

Traffic Operation Plan for Medium sized Towns in Kerala- a Case Study of Iritty Town

Shijil K
Project Engineer,
National Transportation Planning and
Research Centre,
Trivandrum, India

Shahul Hameed PK
Assistant Engineer,
Local Self Government Department,
Government of Kerala,
Kerala, India

Shaheem S
Principal Scientist,
National Transportation Planning and
Research Centre,
Trivandrum, India

Abstract—Iritty town in Kannur district is a major transit center of Kannur which is witnessing rapid growth in vehicular traffic. Frequent traffic congestions and accidents necessitate the need for a proper traffic operation plan for the town. Traffic operation plan will focus on development concepts, strategies, proposals and control regulations for Iritty town. Primary surveys and existing land use details were collected to find out the major bottlenecks in the study area. Results of origin-destination survey, volume/capacity ratio, parking accumulation, parking duration, pedestrian vehicle conflicts were used to identify the major factors contributing to the traffic problems in Iritty town. Proposed traffic operation plan suggests parking regulations, pedestrian facilities, development of ring roads, new bus stand, shifting of market area, new bypass road etc. Junction improvement proposals have been recommended for Bus stand junction and Pazhancherimukku junction to ensure smooth flow of traffic through junctions. At-grade pedestrian crossing facilities have been proposed at all major junctions to ensure the safe crossing of pedestrians. A Foot-over-Bridge has been recommended at Iritty bus stand junction. It is recommended to provide standard footpaths with a minimum width of 1.8m on either side of the roads in the CBD area of the town for the safe movement of pedestrians. Outer ring road, inner ring road and road widening schemes are proposed for upgrading the existing road network. Traffic signs and road markings were also proposed based on IRC-67 and IRC-35 respectively. Implementation of traffic operations plan would reduce the traffic congestion, improve journey speed and ensure safe and orderly movement of traffic in Iritty town.

Keywords—Traffic operation plan, control regulations

I. INTRODUCTION

The daily trips on the roads of Iritty is becoming tedious day by day, depicting the failure of public transportation infrastructure to keep pace with the growing population and developing activities in the town. Major cause of congestion in the roads of Iritty is characterized by the mixed traffic, which include, personal vehicles, buses, trucks, three-wheelers, two-wheelers, animal-driven carts and pedestrians. Mixed traffic creates problems for traffic management and leads to delays in movement of the traffic

Iritty town is located about 40 km from Kannur City, 42 km from Thalassery town and 18km from Kannur International Airport. The study area lies between latitudes 11°58'53.28" north to 11°55'45.29" south and longitudes 75°35'26.31" to 75°41'39.53" East. Road network of Iritty consists of State Highways, Major District Roads (MDR), Others District Roads (ODR) and Local body roads. State Highway 30, widely known as Thalassery-Coorg road traversing from

Thalassery to Coorg (Karnataka) passes through Iritty and is the most important road in Iritty. The study area is served by Public Transport system consisting of both State owned Kerala State Road Transport Corporation (KSRTC) and Private buses. Transport buses and private buses operate from the Iritty bus stand. Jeeps, cars and trucks are the common modes of transport for both goods and passenger movements. Extensive surveys such as road inventory survey, traffic volume survey, land use survey and parking surveys were carried out to identify the deficiencies in the transportation system of the town.

II. DATA COLLECTION AND ANALYSIS

To compile necessary inputs for the study, apart from review of secondary data, various primary surveys were conducted in the study area. Road inventory survey, Speed and Delay survey, Traffic volume survey, turning movement survey at intersections, Parking Survey, Pedestrian Survey and Origin-destination survey were conducted during the study. For the purpose of carrying out the surveys, major roads in the study area were divided into homogeneous sections based on road and traffic characteristics.

