

# **CITY MOBILITY PLAN - KOCHI**

## **1. INTRODUCTION**

### **1.1 GENERAL**

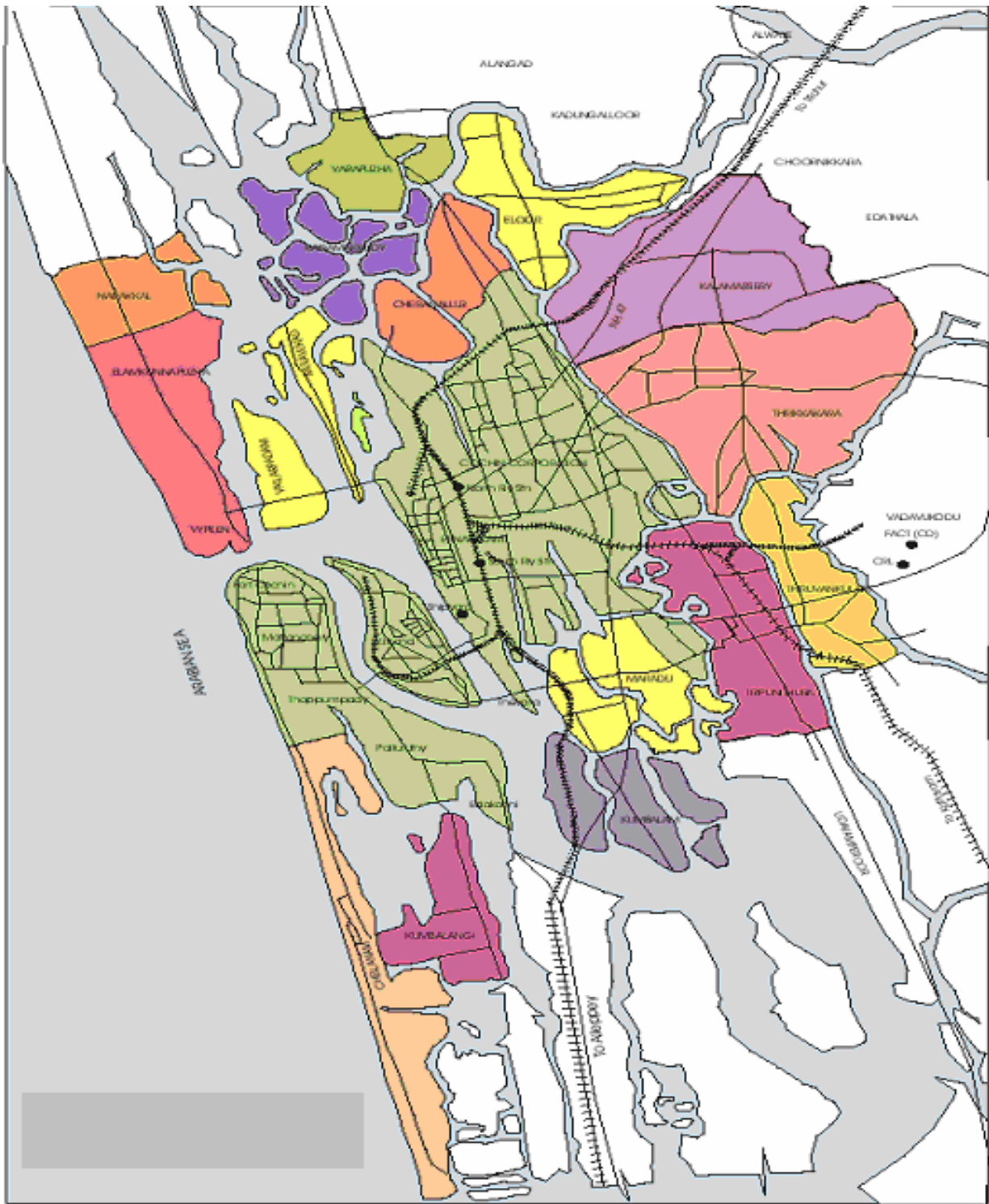
Kochi, the largest agglomeration in the state of Kerala is the nerve centre of all commercial activities in Kerala. One of the major ports in the country Kochi is blessed with connection with other parts of the country through all modes of transport like road, rail, air and water. NH 17, NH 47, and NH 49 pass through Kochi. Kochi port is located on strategic International route. Broad gauge railway lines link up Kochi to all major cities of the country. Kochi has got one of the three international airports in the state. In addition to all these the regional road linkages are supplemented by an extensive network of navigation routes through the lagoon system, serving the movement of passenger and cargo.

Insufficient carrying capacity of the intra-urban and sub urban routes, unhindered development of vast areas as urban extensions due to urbanization, unscientific planning in urban infrastructure development, absence of proper linkage of various forms of transportation etc. have resulted in an inadequate mobility system in the city and suburbs. As part of the comprehensive development of the city an efficient mobility plan has to be formulated.

### **1.2 STUDY AREA**

It was only in the beginning of the 19<sup>th</sup> century that Kochi, which was situated within the narrow strip of land sandwiched between backwaters and sea outgrew to Ernakulam in the eastern side of the back waters. The narrow streets of Fort Kochi and Mattancherry were not sufficient to take up the travel demand even at that time. So Ernakulam was established as the administrative centre of Kochi. In 1840 Kochi rulers shifted their capital to Ernakulam. Public buildings and

educational institutions were set up in Ernakulam. Roads were laid out and markets were established. Railways came to Ernakulam in 1905 and gradually rose to an administrative and commercial town. Mattancherry rose to the status of municipality in 1912 and was followed by Ernakulam in 1913. By the beginning of the twentieth century the eastern extension of Kochi city viz. Ernakulam has developed into a crowded urban settlement. By the middle of the



**KOCHI CDP AREA**

century the expansion of Kochi port by cutting open the sand bar at the sea mouth and forming a deep shipping channel accelerated the development of the city . By the turn of the last millennium the city has expanded further east including shifting of the administrative centre to Kakkanad. Kochi is the Gateway for all international optical fiber cable networks and so has got an added advantage of becoming an IT hub of India. Several establishments like Smart city, Info Park etc. are being developed in the new eastern extension of the city. More over some very important port oriented developments are being planned in the city like Vallarpadam Transshipment terminal, LNG terminal at Puduviye, the SBM of KRL at Vypin, and SEZ at Vypin. The current road network and public transport which cannot even handle the present travel demand has to be developed to handle the future traffic demand. So to address to this burning issue the formulation of a city mobility plan covering the entire urban vicinity region is the necessity of the time.

### **1.2.1 REGIONAL SETTING**

Kochi region as conceived in the regional development plan was primarily an urban vicinity region delineated to encompass settlements lying within the primary influence zone of Kochi city. The core area of Kochi region is the Kochi City. Five other Municipal towns included in the region are linked to the city through transportation corridors. Unlike other states in the country distinct boundary between urban and rural area is totally absent in Kerala. So the development plan should be laid giving emphasis on the settlement structure of the entire region.

### **1.2.2 PHYSICAL CHARACTERISTICS**

The constituent area of Kochi CDP area is listed below.

1. Kochi Municipal Corporation.
2. Kalamassery Municipality
3. Thripunithara Municipality.

4. Elamkunnappuzha Panchayat
5. Njarakkal Panchayat
6. Mulavukad Panchayat
7. Kadamakkudy Panchayat.
8. Cheranallur Panchayat
9. Eloor
10. Varapuzha
11. Thrikkakara
12. Thiruvankulam
13. Maradu
14. Kumbalam
15. Kumbalangi
16. Chellanam

### 1.2.3 DEMOGRAPHY

**Table:1.1 : Spatial distribution of density of population**

S.No.	Name of local body	Area in Ha.	Population 2001	Density per hectare
1	Kochi Corporation	9,488	596,473	63
2	Kalamassery Municipality	2,700	63,1176	23
3	Thripunithura Municipality	1,869	59,881	32
4	Elamkunnappuzha Panchayat	1,166	50,563	21
5	Njarakkal Panchayat	860	24,166	12
6	Mulavukad	1,927	22,842	28
7	Kadamakkudy	1,292	15,824	43
8	Cheranallur	1,059	26,316	25
9	Eloor	1,421	35,573	25
10	Varapuzha	774	24,524	32
11	Thrikkakara	2,746	65,984	21
12	Thiruvankulam	1,049	21,717	33
13	Maradu	1,235	41,012	13

14	Kumbalam	2,079	27,549	17
15	Kumbalangi	1,577	26,661	12
16	Chellanam	1,760	36,029	24
	<b>Total</b>	<b>33,002</b>	<b>1,138,413</b>	<b>35</b>

#### 1.2.4 FUTURE POPULATION

Kochi being the commercial capital of Kerala, the population growth in Kochi Municipal Corporation alone is expected to be 10% per decade. The growth of population in the remaining area is expected to be 19% per decade

**Table 1.2: Projected population of Kochi city**

S.No.	Area	2001	2011	2021	2026
1	Kochi Corporation	596,473	618,348	640,379	648,398
2	Municipalities-2	123,000	142,360	159,233	165,750
3	Panchayats-13	418,940	491,317	569,927	615,521
	<b>Total</b>	<b>1,138,413</b>	<b>1,252,025</b>	<b>1,369,539</b>	<b>1,429,669</b>

The present population of the adjoining municipalities and panchayats is less than the population of Kochi Municipal Corporation., where as the projected population is much greater than the projected population of Kochi Municipal Corporation. So the emphasis should be on the travel demand of outer area.

### 1.3 TRANSPORT SYSTEM CHARACTERISTICS

The major public transport modes in Kochi are City Buses, Autorikshas, and ferry boats operated mainly by private operators. A total of about 650 buses are operated on about 160 routes originating from 60 locations scattered all over the city.

