PROGRAMMNIG

With limited resources available for improvements to the transportation network, much of the interest of decision makers is focused on the programming and budgeting process. The specifics of this process vary from on city or governmental structure to another. In some cases, political decision makers may be interested in the progress of specific projects because these projects are important politically. In other cases decision makers may not be interested in specific projects, but rather in the overall policy that represent.

If there were unlimited resources for transportation projects in a urban centre , there would not be much problem in prioritising the activities. However, the financial and organized resources available for transportation investment are always limited and my in some instances ever be shrinking. In addition to the constraint of declining funding levels, the small number of construction firms in an urban area and the limited ability of government agencies to supervise project construction also limit the number of projects that can be implemented in any one year. Further the limited capacity of government agencies to design facilities or to monitor the design process constrains the number of projects that can reach the programming stage. Giver these circumstances, it becomes necessary to establish priorities for project implementation that is to determine which projects require immediate attention and would receive funding.

4 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 find the extra widening required for the different road links to carry existing traffic volume.
6. To find the roads which require Traffic management measures with widening of carriageway.
7. To Rank the problems for prioritization in the order of their magnitude and complexity by using rating values.
8. Prepare the order of priority for taking up road improvement projects with respect to the hierarchy of road net work & location of road links.

5 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, using computer programs
6. Identify the type of road improvement projects require to meet the existing traffic.
7. Prepare a questionnaire and conduct survey to assign ratings to various road attributes.
8. Ranking the problems for prioritization in the order of their magnitude and complexity by using rating values.
9. Find the order of priority for taking up road improvement projects with respect to the hierarchy of road net work & location of road links.

6 STUDY OF PAST AND PRESENT CONDITIONS IN SALEM CITY

6.1 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.

6.2 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. Table.1 gives the growth of population within the Salem town. Population growth of Salem City Corporation given in Table 1.

Table 1.

Population growth of Salem City Corporation

YEAR	SALEM TOWN / CORPORATION * POPULATION	DECADE VARIATION	% OF DECADE VARIATION

1901	70621	-	-
1911	59153	(-) 11468	(-) 16.24
1921	52244	(-) 6909	(-) 11.68
1931	102149	(-) 49935	95.58
1941	129702	27523	26.94
1951	202335	72633	56
1961	249145	46810	23.13
1971	308716	59571	23.9
1981	361394	52678	17.06
1991*	579951	218557	60.47
2001*	672330	92379	15.92
2011*	754000	81670	12.15

6.3 Existing Land-Use Structures

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. The Table 2. gives the existing land use details of Salem City Corporation area & Figure. 1. is showing the existing land use details of Salem City Corporation area.

Table 2.
Existing land use details of Salem City Corporation area

Sl. No	Use	Area in hectares	% to developed area	% to total area
	Developed area			
1	Residential	3091	66.50	32.39
2	Commercial	461	9.92	4.83
3	Industrial	465	10.00	4.88
4	Education	316	6.80	3.31
5	Public and semi-public	315	6.78	3.30
	Total developed area	4648	100	48.71
	Undeveloped area			
6	Agricultural area			
	A. Wet	1240	25.33	13.00
	B. Dry	2465	50.36	25.83
	C. Hillocks	728	14.89	7.63
7	Reserved forest	461	9.42	4.83
	Total undeveloped area	4894	100	51.29

	Net total	9542		100.00

Source: Salem Local Planning Autority Records

6.4 Existing Traffic Situation

The traffic in Salem town is heterogeneous in nature comprising of slow moving vehicles such as hand carts, animal drawn vehicles, bicycle and fast moving vehicles such as mini cargo vans, Passenger vans Lorries, buses etc. In the absence of separate lanes for slow moving vehicles and cyclists all the vehicles are found to use the available narrow carriageway. The pedestrian side walks have been provided only near Collectorate. In almost all the main roads vendors occupy the road margins and side walks. Hence the pedestrians are deprived of the use of road margins and side walks and use the carriage way, causing hindrance to the free vehicle movement. This may be noticed more in the central area of the old town comprising of Collectorate and Bus stand complex the main private companies. The intraurban routes are also so operated by number of private operators in addition to government Transport Corporation.