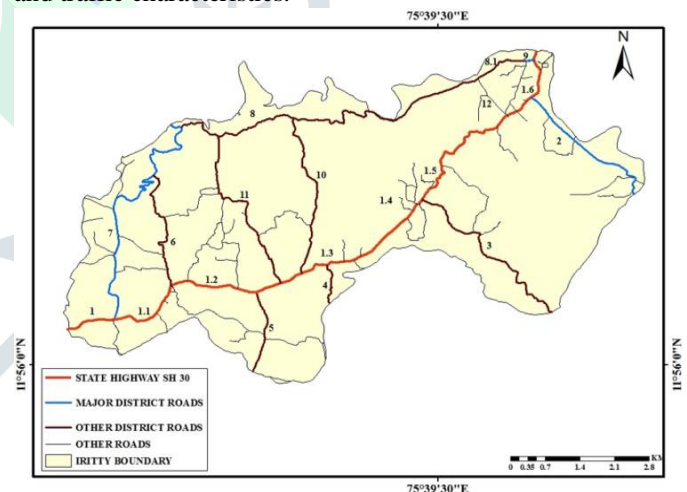


Fig. 1. Homogeneous sections in Iritty Town

A. Capacity Utilization

Capacity utilization of the road stretches was measured by volume-to-capacity ratio (V/C Ratio). It is the ratio of volume of peak hour traffic plying on the road stretch to the capacity of the road stretch. For working out the capacity of different road sections, information compiled during the road inventory survey was compared with the specifications of IRC-106-1990

Table 1. Capacity utilization in homogeneous sections

HS	Name of road section	Volume (V)	Capacity (C)	V/C
1 SH 30 (Thalassery-Coorg Highway)				
HS01	Iritty Bridge – Bus stand Jn	1889	1500	1.26
HS02	Bus stand Jn - Pazhancherimukku	1750	1500	1.17
HS03	Pazhancherimukku –PunnadJn	871	1500	0.58
HS04	PunnadJn - Chavassery Jn	860	1500	0.57
HS05	Chavassery Jn - Kalaroad Bridge	1029	1500	0.69
2 Iritty - Nedumpoil Road				
HS06	Pazhancherimukku – Uvappalli	934	1500	0.62
9 Iritty - Pazhassidam Road				
HS07	Iritty - Nerampok Road	687	600	1.15

It was found that v/c on SH 30 from Iritty bridge to Bus stand Junction, Bus stand Junction to Pazhancherimukku Junction and Iritty- Nerampok road were greater than 1 in the base year itself. These roads are in the CBD area of the town.

B. Traffic Volume at Major Intersections

Major intersections in the study area and its immediate surrounding were identified and classified traffic volume count survey was conducted for all movements at these junctions. The data helps in identifying the traffic issues at the intersections, critical movements etc. The junctions selected for intersection turning volume count and are shown in

Table 2. Intersection turning volume

Sl.No	Name of Intersection	Number of arms	Peak hour	Peak Traffic (PCU)
1	Bus stand Jn	3	5:00 PM-6:00 PM	2641
2	Pazhancherimukku Jn	3	11:00AM-12:00 PM	2498
3	Chavassery Jn	3	5:00 PM-6:00 PM	1261

C. Parking Characteristics

Parking survey was conducted to assess the extent of on-street parking on the road stretches in the study area where significant amount of parking has been observed. The major parking stretch from Iritty bridge to Iritty bus stand junction (360 m), Iritty bus stand junction to Pazhancherimukku junction and Uliyil town are selected for the survey.

Table 3. Parking characteristics of vehicles

Sl No	Name of road stretch	Length (km)	Time	Total (No)
1	Iritty Bridge – Bus standJn (Right)	0.5	11.00AM	218
2	Iritty Bridge – Bus standJn (Left)	0.4	12.15PM	300
3	Bus standJn– Pazhancherimukku Jn(Left)	0.4	9.30AM	107

4	Bus standJn– Pazhancherimukku Jn(Right)	0.4	12.30PM	69
5	Uliyil Town(Right)	0.5	12.10PM	89
6	Uliyil Town(Left)	0.45	4.45PM	31

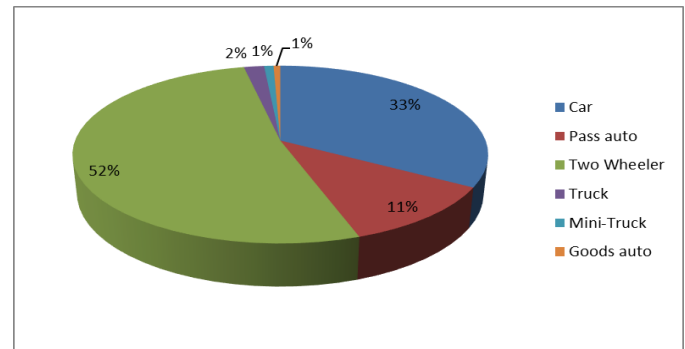


Fig. 2. Composition of Parked Vehicles

On-street parking causes congestion and traffic bottlenecks in the CBD area of the town during peak hours. Thus on-street parking of vehicles is recommended to be allowed on selected stretches of the below mentioned road, depending upon the available shoulder width.