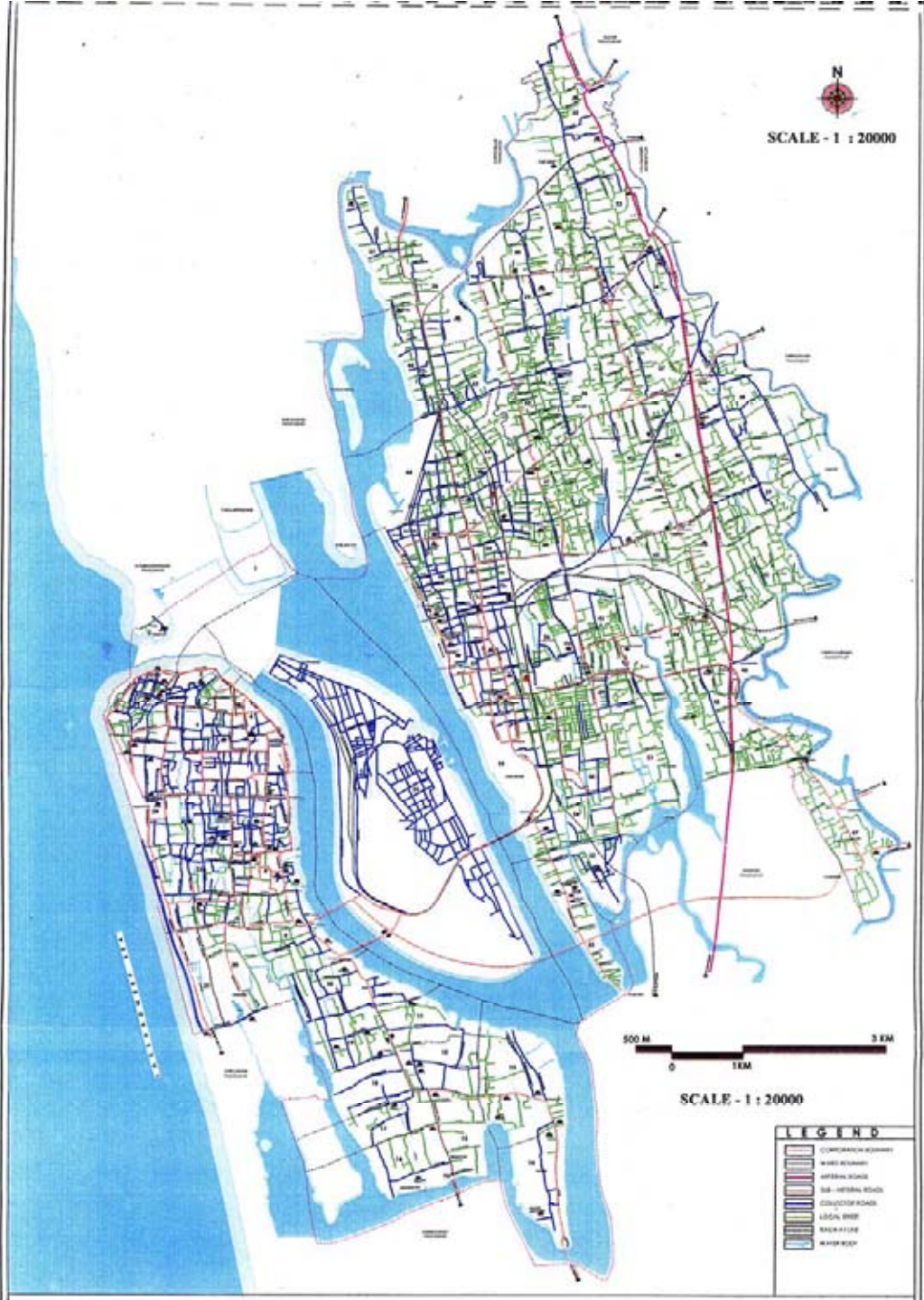
- The buses contribute about 14% of the vehicular traffic and carry 73% passenger traffic

- The share of cars in terms of vehicular trips is about 38% carrying 15% of the passenger.
- Two wheelers contribute 35% of vehicular traffic and 8% of passenger traffic
- Autorikshaws contribute about 13% of vehicular traffic and 4% of passenger traffic.

### **1.3.1. ROAD NETWORK**

The road network is constituted by a broken grid iron pattern. The main emphasis is on the north south axis with minor roads giving the east west connection. Undue concentration of services is seen in certain areas of the city. The lack of accessibility is caused by poor quality of roads, inadequate road width crossing of railway lines, canals and back waters. Main roads catering the core area are M.G road, Shanmugham road and Chittoor road running north south and there are only two east west corridors viz. Banerji road and S.A. road giving access to the core area. Trunk routes connecting the city are

**TRANSPORT NETWORK OF KOCHI CITY**





NH 17, NH47, NH 49, Kothamangalam –Thripunithura-Ernakulam road, and Ettumanoor- Thripunithura- Ernakulam road. The completion of Gosree bridges has converted Vypin road also as a trunk route connecting Kodungallur, Chavakkad and Ponnani through NH 17.

### 1.3.2. VEHICLE POPULATION AND GROWTH

The number of vehicles in Ernakulam District has increased from 91411 in 1989-1990 to 525204 in 2004-2005 showing an average annual growth rate of 13%. Two wheelers constituted the major share of vehicle population in Ernakulam District during the period between 1990 and 2005.

**Table 1.3: Growth of Vehicle Population in Ernakulam District.**

No.	Type of vehicle	1989-90	1994-95	2002-2003	2003-2004	2004-2005
1	Goods vehicle	12059	15315	36628	39874	43922
2	Bus/Minibus	2076	5176	9753	10931	12247
3	Car/Jeep/Van	24737	37481	71404	80448	91402
4	3-Wheelers	6219	17012	33478	35511	37629
5	2-Wheelers	44129	165250	283283	285221	326491
6	Others	2221	1547	12413	12937	13513
	Total	91441	241781	446959	464922	525204

Source: Economic Review, Kerala State Planning Board.

From 1990 to 2005 personal vehicles such as scooters/motorcycles and cars recorded a growth of 7.4 times and 3.7 times respectively. Buses and mini buses also increased by more than 5.8 times.

### **1.3.3. ISSUES AND CHALLENGES**

- Majority of traffic problems are concentrated along two east west corridors of the city
- The city is divided in to two parts by railway line.
- Improper traffic junctions
- Chronic parking problems in core areas
- Absence of pedestrian crossing facilities
- Absence of bus bays
- Insufficient carriageway width to accommodate high volume of traffic
- Narrow bridges and inadequate number of railway over bridges.
- Various types of encroachments
- Absence of proper link roads
- Unscientific route selection of public transport
- Absence of bus terminals.
- Concentration of commercial activities in core area.
- Overcrowding of old town areas like Fort Kochi and Mattancherry.
- Absence of mass rapid transportation system
- Absence of integration of different modes of transport.
- Uncontrolled increase in personal vehicles due to absence of adequate public transport system.
- Lack of increase in road length to accommodate the increasing vehicular density.
- Lack of awareness of traffic rules by public

### **1.4 APPROACH**

The solution to the problem of mobility can be classified in to short term, mid term and long term.

### **Short term solutions**

The issues connected with core commercial area like improper traffic junctions, absence of bus bays, terminals, and pedestrian paths etc. can be addressed now. Some of the issues are already taken up under KSUDP which include:

- Improvement of junctions including road marking, providing signals and retro reflective direction boards etc.
- Road safety measures to roads in the commercial area including providing foot path and drainage.
- Upgradation of roads.

### **Mid term**

The city is fast expanding towards eastern side with the establishment of Info park, Export Processing Zone, Education Institutions etc. The proposed Smart City will again intensify the development. Quick connectivity to the newly developed IT nerve centers from the city centre is an essential requirement for the smooth functioning of these centers. So hindrance free roads with adequate carrying capacity with properly designed grade separators at interchanges should be constructed for proper mobility. The widening of the existing roads and construction of new roads and flyovers should be taken up in the mid term plan along with proper surface water drainage facilities.

### **Long term.**

The city mobility plan should be formulated so as to take up the expected growth of the city with in the next two decades including guiding the growth of the city in a scientific manner. Providing a mass rapid transit system, introduction of a suburban rail traffic system, independent goods corridors, improvement of inland water transport system etc. should be the constituents of long term plan. The over

al development of the region between Main central road and the Kochin Corporation including the urban units of Perumbavoor, Aluva, Thripunithura, Ettumanoor, Angamali and Parumbavoor constituting an agglomeration may be considered in the formulation of long term plan. Eventually the Kochi agglomeration is going to expand up to the major towns of Thrissur in the North east, Kottayam, in the south east, Alappuzha in the south and Kodungallur in the north. Completion of a circular railway line by connecting Angamali or Aluva to Thripunithura and providing suburban traffic up to Thrissur, Kottayam and Alapuzha have to be included in the long term plan. Mass rapid transit system viz. Kochi Metro which is being formulated by DMRC also should be taken up.

## **SURVEYS**

### **2.0 GENERAL**

Various economic activities such as industry, infra structure development connected with port, IT and ITES etc are proposed in Kochi development area. All these activities will attract a large number of people from all parts of the country especially from the neighboring area. Rapid urbanization of the Kochi city and its influence area will be the result of these economic activities. Mobility plan of the city is envisaged to serve the city up to 2026. Various infra structure development work have been planned by several governmental and non governmental agencies such as PWD, KTDC, KINCO, Kochi port, GCDA, Cochin shipyard, KSIDC etc. For preparation of the mobility plan data available with PWD, Corporation, GCDA etc. were collected. Data available from various studies conducted by agencies like NATPC, RITES, KUDP, GCDA, DMRC etc were also studied in detail.

### **2.1 SURVEY PRELIMINARIES**

#### **2.1.1 ZONING SYSTEM**

The study on the survey regions were divided in to traffic zones for spatial distribution of traffic with in the study region. The Kochi corporation area has been divided in to 66 internal zones corresponding to the ward boundaries of the city. The area outside the corporation limits have been divided in to 53 outer zones. Two municipalities and the panchayaths falling with in the influence area of Kochi have been included in different zones

#### **2.1.2 SCREEN AND CORDON LINES**

Traffic survey details of nine screen line location conducted by NATPAC in 2005 is available for study .The screen line locations selected was on

1. Palarivattom on Edappally road

2. Kaloor thodu on Banerji road
3. R.O.B.on Banerji road
4. R.O.Bon Sahodaran Ayyappan Road
5. R.O.B. on bypass
6. Champakkara Bridge on Thripunithura road
7. Old Mattancherry bridge on Wellington-Mattancherry road
8. Venduruthy bridge on Wellington Island road
9. New Mattancherry bridge on Wellington-Mattancherry road

From the traffic volume on these locations Kaloor thodu on Banerji Road recorded the highest traffic volume of 57822 PCU followed by ROB at North over bridge (47827) PCU on Banerji Road and ROB at South (37211 PCU) on SA road. Category wise analysis of traffic movements showed that two wheelers constituted the majority of the traffic on all the screen line survey locations. Composition of two wheelers in the total traffic ranged from 32% to 59% of whole traffic and that of car ranged from 20% to 37% .On new Mattancherry bridge car constituted the majority of traffic (55%) followed by private bases (14%P).

To have an understanding of the volume of intercity passengers and goods movement pattern traffic count at main entry parts of the city located on intercity corridors is essential. The details from survey conducted by NATPAC at the following 11 locations have been adopted in this study.