7 IDENDIFIED 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.
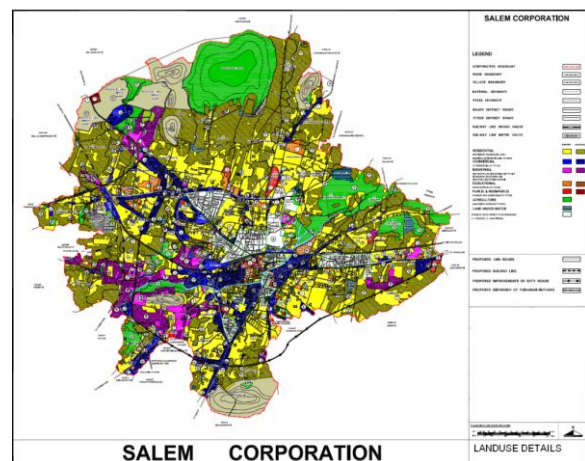

Figure.1. Existing land-use details of Salem City Corporation

Salem Corporation 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. The details of the various categories of roads with their lengths in the town is show in Table. 3

Table.3
Types of roads with their length in Salem Corporation

Sl. No	Category	Road length (km)
1	Cement Concrete Super Roads	54.47
2	Black Topped Roads	628.17
3	Wbm Roads	17.04
4	Earthern Road	23.46
5	Others	24.66
	Total length of municipal roads	748.13

The arterial road network of Salem Chosen for the study consists of four major radial corridors originating from the city bus stand. These roads are Attur road in the east, Trichy road and Coimbatore road in the South and Omalur road in the North west. In addition to these, there are a few secondary radial roads. One orbital corridor is identified and it consists of Shandipet road pallapatti main road and court road. Fig.2. shows the identified road network selected for the present study.

8 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.
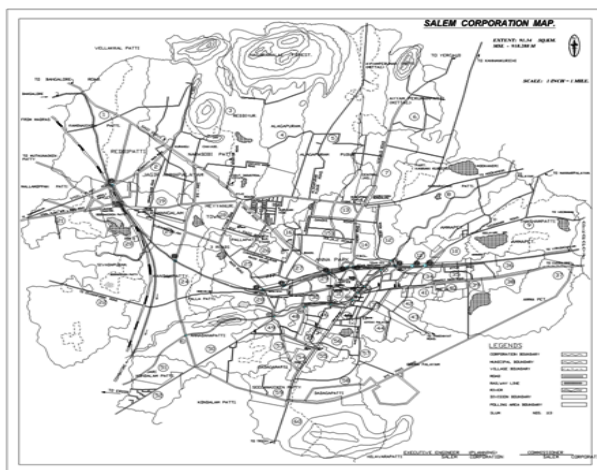

Figure.2. Identified road network of Salem City Corporation

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.

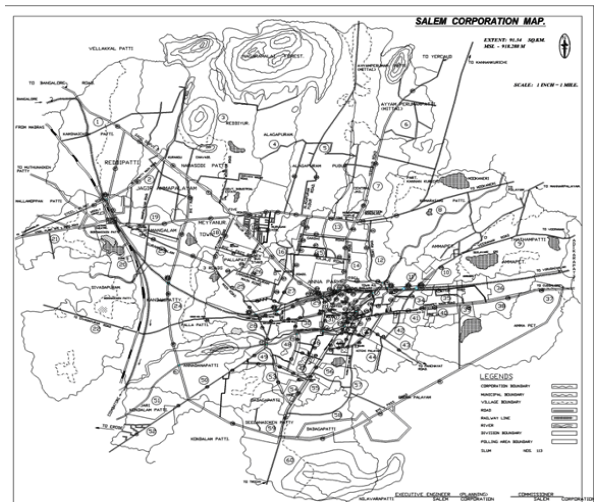Figure 3. Traffic volume count survey points on the 162 road links

9 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.