1. Iritty Bridge to Bus Stand Junction (Thalassery-Mysore road)

However, on-street parking should be completely banned along the following road stretches:

1. Bus Stand Junction to Pazhancherimukku Junction
2. Pazhancherimukku Junction to Keezur Kunnu
3. Uliyil Town
4. Chavassery Junction to Chavassery school

Off-street parking is recommended on vacant plots, where sufficient space is available. Some of the plots where off-street parking could be recommended are:

1. Kalpana Private Parking and surrounding vacant open spaces, near Bus stand
2. Vacant plot behind Iritty town Post office
3. Vacant plot (Private parking) opposite to Uliyil Junction
4. Vacant plot in Veliyambra road near Chavassery junction

Shared parking also is considered for parking on school grounds and public spaces, during the non-working hours of the same to meet the parking demand.

D. Pedestrian Characteristics

Provision of pedestrian facilities is very important to ensure the safety of pedestrians who are the most vulnerable among the road users. In urban centers, pedestrian flows can be significant, and they must be accommodated in planning and design of traffic facilities and controls. The major factors affecting pedestrian demand are the nature of local community, local land use activities, quality, safety and security of provision of pedestrian facilities, car ownership etc.

In general, one third of the total trips in a town are performed by walk. Streamlining of pedestrians from motor vehicles is the most import part in ensuring safe and comfortable movement of them. Pedestrian sidewalks and raised footpaths significantly reduce pedestrian conflicts with motor vehicles. But, roads of Iritty are devoid of footpath in most of the road sections. Footpaths are available for only about 400m of road length starting from Iritty Bridge to Bus Stand junction;

forcing the pedestrians to use the roadway which subsequently risks the life of the pedestrians due to probable collision with a vehicle. Thus, it is recommended to provide footpaths on either side of the road stretches in the CBD area for the safe movement of pedestrians starting from Iritty bridge to Pazhancherimukku Junction. Guardrails should also be provided to confine the movement of pedestrian to the footpath.

The pedestrian cross movements were taken at major junctions in Iritty town. Locations selected for pedestrian survey is shown in Table 4. The intensity of pedestrian-vehicle conflicts represented by PV^2 value (where P is the number of pedestrians crossing a link during peak hour and V is the number of vehicles passing through the link during peak hour) was analyzed. For a road section with central median refuge, value of PV^2 greater than 2×10^8 and for a road section without central median refuge, PV^2 value greater than 108 indicates a higher level of conflict and warrants controlled pedestrian crossing facility. It implies that a divided carriageway could be considered to have reduced impact of PV^2 value by 50%. Based on the above criterion, the critical locations where pedestrians are in sharp conflict with vehicular traffic have been identified.

Pedestrian movements in Iritty town are shown in Table 4. It is evident from Table 4 that PV^2 value exceeds 1×10^8 at many locations in Thalassery – Coorg Highway and in Iritty Nedumpoil Road at Pazhancherimukku junction.

Table 4. Pedestrian characteristics

Sl. No	Name of location	Peak hour	Name of arm	Pedestrian	Vehicle	PV^2 (10^8)
1	Iritty Bus Stand Jn	17.00 - 18.00	Iritty - Mattannur Arm	342	1874	12
2	Pazhancherimukku Jn	11.00 - 12.00	Iritty - Mattannur Arm	112	1365	2.08
		11.00 - 12.00	Peravoor Arm	286	934	2.49

At-grade pedestrian crossing facilities in the form of zebra crossings have been proposed at all junctions to ensure the safe crossing of pedestrians. A Foot-over-Bridge has been recommended at Iritty bus stand junction, where pedestrian-vehicle conflict was found to be high. It is also recommended to provide footpaths with a minimum width of 1.8m on either side of the road stretches in the study area for the safe movement of pedestrians.

E. Origin- Destination Survey

Intercity travel pattern of passenger and commercial traffic were assessed from Origin- Destination survey conducted at the cordon points on the major roads of Iritty town.