**Table 2.1**

Name of the location	Name of Road
1. Near Kumbalangi bridge	Palluruthy Kumbalangi Road
2. Near Corporation Boundary	Chellanam road
3. Near GIDA bridge	High court Vypin Road
4. Near Bridge	Chittoor Road
5. Near Cheranallur	N.H. 47
6. Edappally Bridge	N.H. 47 Bypass
7. Near Thodu	Kakkanadu Road
8. Arakkadavu Bridge	Alinchuvadu Thrippunithara

9. Petta Bridge	Thrippunithura Road
10. Chembaka Bridge	N. H. 47 Bypass
11. Aroor old bridge	Old N.H. 47

**Table 2.2**  
**Summary of daily vehicular traffic at outer cordon survey locations In Kochi city**

Sl.No	Name of Location	Name of Road	In bound		Out bound		Total	
			No	PCU	No	PCU	No	PCU
1	Permpadappu	Palluruthy-Kumbalangi road	3,342	2,473	2,891	2,252	6,233	4,725
2	Chellanam	Thoppumpadi to Chellanam road	2,703	2,212	2,427	2,023	5,130	4,234
3	Near GIDA bridge	High court to Vypeen road	6,798	6,194	6,616	6,614	13,414	12,807
4	Near Bridge	Chittur road	4,459	4,059	4,603	3,977	9,062	8,036
5	Near cheranallur	NH-17	5,062	5,346	5,165	5,131	10,227	10,477
6	Edappally bridge	NH-47 & bypass	25,415	31,829	23,571	28,331	48,986	60,159
7	Near thodu	Kakkanad road	16,427	15,214	15,235	14,765	31,662	29,979
8	Arkkakadavu bridge	Alinchuvadu to Thrippunithura road	3,159	2,448	2,560	1,969	5,720	4,417
9	Petta bridge	Thrippunithura road	17,377	18,705	18,120	21,229	35,497	39,934
10	Thykoodam bridge	NH-bypass	12,999	16,674	16,238	21,242	29,237	37,915
11	Edakochi	NH-47	3,533	3,942	3,803	4,403	7,336	8,345

Source: NATPAC study report ,May,2006.

In addition to this details of survey conducted by RITES during 2000 at 6 outer cordon locations are also available for study which is shown in **Table 2.3**

**Table 2.3**

No.	Location	Inflow	Outflow	Total
1	N.H.47 towards Alapuzha	14108	13434	27542
2	Puthotta bridge (Kottayam road)	2553	1742	4295
3	Hill Palace jn.(towards Kottayam)	7391	7757	15148
4	Aluva – Perumbavoor road	10679	10127	20806

5	N.H.47 towards Thrissur	14851	13708	28559
6	N.H.17 towards Calicut.	3678	4354	8032
	Total	53260	51122	104382

Analysis of the outer cordon survey locations reveal that a maximum number of 48966 vehicles passed through the survey location at Edappally on NH 47 followed by 35497 vehicles through Pelta on Thripunithara Road, 31662 vehicles through Kakkanad Road. N.H. 47 towards Alapuzha and Aluva Perumbavoor Road are other points with high volume of traffic. About 41% of the total vehicles passing through the locations were two wheelers followed by 26% of cars 6.5% of passenger autorikshaws.

Composition of traffic at three outer cordon points are as detailed in **Table 2.4**

**Table 2.4**

SI. No	Type of vehicle	Chittoor road at Near bridge			NH-17 at Cheranullur			NH bypass and NH-17 at Edappally bridge		
		In bound	Out bound	Total	In bound	Out bound	Total	In bound	Out bound	Total
2	Private Bus	306	317	623	199	222	421	811	862	1,673
3	Other Buses	25	23	48	77	60	137	262	317	579
4	Mini-bus/Tempo	70	109	179	326	105	431	181	619	800
5	Car/Van/Jeep	776	700	1,475	1,441	1,214	2,655	7,763	7,330	15,093
6	Passenger auto rickshaw	490	401	891	226	239	465	1,743	1,550	3,293
7	Two-Wheeler	2,030	2,327	4,357	2,111	2,502	4,613	8,008	8,068	16,076
8	Mat	-	-	-	36	34	70	458	405	863
9	Truck	15	10	24	138	109	247	2,568	1,774	4,342
10	Mini-truck /tempo	156	28	184	85	243	328	1,950	1,304	3,254
11	Goods autorickshaw	178	185	363	147	156	303	1,195	964	2,159
12	Bi-cycle	407	496	903	149	168	317	194	99	293
13	Hand cart	-	-	-	-	-	-	-	-	-
14	Bullock cart	-	-	-	-	-	-	-	-	-
15	Others (Specify)	-	-	-	-	-	-	-	-	-
	<b>Total (No.)</b>	<b>4,459</b>	<b>4,603</b>	<b>9,062</b>	<b>5,062</b>	<b>5,165</b>	<b>10,227</b>	<b>25,415</b>	<b>23,571</b>	<b>48,986</b>
	<b>Total (PCU)</b>	<b>4,059</b>	<b>3,977</b>	<b>8,036</b>	<b>5,346</b>	<b>5,131</b>	<b>10,477</b>	<b>31,829</b>	<b>28,331</b>	<b>60,159</b>

Source: NATPAC study report, May, 2006.



### **2.1.3 SECONDARY DATA**

#### **CHARACTERISTICS OF EXISTING DEMAND OF TRAVEL**

Origin destination survey will give the proportion of bypassable traffic along the major external interaction areas. The purpose of journey, the type of vehicle and the average time taken for a trip will give the characteristics of existing travel demand. Pedestrians are also an important component of road users. Pedestrian demand also should be analyzed for a clear understanding of the characteristics of travel demand Kochi is served by four dominant modes of transport viz. Road, rail, water and air. Out of this road net work is the most widely spread penetrating to almost all the accessible points.

#### **Supply of traffic**

The modes of traffic catering Kochi city as already mentioned above constitute all mediums. A vast road net work served by arterial roads, sub arterial road, collector streets and local streets constitute the prime mode of traffic in the city. Due to various infra structure deficiencies the road net work even though gives access to almost all points fail to cater the travel demand. Rail transport system caters mainly to the needs of intercity and goods traffic. Railway lines offshoots to three directions from Kochi. They are Thiruvananthapuram, Via Alappuzha, Thiruvananthapuram, Via Kottayam and to Thrissur. Kochi is well connected to rest of the country and another part of the world by Air transport through Cochin International airport. Air port located in the proximity of two N.H.s viz. NH 47 and NH 17 is close to Thrissur corporation also. It is one of the major air ports in the country. Kochi has a good net work of inland water way system consisting of back Waters, canal, lagoon and estuaries. Kochi port, one of the major parts in the country is an all weather port very near to international sea route.

### **2.1.4 PRIMARY SURVEY**

## Road inventory

An understanding of the extent and quality of road network in a city is very important to assess its shortfall and propose remedial measures.

### Classification of Road

The roads in Kochi can be broadly classified in to

- a) Arterial roads serving as the principal network for through traffic flow accommodating significant intra urban travel and giving connectivity to outlying residential areas and suburban area.
- b) Sub arterial roads with same functions as that of arterial routes but with a lower level of mobility.
- c) Collector streets collecting traffic from local streets and feeding to major routes.
- d) Local streets giving access to abutting property and normally having low carrying capacity.

The length of road network under various classification is given in Table 2.5

**Table 2.5**

#### **Distribution of road network in Kochi city according to functional classification**

<b>Sl.No.</b>	<b>Type of road</b>	<b>Length (KM)</b>	<b>Percentage</b>
1	Arterial road	16.9	2.75
2	Sub-arterial road	53	8.63
3	collector street	151.4	24.66
4	Local Streets	392.665	63.96
	<b>Total</b>	<b>613.965</b>	<b>100</b>

Source: NATPAC study report, May, 2006.

## Type of road

The roads in Kochi corporation area is owned and maintained by PWD or Corporation. The length of various types of roads are given in Table 2.6

**Table 2.6**

### **Distribution of road network in Kochi city according to type of road**

<b>SL.NO</b>	<b>Type of road</b>	<b>Length (KM)</b>	
1	PWD road	72.1	11.74
2	Corporation road	541.865	88.26
	<b>Total</b>	<b>613.965</b>	<b>100.00.</b>

Source: NATPAC study report, May, 2006.

## Right of Way

The right of way of roads in Kochi varies from as low a value of less than 5m to more than 40 m. distribution of road network according to ROW is shown in **Table 2.7**

**Table 2.7**

### **Distribution of road network in Kochi City according to right -of-way**

<b>Sl.No.</b>	<b>Right of way (m)</b>	<b>Road length (km)</b>	<b>Percentage</b>
1	<5	325.604	53
2	10-20	214.887	35
3	20-30	49.117	8
4	20-30	18.418	3
5	>40	5.939	1
	<b>Total</b>	<b>613.965</b>	<b>100</b>

Source: NATPAC study report, May, 2006.

### Carriage way width

Carriage way width of almost all the roads is totally insufficient. Distribution as per carriageway width is shown in **Table 2.8**

**Table 2.8**

No	Carriageway width	Road length (km)	Percentage
1	Less than single lane	100.125	16.3
2	Single lane	347.68	56.6
3	Intermediate lane	81.295	13.2
4	Two lane	52.355	8.5
5	Three lane	4.05	0.7
6	>Four lane	28.46	4.7
	<b>Total</b>	<b>613.965</b>	<b>100</b>

Source: NATPAC study report, May, 2006.

### Surface type and condition of roads

The distribution of road network according to surface type and condition is shown in **Table 2.9**

**Table 2.9**

No.	Surface type		Good	Fair	Bad	Total
1	Bituminous	Km	192.74	263.28	99.43	55.45
2	Bituminous	%	34.7	47.4	17.9	100
3	Cement Concrete	Km	28.24	1.84	0.62	30.7
4	Cement Concrete	%	91.99	5.99	2.02	100

5	WBM	Km	4.21	2.53	9.95	16.69
6	WBM	%	25.22	15.16	59.62	100
7	Earthen	Km	2.21	3.47	5.455	11.135

Source: NATPAC study report, May, 2006.

### Foot path and drainage

**Table 2.10**

#### Distribution of road network in Kochi city according to availability of footpath and drainage facility

Sl.No	Availability of footpath	Percentage of road length	Availability of drain	Percentage of road length
1	Footpath on one side	2	Covered drain	8
2	Footpath on both sides	6	Uncovered drain	68
3	No Foot Path	92	No drain	24
	<b>Total</b>	<b>100</b>	<b>Total</b>	<b>100</b>

Source: NATPAC study report, May, 2006.

### Street lighting

**Table 2.11**

#### Availability and type of street lighting in Kochi City

Sl.No.	Availability of street Lighting	Percentage	
1	Street light available		84
	Fluorescent	28	
	Sodium vapor	72	
	Total	100	
2	Not available		16
	<b>Total</b>		<b>100</b>

Source: NATPAC study report, May, 2006.

## Abutting land use

**Table 2.12**

### Distribution of road network in Kochi city according to abutting land use

Sl.No.	Type of abutting	Length of road (km)	Percentage of road Length
1	Residential	373.297	60.8
2	Mixed land use	67.537	11
3	Public & semipublic	57.1	9.3
4	Commercial	97.008	15.8
5	Others	19.033	3.1
	<b>Total</b>	<b>613.975</b>	<b>100</b>

Source: NATPAC study report, May, 2006.

## Speed delay survey

Details of speed delay survey conducted by NATPAC in 2005 was studied in detail. The assessment of journey speed gives an idea of the travel time required for access between source and destination.