10 ROAD NETWORK DETAILS

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

10.1 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.

11 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 volume on the road links has been calculated. The equivalent PCU factors adopted for various vehicles are shown in Table.4

12 ROAD LINK CAPACITY

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

Table.4
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

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 .5. Predominant land use along the road link affects the capacity and the reduction in capacity due to this factor is shown in Table.6.

Table.5
The 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.6.
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.

Effective width of of carriageway = Actual width of carriageway x (1-landuse/ 100))
- Parking space - Encroachment.

Capacity of road link = Effective width of carriageway x 400 PCU

13 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.8. 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).

Table 7.
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

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.

14 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.

15 TECHNOLOGIES USED FOR FIXING PRIORITY TO IMPLEMENT ROAD IMPROVEMENT PROJECTS

Several efforts have been made to develop comparative analysis techniques to rank project along various dimension. The most popular approach is the use of priority indices based on current condition of the facility. In this study the points assumed to the various grades of attributes are shown in Table.8. The points assumed to the various grades of the attributes   are varied from 0.75 to 3. The rating for each attribute like improving surface condition of carriageway, street lighting, footpath condition drainage condition and widening of carriageway are assigned from the experts view.

16 EXPERT SYSTEM

Questionnaire has been prepared for the purpose of collecting experts view on various road improvements to fix the rating to each. Survey has been conducted with experts and their views on various road attributes has been collected. Average value of each road attribute from the survey has been

assumed as a rating to each road attribute. The rating assigned to each road attribute is shown in Table.9.

Table.8.
Points assumed to the various grades of each road attributes

S. No	Item	Grade	Points	Variable
1	Surface condition	Very poor	1	X11
		Poor	2	X12
		Fair	3	X13
2	Lighting Condition	Very poor	1	X21
		Poor	2	X22
		Fair	3	X23
3	Drainage Condition	Very poor	1	X31
		Poor	2	X32
		Fair	3	X33
4	Foot path Condition	Very poor	1	X41
		Poor	2	X42
		Fair	3	X43
5	Level of service	F	3	X51
		E	3	X52
		D	3	X53
		C	2.25	X54
		B	1.5	X55
		A	0.75	X56

Table.9.
Ratings assigned to each road attribute

S.No	Item	Rating	Variables
1	Improving the road surface condition	37.4	w1
2	Improving the street lighting	10.9	w2
3	Widening of carriage way for the given traffic volume	15.5	w5
4	Improving the footpath for pedestrian	14.3	w4
5	Improving the drainage condition	21.9	w3

The weigtage of the each road link has been calculated by using points allotted to various grades of road attributes and rating assigned to the each road attributes from the

survey. Weightage of each road link has been calculated as follows.

$$\text{Weightage} = (x_{11} \backslash x_{12} \backslash x_{13})w_1 + (x_{21} \backslash x_{22} \backslash x_{23})w_2 + (x_{31} \backslash x_{32} \backslash x_{33})w_3 + (x_{41} \backslash x_{42} \backslash x_{43})w_4 + (x_{51} \backslash x_{52} \backslash x_{53})w_5$$

Where

$x_{11}, x_{12}, x_{13}............ x_{55} =$ Points allotted to various grades of each road attributes

$w_1, w_2, w_3, w_4, w_5 =$ Ratings assigned to the various attributes from the survey.

If the the road link have all road attributes with very poor or poor grade, the the weightage of the road link should be very low of 96.125. If the road link have all road attributes with fair grade, the weightage should be very high of 300.

17   METHODS ADOPTED FOR FIXING PRIORITY TO IMPLEMENT ROAD IMPROVEMENT PROJECTS

In this study two approaches are considered to fix the priority for Implementing road improvement projects.

17.1   PRIORITY BASED ON HIERARCHY OF ROAD NETWORK

In this approach the priority for selecting road links to implement road improvement projects are fixed on the basis of hierarchy of road network.   According to the hierarchy of road network following priority is assumed.