Roadside interview method was adopted for this and it involves collection of travel particulars of vehicles on a normal working day. Zoning map were prepared and the zones are broadly classified into internal and external zones. Iritty municipality is divided into 15 internal zones and the influence area outside the municipal boundary are divided into 21 external zones. The location of cordon survey points are shown in Figure 3.

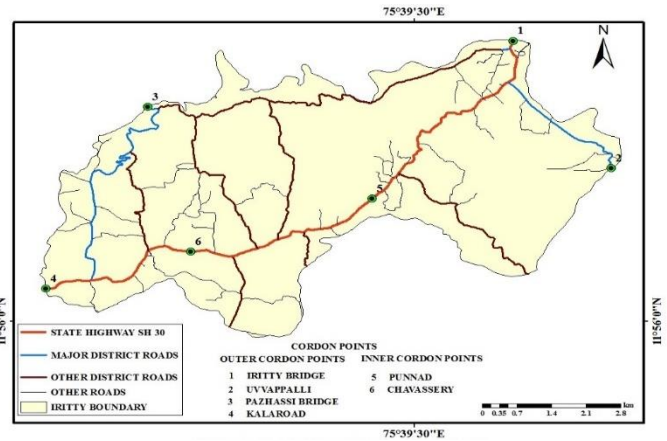


Fig. 3. Location of cordon survey points in Iritty town

Table 5. OD analysis of inter-city daily passenger vehicle

Sl. No	Mode	Internal - Internal	Internal - External	External - Internal	External - External	Total PCU
1	Bus	93	2046	1584	969	4692
2	Minibus	52.5	27	40.5	31.5	151.5
3	Car	641	5835	4683	2667	13826
4	Autorikshaw	3782	4922	2556	1456	12716
5	Two-Wheeler	1549.5	6303	4618.5	2870.25	15341.25
Total PCU		6118	19133	13482	7993.75	46726.75

Desire lines are the pictorial illustration of movement of people and goods from point to point based on the values from Origin-Destination matrix. From the Origin-Destination matrix of passenger movements in Iritty, it is clear that maximum trip production and trip attraction is around the Iritty town region.

The O-D pattern of inter-city passenger traffic revealed that out of 46726.75 PCU passenger vehicles 7993.75 PCU were external to external traffic (by-passable traffic), which is 17% of total traffic.

Desire lines showing the intercity passenger movements through Iritty town is shown in Figure 4.

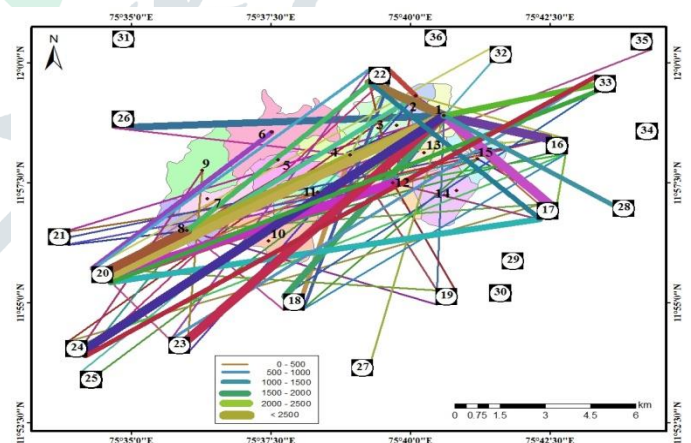


Fig. 4. Desire lines showing pattern of passenger trips

Table 6 OD analysis of inter - city goods vehicle

Sl. No	Mode	Internal - Internal	Internal - External	External - Internal	External - External	Total PCU
1	MAT	425	790	635	1070	2920
2	TRUCK	481	1140	1595	2708	5924
3	LCV	1458	1736	2590	1592	7376
4	GOODS AUTO	620	514	1084	1396	3614
Total PCU		2984	4180	5904	6766	19834

The O-D pattern of inter-city goods traffic revealed that out of 19834 PCU goods vehicles 6766 PCU were external to external traffic (by-passable traffic), which is 34% of total traffic.

Desire lines for intercity goods movement through Iritty town is shown in Figure 5.