**Table 2.13**

### Distribution of road length by peak and off-peak hour journey speed in Kochi city

Journey Speed (Km/Hr)	Peak Period		Off-peak period	
	Road length in (Kms.)	Percentage (%)	Road length in Kms.	Percent age (%)
<10	7.1	4.37	0	0
10-20	47.45	29.24	14.6	9
20-30	53.55	33	39.2	24.2
30-40	40.6	25.01	63.3	39
40-50	10.8	6.65	34.6	21.3
>50	2.8	1.73	10.6	6.5
<b>Total</b>	<b>162.3</b>	<b>100</b>	<b>162.3</b>	<b>100</b>

Source: NATPAC study report, May, 2006.

**Table 2.14****Distribution of road length by peak and off-peak hour running speed in Kochi city**

<b>Journey Speed (Km/Hr)</b>	<b>Peak Period Road length in (Kms.)</b>	<b>Road length in (Kms.)</b>	<b>Off-peak period Road length in Kms.</b>	<b>Percentage (%)</b>
<10	6.7	4.1	0	0
10-20	38.45	23.7	12.9	7.9
20-30	54.75	33.7	31.9	19.6
30-40	33.6	20.7	61.6	38
40-50	21.1	13.00	36.30	22.4
>50	7.7	4.8	19.6	22.4
<b>Total</b>	162.3	100	162.3	100

Source: NATPAC study report, May, 2006.

**Table 2.15****Distribution of causes of delays during peak hour in Kochi City**

<b>SI. No</b>	<b>Causes of Delays</b>	<b>Delay time (sec)</b>	<b>Percentage</b>
1	Intersection	893	41.2
2	Congestion	419	19.4
3	Railway Level Crossing	250	11.6
4	Stopped vehicle	241	11.1
5	Signal	144	6.7
6	Bus stop	128	5.9
7	Pedestrian	89	4.1
	<b>Total</b>	<b>2,164</b>	<b>100</b>

Source: NATPAC study report, May, 2006.

**2.1.5 CLASSIFIED TRAFFIC VOLUME COUNT**

The data available from the traffic volume count is analyzed for the understanding of the volume handled by the road and to assess the requirement of width of carriageway to cater the traffic.

**Table 2.16 Traffic volume observed at Screen line survey points (12 hours)**

Sl.No.	Direction	KSRTC Bus	Private Bus	Other buses	Mini-bus/Tempo	Car/Van/Jeep	Passenger autorickshaw	Two-Wheeler	MAT	Truck	Mini-truck/shaw	Goods autorickshaw	Bi-cycle	Hand cart	Bullock cart	Others (Specify)	Total (Nos.)	Total (PCU)
1	Old Mattacherry Bridge	Willingdon-Mattanchery road																
	To Thoppumpady	-	-	-	-	9	1,012	7,803	-	-	-	705	580	7	-	-	10,116	5,946
	to Kochi	-	-	-	-	6	713	8,139	-	-	-	380	319	1	-	-	9,558	5,332
	<b>Total</b>	-	-	-	-	<b>15</b>	<b>1,725</b>	<b>15,942</b>	-	-	-	<b>1,085</b>	<b>899</b>	<b>8</b>	-	-	<b>19,674</b>	<b>11,278</b>
Composition(%)	-	-	-	-	0.08	8.77	81.03	-	-	-	5.51	4.57	0.04	-	-		100	
2	BOT Bridge	Willingdon-Mattanchery road																
	To Thoppumpady	115	778	109	56	3,031	-	104	83	286	394	9	343	-	-	-	5,308	8,176
	To Kochi	115	729	50	150	2,823	-	550	52	362	463	-	126	-	-	-	5,420	8,083
	<b>Total</b>	<b>230</b>	<b>1,507</b>	<b>159</b>	<b>206</b>	<b>5,854</b>	-	<b>654</b>	<b>135</b>	<b>648</b>	<b>857</b>	<b>9</b>	<b>469</b>	-	-	-	<b>10,728</b>	<b>16,259</b>
Composition(%)	2.14	14.05	1.48	1.92	54.57	-	6.1	1.26	6.04	7.99	0.08	4.37	-	-	-		100	
3	ROB-South	S.A road																
	To Kadavunthura	180	1,505	208	223	4,686	3,334	6,537	4	37	178	777	110	3	-	-	17,782	18,542
	To Pallimukku	163	1,508	148	228	4,649	2,725	7,595	2	52	168	1,199	123	6	-	-	18,564	18,669
	<b>Total</b>	<b>343</b>	<b>3,013</b>	<b>356</b>	<b>451</b>	<b>9,335</b>	<b>6,059</b>	<b>14,132</b>	<b>6</b>	<b>89</b>	<b>334</b>	<b>1,976</b>	<b>233</b>	<b>9</b>	-	-	<b>36,346</b>	<b>37,211</b>
Composition(%)	0.94	8.29	0.98	1.24	25.68	16.67	38.88	0.02	0.24	0.95	5.44	0.64	0.02	-	-		100.00	
4	ROB-North	Banerji road																
	To Kacheripadi	256	2,428	204	167	6,115	3,440	12,183	11	121	106	260	25	-	-	-	25,316	25,405
	To Kaloor	206	1,989	184	75	6,505	4,299	11,466	-	14	345	450	116	-	-	2	25,651	24,862
	<b>Total</b>	<b>462</b>	<b>4,137</b>	<b>388</b>	<b>242</b>	<b>10,620</b>	<b>7,739</b>	<b>23,649</b>	<b>11</b>	<b>135</b>	<b>451</b>	<b>1,110</b>	<b>141</b>	-	-	<b>2</b>	<b>50,967</b>	<b>47,827</b>
Composition (%)	0.91	8.12	0.76	0.47	20.84	15.18	46.40	0.02	0.26	0.88	2.18	0.28	-	-	0.00		100.00	
5	Vonduruthi Bridge	Willington Island road																
	To Willington Island	123	829	62	114	2,837	733	7,173	-	1	79	458	721	-	-	5	13,135	11,330
	To Thovera	130	836	36	111	3,355	450	9,330	-	50	71	290	138	-	-	-	14,797	12,258
	<b>Total</b>	<b>253</b>	<b>1,765</b>	<b>98</b>	<b>225</b>	<b>6,192</b>	<b>1,183</b>	<b>16,503</b>	-	<b>51</b>	<b>150</b>	<b>748</b>	<b>859</b>	-	-	<b>5</b>	<b>27,932</b>	<b>23,888</b>
Composition (%)	0.91	6.32	0.35	0.81	22.17	4.24	59.08	-	0.18	0.54	2.68	3.08	-	-	0.02		100.00	



**Table 2.17**

**Traffic Volume count (12 hours) on major links in Kochi city**

Sl. No.	Name of road sections		KSRTC Bus	Private Bus	Other Buses	Mini-bus/Tempo	Car/Van/Jeep	Passenger autorickshaw	Two-Wheeler	MAT	Truck	Mini-truck/tempo	Goods autorickshaw	By-cycle	Hand cart	Bullock cart	Others (Specify)	Total (Nos)	Total (PCU)
	<b>1. OLD NH</b>																		
1	Edakochi	Kumbalagi vazhi	380	38	39	73	819	240	2,594	94	241	289	220	369	2	-	1	5,399	5,833
2	Kumbalangl vazi	Thoppumpadi	388	914	41	87	2,252	1,228	7,186	74	163	406	529	545	5	-	-	13,820	13,489
3	Thoppumpadi	Thevara	253	1765	98	225	6,192	1,183	16,503	-	51	150	748	859	-	-	5	28,032	23,888
4	Thevara Jn	Pallimukku	489	3412	189	121	6,548	2,558	12,007	-	15	142	1,617	747	-	-	-	27,845	29,810
5	Pallimukku	Jos	534	3724	207	88	7,783	3,003	17,905	-	88	378	1,898	418	-	-	-	36,026	36,204
6	Jos	Madhava Pharmacy	359	1,534	93	136	7,736	3,942	27,281	-	126	149	2,493	556	3	-	3	44,410	34,873
7	Madhava Pharmacy	Kaloor	462	4,137	388	242	10,620	7,739	23,649	11	135	451	1,110	141	-	-	2	49,087	47,827
8	Kaloor	Palarivattam	494	4,623	219	323	15,146	3,914	35,352	6	163	1,144	1,410	901	9	-	-	63,704	57,357
9	Palarivattam	Edapally Jn	497	2,112	288	319	6,588	2,492	18,088	13	220	837	1,183	406	4	-	-	33,047	30,670
	<b>II. Ravipuram-BTH-HIGH CORUT -MADHAVA PHARMACY ROAD</b>																		
1	Ravipuram Jn	BTH Jn	-	297	33	114	3,246	1,953	7,603	-	99	261	333	1,233	8	-	-	15,178	11,832
2	BTH	High Court	333	4,074	196	466	12,103	5,616	14,813	28	124	818	1,553	226	3	-	3	40,555	43,244
3	High court	Madhava Pharmacy	279	4,087	145	322	10,176	4,096	10,057	28	121	750	1,307	138	-	-	3	31,509	36,319

Source: NATPAC study report, May, 2006.

## 2.1.6 INTERSECTION TURNING MOVEMENT SURVEY

Traffic at instructions will have great influence on the capacity of urban roads. Assessment of turning movement of vehicles at intersection could be used in the design of intersections, in planning traffic signals and other control devices. Turning movement survey conducted at 39 intersections by NATPAC is studied for the preparation of the report.

**Table 2.18 Peak hour Traffic volume on major Intersection in Kochi City**

Sl. No.	Name	Peak Hour	No. of arms	Total Junction volume (PCU)	Type of traffic control
1	Palluruthy	08.45 AM TO 09.45 AM	3	1,464	UC
2	Thoppumpady	09.15 AM TO 10.15 AM	3	2460	UC
3	Willington Island	09.45 AM TO 10.45 AM	4	2443	UC
4	Thevara	03.00 PM TO 04.00 PM	3	3527	UC
5	Atlantis	09.45 AM TO 10.45 AM	3	4258	UC
6	Ravipuram	10.00 A.M TO 11.00 A,M	4	5124	P
7	Pallimukku	05.00 PM TO 06.00 PM	4	4847	S
8	Jos	10.45 AM TO 11.45 AM	4	5395	UC
9	Maharaja	11.00 AM TO 12.00 PM	4	5386	S
10	Shenoys	11.00 AM TO 12.00 PM	4	3712	S
11	Abad	03.00 PM TO 04.00 PM	3	3574	P
12	Padma	03.00 PM TO 04.00 PM	4	4225	S
13	Madava Pharmacy	10.45 AM TO 11.45 AM	3	3935	S
14	Kacherippady	09.00 AM TO 10.00 AM	4	5621	P
15	North (Town Hall)	09.00 AM TO 10.00 AM	3	6409	S
16	Lissie	09.00 AM TO 10.00 AM	4	6153	P
17	Stock Exchange	09.00 AM TO 10.00 AM	4	6033	P
18	Kaloor	09.00 AM TO 10.00 AM	4	6326	
19	Desabhimani	09.00 AM TO 10.00 AM	4	4210	UC
20	Palarivattom	05.30 PM TO 6.30 PM	4	4523	P
21	Edappally Bypass	06.00 PM TO 06.30 PM	4	7717	S
22	BTH	05.00 PM TO 06.00 PM	3	2381	P
23	Hospital	04.45 PM TO 05.45 PM	3	3394	P
24	High Court	05.45 PM TO 06.45 PM	4	4680	S
25	KSRTC	03.30 PM TO 04.30 PM	4	1880	UC
26	South	04.45 PM TO 05.45 PM	4	4541	UC
27	Valanjambalam	03.45 PM TO 04.45 PM	4	4015	P
28	Manorama	11.00 AM TO 12.00 PM	3	6098	P
29	GCDA	09.00 AM TO 10.00 AM	4	4906	S
30	Kadavanthara	10.00 AM TO 11.00 AM	4	3959	P
31	Vyttila	11.00 AM TO 12.00 PM	4	8721	S
32	Palarivattam Bypass	04.30 PM TO 05.30 PM	4	7356	S

33	Santhi Nagar	05.00 PM TO 06.00 PM	4	2231	S
34	Kathrikkadavu	05.45 PM TO 06.45 PM	4	3271	SUC
35	Thammanam	05.30PM TO 06.30 PM	4	1607	UC
36	Elamakkara	05.30 PM TO 06.30PM	4	992	UC
37	Kalppalandimukku	03.45 PM TO 04.45 PM	4	1278	UC
38	Koovappadam	03.45 PM TO 04.45 PM	4	1199	UC
39	Saudia	10.15 AM TO 11.15 AM	3	774	UC

Source: NATPAC study report, May, 2006.