Priority 1.   Radial roads in CBD area with low weightage.

Priority 2.   Radial roads in Fringe area with low weightage.

Priority 3.   Orbital roads in CBD area with low weightage.

Priority 4.   Orbital roads in Fringe area with low weightage.

Priority 5.   Other roads in CBD area with low weightage.

Priority 6.   Other roads in Fringe area with low weightage.

As per above priority basis the priority has been fixed to the road improvement projects of road links in Salem corporation area. The of priority for selecting road links to implement the road improvement projects as per hierarchy of road network is given in Table.10.

Table.10

Order Of Priority For Implementing Road Improvement Projects In Salem Based On Hierarchy Of Road Network

Priority No	Link Number	Type	Location Type	Total weightage
1	140	Radial	CBD	135.625
2	146	Radial	CBD	147.1
3	139	Radial	CBD	147.25
4	52	Radial	CBD	157.525
5	55	Radial	CBD	157.525
6	79	Radial	CBD	162.125
7	85	Radial	CBD	180.625
8	145	Radial	CBD	181.975
9	86	Radial	CBD	184.025
10	2	Radial	CBD	191.525
11	67	Radial	CBD	191.525
12	123	Radial	CBD	191.525
13	124	Radial	CBD	191.525
14	43	Radial	CBD	194.2
15	44	Radial	CBD	194.2
16	138	Radial	CBD	196.275
17	1	Radial	CBD	203.15
18	122	Radial	CBD	205.825
19	60	Radial	CBD	206.55
20	61	Radial	CBD	206.55
21	66	Radial	CBD	214.775
22	100	Radial	CBD	217.3
23	125	Radial	CBD	217.3
24	126	Radial	CBD	217.3
25	127	Radial	CBD	217.3
26	45	Radial	CBD	217.45
27	97	Radial	CBD	217.45
28	121	Radial	CBD	217.45
29	115	Radial	CBD	227.725
30	154	Radial	CBD	228.925
31	46	Radial	CBD	229.075
32	47	Radial	CBD	229.075
33	42	Radial	CBD	231.6
34	49	Radial	CBD	231.6
35	128	Radial	CBD	231.6
36	129	Radial	CBD	231.6
37	131	Radial	CBD	231.6
38	149	Radial	CBD	231.6
39	53	Radial	CBD	232.325
40	133	Radial	CBD	233.05
41	65	Radial	CBD	240.55
42	3	Radial	CBD	243.225
43	152	Radial	CBD	243.225
44	153	Radial	CBD	243.225
45	4	Radial	CBD	250.825
46	6	Radial	CBD	250.825
47	118	Radial	CBD	250.825
48	151	Radial	CBD	254.85
49	114	Radial	CBD	262.45
50	116	Radial	CBD	265.125
51	117	Radial	CBD	265.125
52	48	Radial	CBD	266.475
53	130	Radial	CBD	266.475
54	132	Radial	CBD	266.475
55	147	Radial	CBD	266.475
56	148	Radial	CBD	266.475
57	150	Radial	CBD	266.475
58	5	Radial	CBD	274.075
59	110	Radial	CBD	274.075
60	111	Radial	CBD	288.375
61	112	Radial	CBD	288.375
62	113	Radial	CBD	288.375
63	29	Radial	Fringe	124.725
64	143	Radial	Fringe	147.1
65	144	Radial	Fringe	147.1
66	137	Radial	Fringe	147.975
67	51	Radial	Fringe	169.725
68	69	Radial	Fringe	169.725
69	28	Radial	Fringe	173.025
70	141	Radial	Fringe	173.025
71	70	Radial	Fringe	179.9
72	50	Radial	Fringe	180.625
73	142	Radial	Fringe	181.975
74	71	Radial	Fringe	183.3
75	68	Radial	Fringe	191.525
76	62	Radial	Fringe	194.925
77	63	Radial	Fringe	194.925
78	72	Radial	Fringe	203.875