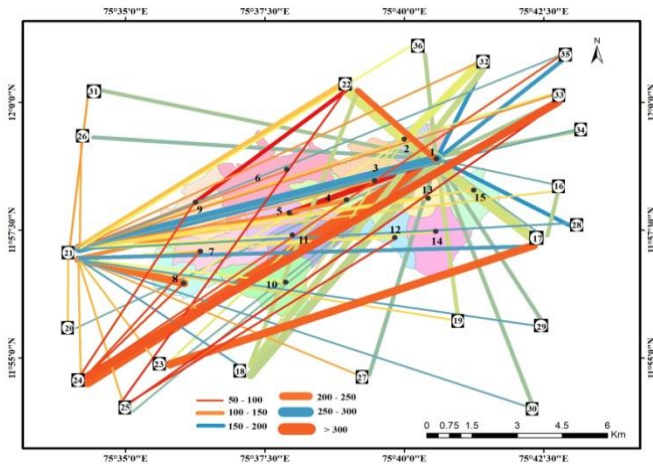


Fig. 5. Desire lines showing the intercity goods pattern

This pattern of inter-city passenger and goods traffic with higher percentage of external to external traffic necessitate the need for town bypass and external ring roads

III. TRANSPORT DEVELOPMENT PLANS

The Origin-Destination survey thus provides details of the trip pattern and travel choices of passengers. The study collected valuable data related to traffic and travel patterns in the study area and the information is used in forecasting and planning for area-wide transportation needs and services. Based on the future traffic projections the following transport development plans are proposed for Iritty town.

A. Development of Outer Ring Road

A proper road network system for the town can be developed by substantial improvement of road network and incorporating ring roads as links between the radial roads.

An outer ring road is also recommended on the outskirts of the study area to divert the goods traffic and by-passable traffic away from the CBD area. The proposed ring road starts from proposed Veliyambra new Bridge (parallel to Pazhasi Dam Bridge) and passes through Kuyiloor Junction (Thalipparamba-Iritty road), Padiyoor, Iritty bridge junction, Madathil Junction, Edoor (Madathil-Edoor Road), Kakkayangad (Malabar hill highway), Vellilode (Kakkayangad-Uruvachal road), 21st Mile (Sivapuram-Naduvanad road), 19th mile (SH30) and ends at Veliyambra new bridge (19th Mile – Pazhassidam Road)..

The ring road has got the advantage that a major portion of it passes through the existing roads. However, widening of the roads to a ROW of at least 15m needs to be done for the ease movement of goods and passenger vehicles. A missing link road of about 0.75 km and a new bridge is to be constructed to connect 19th mile Pazhassi dam Road with Thalipparamba-Iritty highway. Figure 6. shows the alignment of the proposed ring road

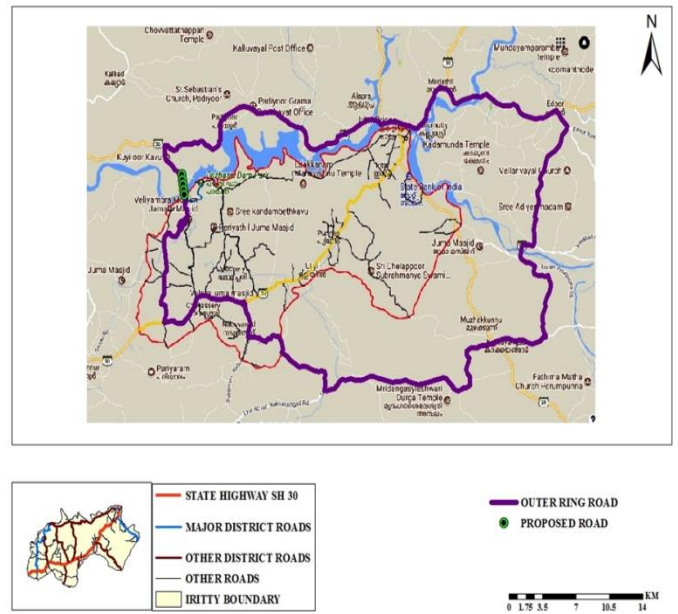


Fig. 6. Proposed outer ring road

B. Development of Inner Ring Road

The proposed alignment of inner ring road connects the following existing roads and new links. Amala hospital junction-Keezhur ambalam junction- Nerampok road junction-New link connecting old bus stand road with Iritty Nedumpoil road.