### 2.1.7 ORIGIN DESTINATION SURVEY

The intercity passengers and goods movement can be studied with the help of origin destination survey. The details of O.D. survey conducted by Natpac in 11 locations in Kochi have been adopted for the preparation of this report.

### 2.1.8 HOUSEHOLD SURVEY

To study the socio economic and travel characteristics the details available from household travel survey carried out by different agencies have been adopted. A total of 7400 household interviewed in Kochi CDP area representing all traffic zones are available. The socio economic characteristics are enumerated in the tables below.

**Table 2.19 Household Distribution by size**

Household size	No. of Households	Percentage	Cumulative percentage
<=3	2021	27.3	27.3
4	2047	27.7	55
5	1957	26.4	81.4
6	998	13.5	94.9
More than 6	377	5.1	100
Total	7400	100	

Source:RITES report August2001

**Table 2.20 Distribution of sampled population by age structure**

Table 3.35 Category	Age	structure					
	<=5	6-20	21-35	36-45	45-60	>60	
Male	941	4411	5724	3313	3411	1804	19604
%	4.8	22.5	29.2	16.9	17.4	9.2	100
Female	771	3874	5764	3231	2901	1817	18358
%	4.2	21.1	31.4	17.6	15.8	9.9	100
Total	1712	8284	11489	6544	6312	3621	37962
%	4.5	21.8	30.3	17.2	16.6	9.5	100

Source:RITES report August2001

**Table 2.21 Education and qualification**

Category	Uneducated	Below matric	Matric	+2	Degree/Dip	P.G	Total
Male	706	5.38	6254	4019	3019	569	19604
%	3.6	25.7	31.9	20.5	15.4	2.9	100
Female	955	5214	5893	3415	2497	386	18358
%	5.2	28.4	32.1	18.6	13.6	2.1	100
Total	1660	10252	12147	7433	5516	954	37962
%	4.4	27.0	32.0	19.6	14.5	2.5	100

**Table 2.22 -Occupational characteristics**

Sex	Govt.	Pvt.	Business	Stud.	House wife	Retired	Un-employed	Other	Total
Male	1313	6646	2764	4234	-	1157	2568	921	19604
	6.7	33.9	14.1	21.6		5.9	13.1	4.7	100
Female	330	1046	92	3653.	10795	294	1377	771	18358
	1.8	5.7	0.5	19.9	58.8	1.6	7.5	4.2	100
Total	1644	7692	2856	7888	10795	1450	3945	1692	37962
	4.3	20.3	7.5	20.8	28.4	3.8	10.4	4.5	100

Source:RITES report August, 2001

**Table 2.23 House hold vehicle ownership**

Vehicles owned	House holds	Percentage
None	3862	52.2
Car	209	2.8
Two wheeler	1043	14.1
Cycle	1428	19.3
Car& two wheeler	234	3.2
Car& cycle	87	1.2
Car/ two wheeler/ cycle	104	1.4
Two wheeler/ cycle	433	5.9
Total	7400	5.9

Source:RITES report August2001

**Table 2.24 Modal share of passenger Trips**

Mode	Home Trips	Based Percentage	Non-home	Based Percentage	Trips	Total Percentage
Bus	908563	72.19	60840	74.87	969403	72.35
Car	49568	3.94	4647	5.72	54215	4.05
Two wheeler	74865	5.95	5356	6.59	80221	5.99
Auto	62365	4.96	1377	1.69	63742	4.79
Cycle	32186	2.56	1488	1.83	33674	2.51
Ferry	125729	9.99	4900	63.03	130629	9.75
Train	5284	0.42	2654	3.27	7938	0.59
Total	1258560	100.0	6205	100.0	133982	100.0

Walk	110484	94.7	6205	5.3	116688	8.0
Total with walk trips	1369044	94.0	87467	6	1456510	100.0

Source: RITES report August 2001

### 2.1.9 PUBLIC TRANSPORT OPERATOR SURVEY

The important public transport system catering Kochi is Bus transport. Travel demands of majority of the people in and Kochi is met by Bus transport system.

**Table 2.25 Percentage Distribution of private buses according to Kilometer operated per day**

S. No.	Kilometre operated/day	Percentage of buses
1	< 200	10
2	201 - 250	14
3	251 - 300	68
4	301 - 350	8
	Total	100

Source: NATPAC study report, May, 2006.

**Table 2.26 Percentage Distribution of private buses according to Passenger carried per day**

S. No.	Kilometer operated/day	Percentage of buses
1	< 500	12
2	500-750	19
3	750-1000	31
4	1500-2000	13
	<b>Total</b>	<b>100</b>

Source: NATPAC study report, May, 2006.

### 2.1.10 Intermediate public transport system

Intermediate public transport system comprises of Autorikshaw, jeeps, vans and taxis. In cities IPT modes play an important role in the transportation system. They help to reduce the inadequacy of public transportation system to a certain extent. The IPT is gradually becoming an important mode of the transport system

of Kochi city as the city is witnessing rapid strides in economic development and hitherto undeveloped areas with limited accessibility.

Growth of IPT vehicles

**Table 2.27 Growth of Intermediate public transport modes in Ernakulam district and Kerala State**

Sl. No.	Intermediate Public Transport mode	No. of vehicles in		Percentage Increase
		2003	2004	
<b>Ernakulam District</b>				
1	Taxi	9,331	10,362	11.05
2	Auto rickshaw	33478	35511	6.07
<b>Kerala State</b>				
1	Taxi	88,070	285,092	6.11
2	Auto Rickshaw	285,092	303,092	6.31

Source: NATPAC study report, May, 2006.

**Table 2.28 Percentage distribution of IPT Vehicles according to distance operated per day ( including dead kilometers)**

Sl. No.	Distance operated (Km)	Percentage of Ipt Vehicles	
		Taxi	Auto Rickshaw
1	Up to 50	31	22
2	51- 75	25	46
3	76-100	15	14
4	101-150	13	10
5	> 150	16	8
	Total	100	100

Source: NATPAC study report, May, 2006.

### 2.1.11 Parking survey

Uncontrolled vehicles growth is a byproduct of urbanization and economic development. The necessity of locating and regulating parking spaces for vehicles is major problem in Kochi as in other cities. Haphazard street parking becomes a menace resulting in traffic congestion and consequent reduction in capacity.

**Table 2.29 Maximum on-street parking accumulation along other major roads in Kochi city**

S. No.	Section	Mini Bus	Car	Two Wheeler	Passenger Auto	Goods Auto	Mini Truck	BI-cycle	others	Total ( No. of veh)	Total (ECS)
	I. Shanmugham Road										
1	High Court to Menaka	0	35	54	0	2	0	4	0	95	50
2	Menaka to Annie Beasant Park	3	109	166	10	3	8	10	0	309	176
	Total	3	144	220	10	5	8	14	0	404	226
	II. Market Road										
1	HPO - Convent	0	24	32	18	5	4	13	1	97	53
2	Convent - Jew Street	1	23	59	48	31	7	43	0	212	98
3	Jew street - Global Exchange	14	15	54	15	32	13	14	4	161	99
	Total	15	62	145	81	68	24	70	5	470	250
	III. Borad way										
1	St. Immanuel - Canara	0	57	85	10	4	8	7	0	171	99
2	Canara - Main Market	0	17	163	17	11	7	130	4	349	112
3	Main Market - Commissioner Office	2	53	73	16	16	8	11	4	183	108
	<b>Total</b>	<b>2</b>	<b>127</b>	<b>321</b>	<b>43</b>	<b>31</b>	<b>23</b>	<b>148</b>	<b>8</b>	<b>703</b>	<b>319</b>

Source: NATPAC study report, May, 2006.

### 2.1.12 Pedestrians survey

In a country like India pedestrians form a major component of road users. A significant proportion of trips are performed by walk. Due to absence of foot path and railing pedestrian spill over is very high obstructing vehicular traffic and increasing accidents. Pedestrians are the most valuable road users. Pedestrians vehicle ratio.

**Table 2.30 Pedestrian-vehicle conflict at problematic locations in Kochi city**

Sl. No.	Location	Name of road	Peak Hour	Total pedestrian volume	Corresponding traffic volume
1	Ravipuram Jn	MG Road	8.45-9.45	377	4036
2	South Jn	Chittur Road	3.30-4.30	594	2120
3	Ground	MG Road	9.30-10.30	293	4433
4	Jos Jn	MG Road ( North)	9.15-10.15	581	3575
5	Jos Jn	MG Road (South)	9.15-10.15	510	4065
6	Kacheripadi	Chittoor Road	5.00-6.00	566	1058
7	Kacheripadi	Banerji Road	3.15-4.15	495	3698
8	Kadavunthara	Kaloor Road	5.00-6.00	268	1448
9	Kadavunthara	S.A. Road	5.30-6.30	370	2880
10	Vyttila	Bypass Road (Kundanoor side)	5.45-6.45	338	4744
11	Vyttila	Bypass Road (Edapally side)	4.45-5.45	514	5210
12	Vyttila	Thripunithura road	5.15-6.15	721	3145
13	Town Hall	Banerji Road	9.15-10.15	499	5438
14	Pallimukku	MG Road	9.30-10.30	660	4940
15	Pallimukku	S.A. Road	10.45-11.45	1213	1220
16	Manorama	S.A. Road	8.45-9.45	725	4880
17	Palarivattom	Kakanadu Road	4.00-5.00	839	3869
18	High Court	Banerji Road	5.30-6.30	1330	3466
19	High Court	Shanmughom road	5.30-6.30	2183	4207
20	St. Antony's Church	Between Kaloor and Palarivatom	9.15-10.15	227	5185
21	Padma	MG Road	8.45-9.45	562	3614
22	Shenoy	MG Road	9.00-10.00	609	3368
23	Dwaraka	MG Road	8.45-9.45	328	3417
24	Edapally	NH 47 toward Palarivattom	3.15-4.15	528	3464
25	Edapally	NH 47 Bypass	6.00-7.00	388	5427
26	Thoppumpady	BOT bridge	8.15-9.15	339	1688
27	Kaloor	Banerji Road	8.30-9.30	1156	5243
28	Boat Jetty	Shanmughom road	8.45-9.45	614	3082
29	Menaka	Shanmughom road	4.45-5.45	2479	4207
30	Opposite Cineplex	Banerji Road	9.00-10.00	209	2317

Source: NATPAC study report, May, 2006.