79	12	Radial	Fringe	205.825	122	11	Orbital	Fringe	205.825
80	27	Radial	Fringe	205.825	123	16	Orbital	Fringe	206.55
81	9	Radial	Fringe	217.45	124	30	Orbital	Fringe	206.55
82	10	Radial	Fringe	217.45	125	33	Orbital	Fringe	206.55
83	134	Radial	Fringe	221.425	126	19	Orbital	Fringe	216.1
84	135	Radial	Fringe	221.425	127	64	Orbital	Fringe	218.175
85	155	Radial	Fringe	221.425	128	18	Orbital	Fringe	253.5
86	7	Radial	Fringe	227.725	129	20	Orbital	Fringe	253.5
87	13	Radial	Fringe	227.725	130	21	Orbital	Fringe	253.5
88	15	Radial	Fringe	228.45	131	22	Orbital	Fringe	253.5
89	136	Radial	Fringe	233.05	132	34	Orbital	Fringe	276.75
90	8	Radial	Fringe	243.225	133	35	Orbital	Fringe	276.75
91	25	Radial	Fringe	243.225	134	36	Orbital	Fringe	288.375
92	26	Radial	Fringe	243.225	135	37	Orbital	Fringe	288.375
93	108	Radial	Fringe	262.45	136	38	Orbital	Fringe	288.375
94	14	Radial	Fringe	274.075	137	54	Others	CBD	157.525
95	109	Radial	Fringe	274.075	138	84	Others	CBD	169.725
96	56	Orbital	CBD	157.525	139	92	Others	CBD	180.625
97	57	Orbital	CBD	157.525	140	81	Others	CBD	184.025
98	78	Orbital	CBD	162.125	141	83	Others	CBD	184.025
99	91	Orbital	CBD	180.625	142	80	Others	CBD	194.925
100	90	Orbital	CBD	184.025	143	94	Others	CBD	194.925
101	58	Orbital	CBD	194.925	144	98	Others	CBD	203.15
102	59	Orbital	CBD	194.925	145	93	Others	CBD	203.875
103	159	Orbital	CBD	194.925	146	95	Others	CBD	205.825
104	160	Orbital	CBD	194.925	147	96	Others	CBD	205.825
105	87	Orbital	CBD	205.825	148	82	Others	CBD	207.275
106	88	Orbital	CBD	205.825	149	120	Others	CBD	229.075
107	89	Orbital	CBD	205.825	150	99	Others	CBD	254.85
108	158	Orbital	CBD	206.55	151	119	Others	CBD	288.375
109	157	Orbital	CBD	218.175	152	161	Others	Fringe	157.525
110	156	Orbital	CBD	255.575	153	162	Others	Fringe	157.525
111	74	Orbital	Fringe	124.725	154	23	Others	Fringe	205.825
112	73	Orbital	Fringe	136.35	155	24	Others	Fringe	205.825
113	76	Orbital	Fringe	136.35	156	101	Others	Fringe	218.025
114	77	Orbital	Fringe	136.35	157	102	Others	Fringe	218.025
115	75	Orbital	Fringe	147.975	158	103	Others	Fringe	232.325
116	31	Orbital	Fringe	154.85	159	106	Others	Fringe	254.225
117	32	Orbital	Fringe	169.15	160	107	Others	Fringe	254.225
118	17	Orbital	Fringe	183.3	161	105	Others	Fringe	265.85
119	39	Orbital	Fringe	190.325	162	104	Others	Fringe	277.475
120	40	Orbital	Fringe	190.325					
121	41	Orbital	Fringe	201.95					

17.2 PRIORITY BASED ON LOCATION ROAD LINKS

In this approach the priority for selecting road links to implement road improvement projects are fixed on the basis of location of road link. According to the location of road link following priority is assumed.

Priority 1. Radial roads in CBD area with low weightage.