The proposed inner ring road for Iritty passes through the circumference of CBD area of the town. This road connects Thalassery-Mysore road with Keezurambalam Road at Amala hospital junction, Nerampok Road at KeezurAmbalam junction and Nerampok road meets SH 30 at Nerampok road junction. A new link connects SH30 with old Iritty bridge road, a new link parallel to SH30 connects to Iritty-Nedumpoil road near Iritty Block Panchayath office. Another new link connects Iritty-Nedumpoil road to SH30 near Sub Registrar office Iritty. Traffic not destined to the core area can utilize this inner ring road thereby relieving congestion inside CBD area. This ring road has been proposed along the existing road links through the periphery of the CBD area. The total length of inner ring road is about 4 km and it is to be developed as standard two lane road having a minimum of 12m ROW.

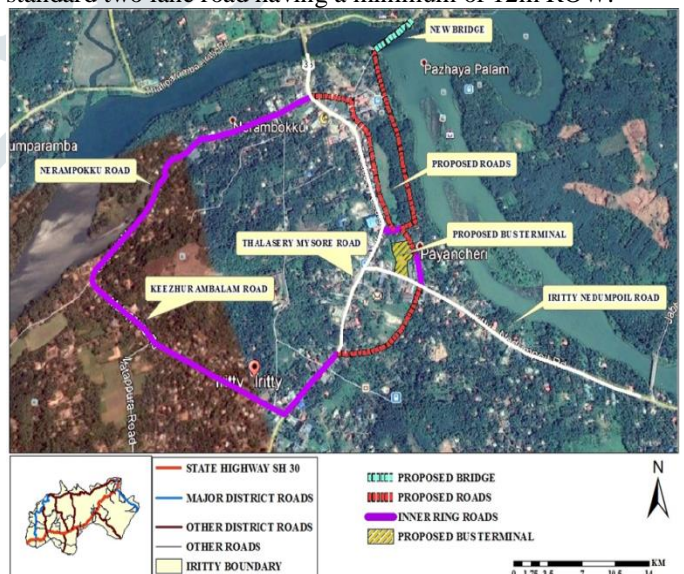


Fig. 7. Proposed inner ring road

C. Development of Goods Terminal

In spite of the fact that a large number of goods are getting transported to various destinations, Iritty Municipality lacks a goods terminal with adequate facilities. At present, trucks are being parked on the vacant plot near and inside Kalpana

Private parking space. Therefore, along with the proposed passenger vehicle parking space, a well-planned goods terminal section is recommended to be constructed at Kalpana private parking space.

D. Up-Gradation of Existing Bus Stand

The existing Bus Stand located in the CBD portion of Iritty Municipality, and serves as a bus terminal for KSRTC buses as well as private buses. Buses turning movements and stopping along the road shoulder at the bus stand junction to alight the passengers cause queuing up of vehicles, resulting in severe congestion and delays. Hence, it is recommended to provide one way operation of bus stand road for busses entering the bus stand. The exit route can be provided through the new road link connecting the old Iritty bridge road and the Thalassery Mysore road. Thus exit route of busses can be removed from the bus stand junction.

The existing bus stand is not adequate for the number of busses operating from the bus stand. Hence the bus stand area should be increased to accommodate the traffic demand. There is vacant land available around the bus stand so that land acquisition can be done without many hurdles.

E. Proposed New Bus Stand

It is also proposed to construct a bus terminal on the vacant area near Pazhancherimukku junction which is known as new KSRTC Bus stand by the side of Iritty-Nedumpoil road which will act as a mobility hub for inter-city buses operating in the Peravoor/Kottiyoor route.

The proposed Bus Stand near Pazhancherimukku will eliminate the bus trips coming from and to Peravoor and adjoining areas entering to the CBD area of Iritty town. The existing bus stand will serve for intra city busses operating in other routes along SH 30. The proposed Bus Stand should be constructed ensuring the smooth entry and exit of buses and efficient handling of the passenger volume; with adequate amenities such as provision of parking spaces, enquiry and reservation counters, telephone booths, cloak rooms, public toilets, ATMs, etc. An integrated Bus Station cum commercial complex is recommended to be built for maintaining the operating cost of the proposed Bus Station.