### 2.1.13 TERMINAL SURVEY

#### (a) Bus terminal

Except for Kaloor and KSRTC bus station terminal facilities are not available at any of the places with in Kochi city and have often parked road side creating traffic problem.



**Table 2.31 Number of buses operated to various routes from KSRTC Station in Kochi**

Sl. No.	bus route	No. of ordinary buses	No. of fast passenger/express buses	Total buses
1	Cherthala side	6	11	17
2	Thripunithara side	13	17	30
3	Aluva side	1	10	11
4	Cheranalloor side	4	2	6
5	Chellanam side	2	0	2
6	GIDA bridge side	1	0	1
7	Inter State		18	18
	<b>Total</b>	<b>27</b>	<b>40</b>	<b>85</b>

Source: NATPAC study report, May, 2006.

**Table 2.32 Major routes of inter-city private buses operated from Kaloor bus terminal in Kochi city**

Sl. No.	Origin	Major destination	No. of buses	No. of tips
<b>Towards Cherthala direction</b>				
1	Ernakulam	Cherthala, Eramalloor Poochakkal, Arookutty	85	750
2	Pukkattupady	Eramalloor, Arookutty, Keltron Ferry	12	90
3	Kakkanadu	Eramalloor, Arookutty, Keltron Ferry	15	120
		<b>Sub-total</b>	<b>112</b>	<b>960</b>
<b>Towards Thrippunithura direction</b>				
4	Kakkanadu	Perumbavoor, Vaikkam Piravam	12	75
5	Ernakulam	Perumbavoor, Piravam, Koothattukulam, Pattimattam, Muvattupuzha, Thalayolaparambu, Kootayam, Thodupuzha	148	744
		<b>Sub - Total</b>	<b>160</b>	<b>819</b>
		<b>Total</b>	<b>272</b>	<b>1,779</b>

Source: NATPAC study report, May, 2006.

**Table 2.33 Major route and trips of inter-city private buses operated on northern side of Kochi City**

Sl. No.	Origin	Major destination	No. of buses	No. of trips
1	Ernakulam	North Paravoor (Via Varapuzha & Pathalam)	40	320
2	Ernakulam	North Paravoor (Via Kalamassery)	2	12
3	Ernakulam	North Paravoor (Via, Manjummel)	16	96
4	Ernakulam	North Paravoor (Via. Cherai)	96	864
5	Ernakulam	Munambam	29	290
6	Ernakulam	Munambam (Via Paravoor)	6	36
7	Ernakulam	Njarakkal	17	289
		<b>Total</b>	<b>206</b>	<b>1,907</b>

Source: NATPAC study report, May, 2006.

**(b). Goods terminal**

Even though more than 26000 trips carrying about 87000 of various types of goods are transported every day through Kochi a proper goods terminal is absent in the city.

**Table 2.34 Distribution of goods vehicle trips through outer cordon points according to pattern of movement in Kochi City.**

Sl. No.	Purpose	Vehicle			Total	
		Truck	Mini-truck	Goods auto	No.	Percent
	<b>I. TOTAL TONNAGE</b>					
1	Internal to Internal	652	52	13	717	0.89
2	Internal to Internal	16990	5206	922	23118	28.61
3	External to Internal	22584	7224	1296	31104	38.5
4	External to Internal	22.379	3.206	273	25858	32
	Total	62.605	15688	2504	80797	100
	Percent	77.48	19.42	3.1	100	
	<b>II. VEHICLE TRIPS - TOTAL</b>					
1	Internal to Internal	85	37	54	176	0.67
2	Internal to Internal	3414	3156	2744	9314	35.65
3	External to Internal	4298	3950	2897	11145	42.66
4	External to Internal	3379	1547	567	5493	21.02
	Total	11176	8690	6262	26128	100
	Percent	42.77	33.26	23.97	100	
	<b>III. VEHICLE TRIPS - LOADED</b>					
1	Internal to Internal	50	27	47	124	0.62
2	Internal to Internal	2350	2311	2039	6700	33.38
3	External to Internal	3694	2953	1994	8641	43.05
4	External to Internal	2994	1198	414	4606	22.95
	Total	9088	6489	4494	20071	100
	Percent	45.28	32.33	22.39	100	
	<b>IV. VEHICLE TRIPS - EMPTY</b>					
1	Internal to Internal	35	10	7	52	0.86
2	Internal to Internal	1067	845	705	2614	43.16
3	External to Internal	604	997	903	2504	41.35
4	External to Internal	385	349	152	886	14.63
	Total	2088	2201	1767	6056	100
	Percent	34.48	36.34	29.18	100	

Source: NATPAC study report, May, 2006.

**2.1.14 TOURIST MOVEMENT**

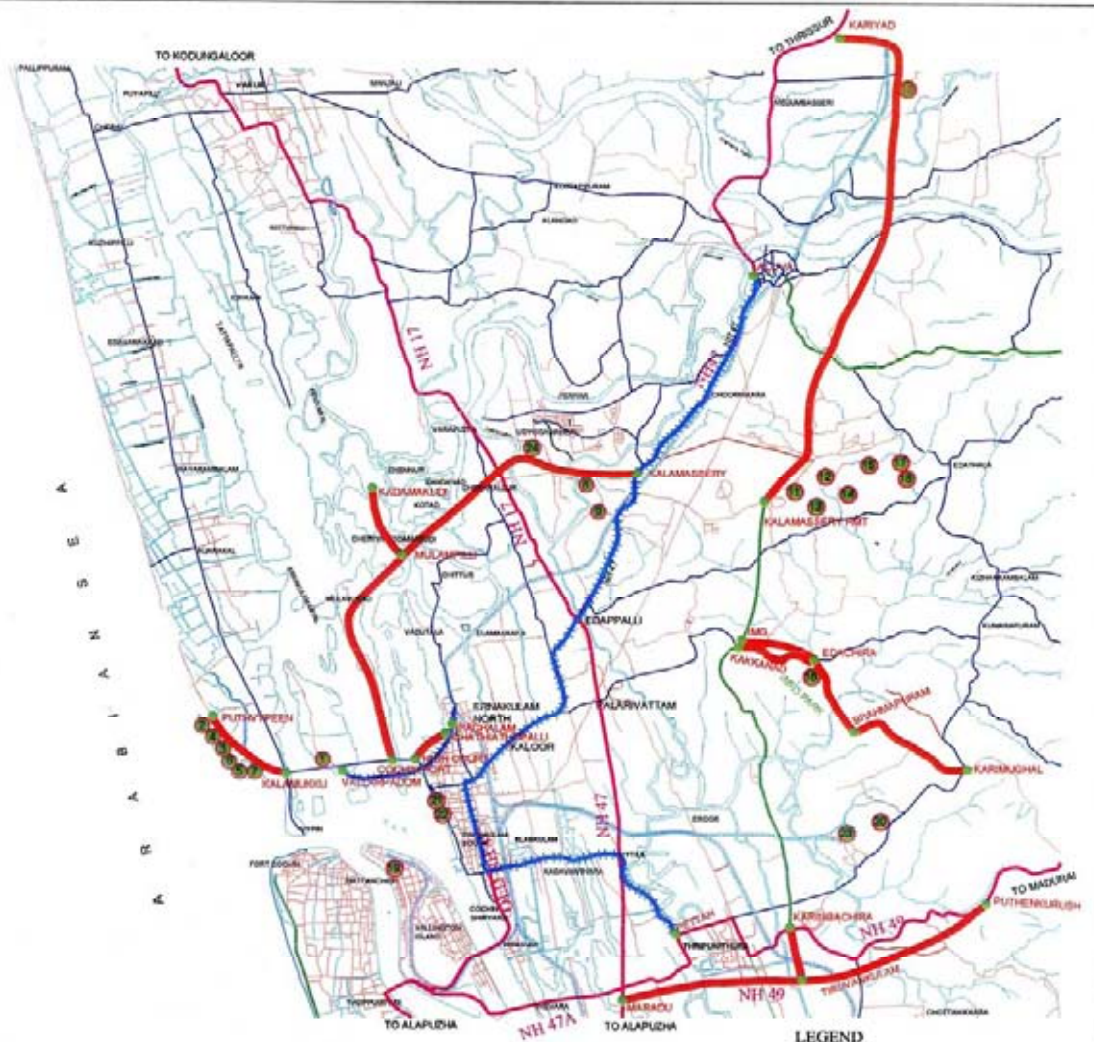
Kochi is blessed with numerous places of tourist interest. On an average 60,000 foreign and 700,000 domestic tourists are attracted to Kochi every year. Most of

the tourist locations are connected by road and water. Water transport would be a comfortable and attractive mode transportation for Tourists.

**Table 2.35 P. 129 of Rites**

Number of days of stay	Torist groups	Percentage
Up to5	226	75.33
6-10	58	19.33
>10	16	5.33
Total	300	100.00

Source: NATPAC study report, May, 2006.



- 1. International Container Transshipment Terminal
- 2. LNG Regasification Terminal
- 3. International Bunkering Terminal
- 4. International Ship Repair Complex
- 5. Crude Oil storage facilities
- 6. International Cruise Terminal
- 7. Port Based Special Economic Zone
- 8. Expansion of existing Chemical Plant
- 9. Expansion of Aluminium Extrusion Plant
- 10. Land utilization plan for  
Cochin International Air Port Limited
- 11. Bio - Technology zone
- 12. SEZ for electronics

- 14. Academic zones
- 15. Commercial and Residential Zones
- 16. IT Township at Infopark
- 17. Land Acquisition for Special Economic Zone (SEZ)
- 18. Reclamation for streamlining of flow in the Port Channel for reducing siltation and for future development works
- 19. Capital Dredging of Navigational Channels
- 20. Petro Chemical Copmplex
- 21. Water Sports and Tourism related operation of Tourist Vessels
- 22. Tourist Submarine at Kochi
- 23. Treatment Storage and Disposal facility
- 24. Setting up of BOOT/Joint Venture Projects at FACT

**LEGEND**

- ROAD DEVELOPMENT PROPOSALS
- EXISTING RAIL WAY LINE
- PROPOSED METRO RAIL
- PROPOSED RAIL CONNECTIVITY
- MAJOR DEVELOPMENT PROPOSALS
- WATER BOODS
- NATIONAL HIGHWAY
- STATE HIGHWAY
- MAJOR DISTRICT ROADS
- OTHER ROADS

**LOCATION OF MAJOR DEVELOPMENT PROJECTS ENVISAGED BY VARIOUS AGENCIES IN AND AROUND KOCHI CITY**

### **3. TRAFFIC ANALYSIS**

#### **3.0 GENERAL**

For preparation of the city motility plan first the details and findings available in surveys conducted by various agencies have been listed out in the previous chapter. In this chapter an analysis of the findings of the surveys are done to assess the deficiencies and to have an understanding on the area requiring improvement

#### **3.1 DAILY TRAFFIC**

##### **3.1.1 OUTER CORDON**

Analysis of volume count at outer cordon survey locations reveals that a maximum number of 48986 vehicles entered or exited the city through Edappalli Bridge on NH 47 followed by 35, 497 vehicles through Petta on Thripunithara road ,31,662 vehicles through Kakkanad Road. About 41% of the total vehicles were two wheelers followed by 26% of cars ad 6.5% of passenger autorikshaws . Out of the 11 survey locations 4 locations showed total traffic count of more than 20000 PCU. Thripinithara Road, NH bypass and Kakkanad Road require more than 6 lane carriageway.