Priority 2. Orbital roads in CBD area with low weightage

Priority 3. Other roads in CBD area with low weightage.

Priority 4. Radial roads in Fringe area with low weightage.

Priority 5. Orbital roads in Fringe area with low weightage.

Priority 6. Other roads in Fringe area with low weightage.

As per above priority basis the priority has been fixed to the road improvement projects of road links in Salem corporation area. The of priority for selecting road links to implement the road improvement projects as per location of road link is given in Table.11.

Table.11.
Order of priority for implementing road improvement projects in salem based on location of road link

Priority No	Link Number	Location	Type	Total Weightage
1	140	CBD	Radial	135.625
2	146	CBD	Radial	147.1
3	139	CBD	Radial	147.25
4	52	CBD	Radial	157.525
5	55	CBD	Radial	157.525
6	79	CBD	Radial	162.125
7	85	CBD	Radial	180.625
8	145	CBD	Radial	181.975
9	86	CBD	Radial	184.025
10	2	CBD	Radial	191.525
11	67	CBD	Radial	191.525
12	123	CBD	Radial	191.525
13	124	CBD	Radial	191.525
14	43	CBD	Radial	194.2
15	44	CBD	Radial	194.2
16	138	CBD	Radial	196.275
17	1	CBD	Radial	203.15
18	122	CBD	Radial	205.825
19	60	CBD	Radial	206.55
20	61	CBD	Radial	206.55
21	66	CBD	Radial	214.775
22	100	CBD	Radial	217.3
23	125	CBD	Radial	217.3
24	126	CBD	Radial	217.3
25	127	CBD	Radial	217.3
26	45	CBD	Radial	217.45
27	97	CBD	Radial	217.45
28	121	CBD	Radial	217.45
29	115	CBD	Radial	227.725
30	154	CBD	Radial	228.925
31	46	CBD	Radial	229.075
32	47	CBD	Radial	229.075
33	42	CBD	Radial	231.6
34	49	CBD	Radial	231.6
35	128	CBD	Radial	231.6
36	129	CBD	Radial	231.6
37	131	CBD	Radial	231.6
38	149	CBD	Radial	231.6
39	53	CBD	Radial	232.325
40	133	CBD	Radial	233.05
41	65	CBD	Radial	240.55
42	3	CBD	Radial	243.225
43	152	CBD	Radial	243.225
44	153	CBD	Radial	243.225
45	4	CBD	Radial	250.825
46	6	CBD	Radial	250.825
47	118	CBD	Radial	250.825
48	151	CBD	Radial	254.85
49	114	CBD	Radial	262.45
50	116	CBD	Radial	265.125
51	117	CBD	Radial	265.125
52	48	CBD	Radial	266.475
53	130	CBD	Radial	266.475
54	132	CBD	Radial	266.475
55	147	CBD	Radial	266.475
56	148	CBD	Radial	266.475