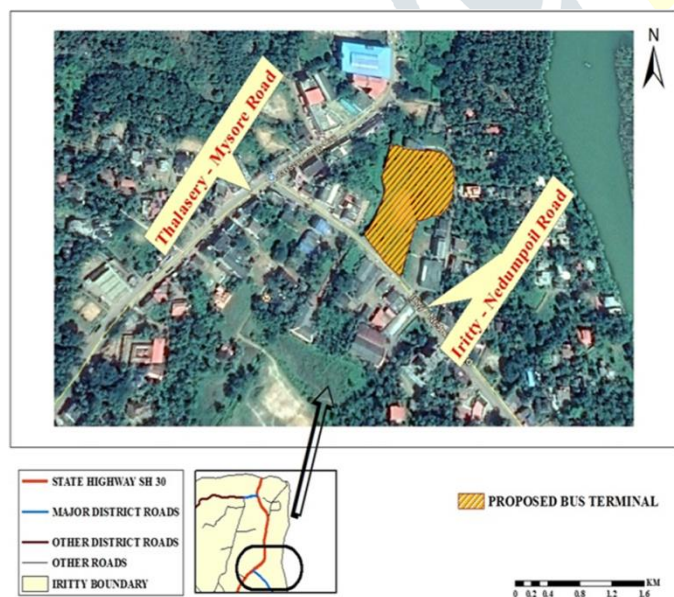


Fig. 8. Proposed new bus stand

F. Shifting Of Market Area

The market area in Nerampok road within the CBD portion of Iritty generates a considerable amount of traffic. Therefore, it is recommended to shift the market to the vacant area near Pazhancherimukku proximity near to the proposed new bus stand.

G. Mattannur Bypass Road

A bypass is a road or highway that avoids a built-up area, town to let through traffic flow without interference from local traffic, to reduce congestion in the built-up area and to improve road safety. Naduvanad-Sivapuram road starting at 21st mile in Thalassery-Mysore road can be developed as Mattannur bypass road. Since Mattannur is expected to get higher number of traffic related to the Kannur international airport, this bypass road can greatly improve to traffic numbers in the town.

The 21st mile Naduvanad-Sivapuram road connects the through traffic to Kuthuparamba, Thalassery at Uruvachal which is about 5Km away from Mattannur town. The proposed bypass can be used by passengers travelling to both Thalassery and Kannur via Kuthuparamba. The proposed bypass road has got the advantage that it passes through existing roads. However, widening of the roads to a ROW of at least 15m needs to be done for the ease movement of goods and passenger vehicles. Figure 9. shows the proposed Mattannur bypass road.



Fig. 9. Proposed Mattannur bypass road

III. CONCLUSIONS AND RECOMMENDATIONS

Based on the extensive field studies conducted and further analysis of data collected, shortcomings of existing road system have been identified. The base line data contains evaluation of transport network in Iritty town, volume and capacity utilization along major roads, parking demand and pedestrian traffic.

Traffic improvement measures have been suggested to improve the transportation scenario of Iritty town. Junction improvement proposals have been recommended for major junctions within the CBD portion of the study area to ensure smooth flow of traffic through junctions. On-street parking measures such as implementation of ‘no-parking’ and parking tickets scheme; and identification of off-street parking lots on vacant plots have been proposed to improve the parking scenario within the CBD area, where parking is prevalent. At-grade pedestrian crossing facilities in the form of zebra crossings have been proposed at all junctions to ensure the safe crossing of pedestrians. A Foot-over-Bridge has been recommended at Iritty Bus Stand junction, where pedestrian-vehicle conflict was found to be high. It is also recommended to provide footpaths with a minimum width of 1.8m on either side of the roads for the safe movement of pedestrians. An outer ring road has been proposed to divert the by-passable traffic plying through the study area. Road widening schemes

and proposals for upgrading the existing road network have also been recommended.

Other proposals such as provision of traffic signs and road markings, up-gradation of the existing Bus stand, shifting of market area from Nerampok road, and provision of goods terminal have also been proposed.

Early implementation of traffic improvement schemes would reduce the traffic congestion - resulting in improvement of journey speed and reduction in delays, and helps to ensure safe and orderly movement of traffic on the existing road system. It is hoped that, the long-term traffic operations plan will go a long way in achieving transport driven land use development for Irritty town.

REFERENCES

- [1] IRC-67 "Code of practice for road signs" ., third revision. 2012
- [2] IRC-67 "Code of practice for road markings", second revision,2015
- [2] IRC-106 "Guidelines for capacity of urban roads in plain areas",1990