##### **3.1.2 SCREEN LINE**

From the analysis it is seen that Kaloor Thodu on Banerji road recorded the highest traffic volume of 57822 PCU followed by R.O.B at North over bridge on SA road (37211 PCU) Composition OF two wheelers ranged from 32% to 59% while that of car from 20 to 37. Out of the 9 screen line survey points the total PCU was less than 20000 at only two points. But only two roads have 4 lane carriage way to accommodate more than 20,000 PCU.

### **3.1.3 VARIATION OF TRAFFIC**

The morning peak hour traffic ranges between 7.25 to 9.34% of average daily traffic, North Edappalli Bridge on NH 47 recording the highest. The evening peak hour traffic is 7.21 to 8.65% of average daily traffic.

#### **3.1.3.1 TURNING MOVEMENT SURVEY**

Analysis of traffic details of 34 junctions reveals that maximum peak hour traffic is at Vyttila (8721) followed by Edappally (7717) and Palarivattom (7356). The peak hour traffic in almost all the junctions of M.G. Road, Banerjii Road, SA Road and bypass is more than 3500 PCU. The maximum right turning traffic is observed at Pallimukku (3232) followed by Edappally (1794) ,Ravipuram and Manorama.

#### **3.1.3.2 PARKING SURVEY**

To study the accumulation of parked vehicles on road sections the details of parking surveys conducted on major roads was analyzed. The highest on-street accumulation takes place on MG road as 880 equivalent car spaces (ECS) followed by Banerji Road (589 ECS) and S.A road (456). In the case of off street parking the highest accumulation was along Banerji road (500 ECS) followed by MG road (494) and SA road (409).

#### **3.1.4 PEDESTRIAN SURVEY**

Based on the analysis of the data it is found that peak hour pedestrian traffic crossing at major locations ranges form 209 to 2479. It is also found that peak hour traffic is observed high at Menaka (2479) on Shanmughan road followed by high court on Shanmughan road 2183) and Banerji road (1330).

### **3.1.5 ROAD NET WORK INVENTORY**

The share of arterial roads in the total road net work in the city is only 2.75%. Where as the sub arterial roads is about 9%. Local streets forms the major part of the road network. Out of the total length , 72.10 (11.74%) is owned by PWD and 541.865 (88.26%) by corporation .53% of the total roads in Kochi are of local street category having a right of way of less than 5m. 35% of roads in study area of collector road category and have a right of way of ranging and 5 to 10. 8% of the roads are of sub arterial category having ROW ranging from 10 to 20m. Hardly 1% of the roads (5.939) of the roads in Kochi city have ROW more than 40m. The data collected from the inventory show that in Kochi 16.3 % of the roads have less than 3m carriage way, while 56.6% have single lane carriage way of 3.5m ,13.2% have intermediate lane of 5.5m, 8.5m two less 0.70% have two lanes with shoulders and 4.7% more than four lane. 90% of the roads have bituminous surface, 5% concrete surface, 3% WBM surface and 2% earthen surface.

### **3.1.6 HOUSE HOLD SURVEY**

From the analysis of details available it is seen that 45% of the house holds have more than 5 or more members in the house. Out of the total population members in age group of 6-20 years and 21-35 years constitute 22% of 30.5 respectively. Male female distribution in all categories is almost equal. Of the total population 79% have studied up to higher secondary. The occupational structure of the house hold show that 59% females are housewives, 20% students and 14% engaged in other occupations. Among males about 41% constitute the working class 14% are employed in business sector and about 22% are students. 6% are retired and 13% unemployed.

The mode wise analysis of travel time shows that among the bus trips about 10% trips take up to 15 minutes, 31% trips take 15 to 30 minutes and 28% trips are of 30-45 minute duration. About 15% of the trips are of more than 1 hour duration.

### **3.1.7 ORIGIN DESTINATION SURVEY**

Traffic Intensity of intercity traffic is assessed from the details available from the inflow and outflow of vehicular traffic at major roads connecting Kochi to other cities. Maximum vehicular density is observed on NH47 at Edappally (6015 a PCU) towards Thrissur (37915) and towards Alapuzha closely followed by Thripunithura road leading to Kottayam and Moovattupuzha and Kakkanad Road 29979 PCU. The low vehicular traffic along NH 17 is due to the hindrance created by the level crossing at Edappalli. The traffic density at Edakochi is only 8345 PCU, but the construction of a bridge connecting NH47 at Edakochi will increase the traffic at this point rejuvenating the old route to Alapuzha and will release the traffic congestion along SA road and Bypass. The construction of a wider alternate Vypin Road will increase the traffic along Vypin road forming shorter alternate route to Kodungallur.



## **4. TRAVEL DEMAND MODELLING AND FORECAST**

### **4.0 GENERAL**

The data base for land use transport model has been collected form the earlier studies carried out for the Study area. The proposed transport network has been developed by considering the anticipated road network, rail network and rail based MRT system etc.

### **4.1 BASE YEAR TRAVEL DEMAND MODELLING**

RITES have conducted a study to assess the travel demand of taking the base year as 2001 and horizon year as 2021. The study has been conducted in 50- traffic zones inside the corporation and balance in adjoining Panchayaths and Municipalities.

### **4.1 LAND USE DATA**

The base year land use data in terns of zonal population and basic educational other employments used for calibration are shown below:

Population	1905797
Basic Employment	237002
Educational Employment	8696
Other employment	384192

### **4.3 TRANSPORT NETWORK DATA**

The transport Network considered for the development of model has been the integrated transport network of road, rail and ferry facilities available at present. The base ear network had the parameters as follows.

Number of links	356
Number of road nodes	252

Number of rail nodes	13
Number of WT nodes	15

#### **4.4 TRAVEL DATA**

The trip matrices available are work, educational and other trips. These matrices used as observed data derived from surveys day 2000. The trip summary is a detailed below.

Work trips	818559
Education	400831
Other trips	149653
Total trips	1369043
Mean walk trip length	20.41
Mean education trip length	19.46
Mean other trip length	19.70

#### **4.5 STRUCTURAL PARAMETERS**

The one year information and the structural parameters obtained for the model are as below

Total population	19.06 lakh
Total employment	6.30
Total basic employment	2.37 lakh
Total educational employment	3.84 lakh
Forecast for GCDA	

The population and employment are likely to show a shift in location in a period of 10 to 20 years. For better accessibility, having educational and job related advantages, population has been found to move within urban area or in the vicinity.

## 4.6 TRANSPORT DEMAND FORECAST

Table 4.1: Projected purpose wise Trip ends

Year	Work	Edn.	Other	Total	Non home based	Intra city	Intercity	Total
2000	818559	400831	149653	1369043	116520	1456510	251600	1708110
2011	1155500	555600	311100	2022200	181998	2204198	352672	2556870
2021	1564100	756800	454100	2775000	277500	3052500	488400	3540900

### 4.6.1 DAILY TRAFFIC

Daily traffic in the study area has been assigned on the integrated mass transport network, (road, rail, and IWT) for horizon year of 2021. The traffic concentration on the corridors indicate that the road links and IWT links are in the range of 0.44 to 4.9 lakhs and 0.1 to 0.4 passenger trips respectively

Table 4.2: Daily Passenger Traffic at various road sections in lakhs

No.	Section	2000	2005	2011	2021
1	M.G.Road	2.11	2.62	3.23	4.31
2	Shanmugham road	1.85	2.29	2.28	3.75
3	Banerji road	2.46	3.02	3.71	4.95
4	NH 47 Bypass	2.35	2.91	3.59	
5	NH 47-Kalamassery	1.62	1.87	2.22	3.03
6	S.A.road	2.15	2.58	3.18	4.24
7	Edappalli	1.2	1.49	1.78	2.29
8	NH 17	0.85	0.91	1.15	1.68
9	Thammanam -Pulleppady	0.4	0.46	0.61	0.92
10	NH bypass-Vyttila	0.41	0.45	0.65	1.09
11	NH bypass-Kundanoor	0.84	1.07	1.32	2.12
12	Vypin	0.61	0.85	1.07	1.89
13	Kakkanad	0.41	0.48	.93	1.17
14	Kallor-Kadavanthara	0.69	0.77	0.95	1.27
15	Edakochi	0.6	0.67	0.77	1.13
16	P.T.Jacob	0.89	1.04	1.33	1.96
17	M.A.road	0.21	0.26	0.3	0.44
18	Wellington Island	0.12	0.20	0.31	0.45
19	Angamali-Perumbavoor	0.46	0.6	0.77	0.92
20	Wellington Island- Petta	0.5	0.73	0.84	1.26
21	Vyttila-Petta	1.02	1.14	1.33	0.69
22	Thripunithura-Vaikom	0.35	0.41	0.49	0.74

## **5. PROPOSED ROAD NET WORK PLAN FOR KOCHI**

### **5.0 GENERAL**

Road network forms the most widely spread infrastructure of a city since it can act both as integration with various forms of transport as well carrier of intercity and extra urban transport system. From the traffic analysis and projected travel demand a city mobility plan can be chalked out with scientifically planned road network system. But due to high density of population, unorganized commercial activities, high cost of land acquisition etc. the widening of existing over congested routes and construction of new roads will be very difficult. A road network plan to cater the projected travel demand of the horizon year need be planned taking the following factors also in to consideration.

- Historical evolution and expansion of the city
- Projected to travel demand of the various corridors
- Identification of the future nerve centers and provision of unhindered access to these nerve centers.