57	150	CBD	Radial	266.475	99	28	Fringe	Radial	173.025
58	5	CBD	Radial	274.075	100	141	Fringe	Radial	173.025
59	110	CBD	Radial	274.075	101	70	Fringe	Radial	179.9
60	111	CBD	Radial	288.375	102	50	Fringe	Radial	180.625
61	112	CBD	Radial	288.375	103	142	Fringe	Radial	181.975
62	113	CBD	Radial	288.375	104	71	Fringe	Radial	183.3
63	56	CBD	Orbital	157.525	105	68	Fringe	Radial	191.525
64	57	CBD	Orbital	157.525	106	62	Fringe	Radial	194.925
65	78	CBD	Orbital	162.125	107	63	Fringe	Radial	194.925
66	91	CBD	Orbital	180.625	108	72	Fringe	Radial	203.875
67	90	CBD	Orbital	184.025	109	12	Fringe	Radial	205.825
68	58	CBD	Orbital	194.925	110	27	Fringe	Radial	205.825
69	59	CBD	Orbital	194.925	111	9	Fringe	Radial	217.45
70	159	CBD	Orbital	194.925	112	10	Fringe	Radial	217.45
71	160	CBD	Orbital	194.925	113	134	Fringe	Radial	221.425
72	87	CBD	Orbital	205.825	114	135	Fringe	Radial	221.425
73	88	CBD	Orbital	205.825	115	155	Fringe	Radial	221.425
74	89	CBD	Orbital	205.825	116	7	Fringe	Radial	227.725
75	158	CBD	Orbital	206.55	117	13	Fringe	Radial	227.725
76	157	CBD	Orbital	218.175	118	15	Fringe	Radial	228.45
77	156	CBD	Orbital	255.575	119	136	Fringe	Radial	233.05
78	54	CBD	Others	157.525	120	8	Fringe	Radial	243.225
79	84	CBD	Others	169.725	121	25	Fringe	Radial	243.225
80	92	CBD	Others	180.625	122	26	Fringe	Radial	243.225
81	81	CBD	Others	184.025	123	108	Fringe	Radial	262.45
82	83	CBD	Others	184.025	124	14	Fringe	Radial	274.075
83	80	CBD	Others	194.925	125	109	Fringe	Radial	274.075
84	94	CBD	Others	194.925	126	74	Fringe	Orbital	124.725
85	98	CBD	Others	203.15	127	73	Fringe	Orbital	136.35
86	93	CBD	Others	203.875	128	76	Fringe	Orbital	136.35
87	95	CBD	Others	205.825	129	77	Fringe	Orbital	136.35
88	96	CBD	Others	205.825	130	75	Fringe	Orbital	147.975
89	82	CBD	Others	207.275	131	31	Fringe	Orbital	154.85
90	120	CBD	Others	229.075	132	32	Fringe	Orbital	169.15
91	99	CBD	Others	254.85	133	17	Fringe	Orbital	183.3
92	119	CBD	Others	288.375	134	39	Fringe	Orbital	190.325
93	29	Fringe	Radial	124.725	135	40	Fringe	Orbital	190.325
94	143	Fringe	Radial	147.1	136	41	Fringe	Orbital	201.95
95	144	Fringe	Radial	147.1	137	11	Fringe	Orbital	205.825
96	137	Fringe	Radial	147.975	138	16	Fringe	Orbital	206.55
97	51	Fringe	Radial	169.725	139	30	Fringe	Orbital	206.55
98	69	Fringe	Radial	169.725	140	33	Fringe	Orbital	206.55

141	19	Fringe	Orbital	216.1
142	64	Fringe	Orbital	218.175
143	18	Fringe	Orbital	253.5
144	20	Fringe	Orbital	253.5
145	21	Fringe	Orbital	253.5
146	22	Fringe	Orbital	253.5
147	34	Fringe	Orbital	276.75
148	35	Fringe	Orbital	276.75
149	36	Fringe	Orbital	288.375
150	37	Fringe	Orbital	288.375
151	38	Fringe	Orbital	288.375
152	161	Fringe	Others	157.525
153	162	Fringe	Others	157.525
154	23	Fringe	Others	205.825
155	24	Fringe	Others	205.825
156	101	Fringe	Others	218.025
157	102	Fringe	Others	218.025
158	103	Fringe	Others	232.325
159	106	Fringe	Others	254.225
160	107	Fringe	Others	254.225
161	105	Fringe	Others	265.85
162	104	Fringe	Others	277.475

17.3 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.10.

Table.10.
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

In programming process, priorities are set for project implementation. Even in cases where a formal process of priority setting do s not exist, the allocation of organizational an d financial resources for the development of some projects over others is an implicit setting of priorities. The important technique devised in this study is working out priority indices based on measures of current conditions of the facilities. There are two approaches for fixing the priorities to select road links to improve existing conditions.

In the first approach priorities are fixed mainly based on hierarchy of road net work and considering location of road links with weightages assigned to the road links. In the second approach priorities are fixed mainly based on location of road links   and considering hierarchy of road net work with weightages assigned to the road links.

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