### **5.1 IDENTIFICATION OF MAJOR TRAVEL CORRIDORS**

#### **5.1.1 HISTORIC**

The present Kochi city is the offshoot of a small port town established in Mattanchery during the 14<sup>th</sup> Centaury. The over crowding of the port area forced the expansion of the city towards East on the mainland converting Ernakulam as

the administrative and commercial Centre. The partially planned Ernakulam has become over crowded by the fall of the last Centaury. Now Kakkanad portion situated further east already converted as the administrative centre is gradually maturing to the new generation IT and ITES business Centers. All the traffic projection based on usual land use methods will be baseless due to the spontaneous development of the area due to the formulation of mega projects like Smart City and Info Park. The adjoining areas are already under the clutches of unscientifically planned real estate boom. It took nearly five centuries for the saturation of Fort Kochi and Mattancherry and to get congested forcing the rulers to shift their headquarters to Ernakulam due to the slow pace of development and urbanization in the middle ages ,while it took only about 150 years for Ernakulam to get saturated due to quick urbanization. At this rate due to the rapid urbanization of the 21<sup>st</sup> centaury Kakkanad and its surrounding are will be saturated with in three decades and so an integrated master plan for this area has to be formulated to face this eventuality.

### **5.1.2 FUTURE NERVE CENTERS.**

The identification of the future nerve centers attracting commuters in large numbers is the prime Factor factor in planning of the city Mobility Plan. The future nerve Centers will be based on commercial, Industrial and tourism. Port connected developments like Vallarpadam Transshipment Terminal, LNG Terminal at Pudukkottai will provide a large number of employment opportunities

with allied industries and enabled services. Kakkanad area which is fast developing as the IT hub of the state has already started attracting business firms. From the projected travel demand it can be seen that the present central business district area adjoining MG Road will still be the commercial centre in the horizon year also. A large number of foreign and domestic tourists are visiting the city every year. The main tourist attraction being around Willington Island and Mattanchery.

### **5.1.3 PORT CONNECTED ACTIVITIES**

The following development projects are envisaged in the port area of Kochi.

1. International Container Transshipment Terminal.
2. L.N.G Regasification Terminal
3. International Bunkering Terminal
4. International ship repairing complex
5. Crude oil storage facilities
6. International Cruise Terminal
7. Port based special Economic Zone.

All these projects costing around Rs. 7000 cores will be in operation before 2012.

Infrastructure support planned for the future development include the following projects.

1. National highway connectivity
2. Rural Connectivity
3. Coastal road between Vypin and Kalamukku.

#### **5.1.4 INDUSTRIAL DEVELOPMENT PROJECTS IN THE EASTERN SIDE OF THE CITY .**

The proposed commercial and industrial future development projects include the following.

1. Info Park
2. Smart City
3. Expansion of existing chemical plant at Kalamassery.
4. Expansion of aluminium extrusion plant.
5. Petrochemical complex at Ambalamughal

Planning should be done at this early stage itself to give access to Kalamassery, Kakkanad etc not only from the city Centre but from all parts of Kerala. The existing connectivity available to these future nerve Centers are through bypass, NH49 to Moovattupuzha and Seaport Airport road passing through the Centre of this area. Info Park authorities are planning to construct new approach from the seaport Air port road to InfoPark area. A comprehensive plan has to be chalked out for this area giving connectivity to M.C. Road, Aluva Munnar Road and increasing the number of connectivity to Seaport Airport Road. A suburban Railwayline connecting Aluva or Angamali to Thripunithura and ultimately south junction forming a ring rail system will help the mass rapid transit through the city.

### **5.1.5 CENTRAL BUSINESS DISTRICTS**

From the study of the travel demand after two decades it can be seen that the importance of MG Road and surrounding area as the Central business area will not be reduced. The already congested narrow roads and unscientifically constructed intersections in addition to the lack of parking spaces and buss bays will make this area immovable in the future.

The main infrastructure deficiencies in this area are

- Insufficient carriage way width
- Insufficient on street and off street parking facility
- Absence of good quality link roads connecting the three major corridors Viz. Shanmugham road, M.G. Road and Chittor Road.
- The presence of railway line dividing the city into two due to absence of R.O.Bs..
- Over saturation in SA road and Banerji Road, the only connection to the eastern part of the town due to large volume of traffic and presence of intersections at close intervals.

Short term measures of providing foot paths, up gradation of inter section by providing islands and road markings, improving drainage facilities etc have been



taken up under KSUDP Scheme. Medium term measures include widening of the corridors, improvement of intersections including construction of grade separators at intersections, widening of R.O.B, construction of new R.O.B. etc. Major infrastructure development works proposed are

- Early completion of link roads and R.O.B
- Widening of R.O.Bs on S.A road and Banerji road.
- Construction of fly overs at select locations on Shanmugham road, Banerji road and SA road.
- Construction of on street and off street parking facilities.
- Construction of pedestrian subways.

#### **5.1.6 TOURIST CENTERS**

The main tourist attractions of the city are concentrated in Willington Island , Fort Kochi, Mattanchery, Bolgatty Island, Vypin and the back water side of Ernakulam. Construction of jetties with aesthetic appearance, introduction of sophisticated inland Water transport vessels, construction of a high speed corridor to Airport, Construction of Edakkochi bridge connecting Edakkochi to NH 47A and construction of a high speed corridor along the old NH giving an alternate route to the southern districts bypassing the busy central commercial area. The main infrastructure development projects to be taken up include

- Extension of Shanmugham road connecting NH.
- Construction of Vypin Road bypassing the heavily built up area
- Construction of Edakkochi Bridge

### **5.1.7 CORRIDOR IMPROVEMENT SCHEMES.**

The identification of major travel corridors were done after analyzing the projected traffic volume, network inventory and speed delay surveys in addition to guiding the future traffic in an orderly manner.

### **5.1.8 M.G. ROAD CORRIDOR**

M.G. Road is the spine of the city connecting the two main east west corridors of SA road and Banerji Road and extending to Wellington island , Fort Kohi and Mattancherry. On either side of the road land use is commercial. Main problems are

- Inter section spacing close by, thus causing frequent stoppages
- On street parking reducing the effective carriage way
- Absence of bus bys

Short term measures proposed in this corridor in KSUDP are traffic improvement programs. Medium term measures proposed include construction of fly overs

#### **1. At Pallimukku, by passing Ravipuram junction**

- These are the main junctions where substantial right turning movement is noticed. Major traffic moment is straight.

#### **2. At Jose Junction**

In addition to this widening of the road beyond Pallumukku including the improvement of RUB has to be taken up.

### **5.1.9 BANERJI ROAD**

Banarji road connects the high court to the by pass passing through MG road, Chittoor Road, North R.O.B., Kaloor, Palarivattam and Edappaly. It connects the CBD to residential areas on northern parts in addition to the international Air Port. The traffic Volume in this road is the maximum in the city. One of these remedial measures from the three options proposed to relieve the congestion of the corridor can be adopted.

1. Construction of a two tier road starting from By pass junction and ending at Shanmugham road there by providing a high speed corridor to intercity traffic giving quick access to Airport ,providing access to MG road and Chittoor road and with no intermediate entry points
2. Construction of flyover by passing the adjacent junctions of Kacheripady and Madhava Pharmacy
3. Widening of North over bridge and extending it up to Madhava Pharmacy junction.

### **5.1.10 S.A. Road**

This is also one of the busiest roads in the city requiring 6 lane carriage way. The improvement measures recommended are

- Widening of South R.O.B
- Construction of a fly over at the road towards for- shore road to be examined.

### **5.1.11 NH 47, NH 47A & NH 49**

NH 47A should be projected as the easiest access to Wellington Island, Fort Kochi and Edakochi. The mobility improvement measures recommended are

1. Extension of the viaduct including construction of a fly over at Kundannur Junction
2. Construction of Edakochi bridge and providing a easier outlet from the city by rejuvenating the Old NH.

### **5.1.12 IMPROVEMENT OF INTERCITY CORRIDORS.**

Intercity corridors to be improved are

- 1 N.H.47 – Improvement of N.H. is taken up under N.H.D.P.
- 2 N.H. 17 - Improvement of N.H. is taken up under N.H.D.P.
- 3 N.H. 49 - Realignment of the road is essential
- 4 Vypin road -Realignment of the road is essential
- 5 Extention of Shnmugham Road - Widening and geometric improvement required
- 6 Thripunithura Road- Widening and geometric improvement required
7. Completion of 2<sup>nd</sup> phase of Seaport Air port Road
8. Construction of new road corridor connecting MC road.
9. Construction of Edakochi Bridge and rejuvenation of Old NH

## 5.2 INTERSECTION IMPROVEMENT SCHEMES

Almost all the junctions in the city on main corridors are handling huge volume of traffic. As short term measures improvement of geometrics, streamlining, providing signalling system etc. can be resorted to. About 12 junctions are now taken up under KSUDP for improvement. As medium term measures streamlining the traffic at intersections by providing grade separators are to be resorted to. Under JNNURM fly overs are proposed in the following locations.

1. Subway on NH 47 at Cochin University junction.
2. Subway at Menaka with connection to Broadway
3. Edappally
4. Palarivattom
5. Vyttila
6. Kundanoor
7. S.N. Junction at Thripunithura
8. Fly over at NH 47 (Thammanam Pulleppady Road extension-sea port Air Port road.)
9. Seaport air port road Near Collectorate.

Two flyovers in M.G. Road and one on Banerji road are also found necessary which may be examined in detail.

### **5.2.1 PEDESTRIAN CROSSINGS**

Pedestrians are the most vulnerable road users with practically no facilities.

Pedestrian crossings are proposed at identified location where high pedestrian movements are noticed.

1. Kaloor
2. Kacheripadi
3. Menaka
4. Thoppumpady
5. Jos junction
6. Fort Kochi
7. Kadavanthra
8. Boat Jetty

### **5.2.2 PARKING FACILITIES**

Under JNN URM multi level parking facilities are recommended at 11 locations in the C.B.D. In addition to these parking facilities are proposed in peripheral area. 5 Centres are identified in the JNNURM Scheme. They are:

1. S.A. Road
2. M.G.Road
3. Chittoor road
4. Marine drive
5. Banerji road

6. Kaloor –Kadavanthara road
7. Kaloor
8. NH 47 Bypass
9. Thoppumpady
10. Fort Kochi
11. Palarivattom

### **5.2.3 BUS TRANSPORT**

Bus transport forms a prominent part of the public transport system. The main deficiencies experienced by the bus transport system are absence of bus terminals, bus bays and waiting shelters. Bus traffic also acts as integration with different modes of traffic.

### **5.2.4 BUS TERMINAL**

Since bus traffic acts as integration with different modes of traffic bus terminal facilities should be provided near terminals of other modes of traffic. The existing two terminals for long routes situated in the CBD should be relocated outside the CBD near NH Bypass to reduce the number of Vehicles plying inside the CBD. 15 Mofussil bus terminals are proposed under JNNURM. They are:

1. Vyttila
2. Kakkanad
3. Thripunithura
4. Edakochi

5. Fort Kochi
6. Kalamassery
7. High Court
8. Perumpadappu
9. Mattancherry
10. Kumbalangi
11. Palluruthy
12. Chellanam
13. South Rly.Stn.
14. Vypin
15. Maradu

#### **5.2.5 RESCHEDULING OF BUS ROUTES.**

Now the scheduling of the buses are in such a way that all the intercity and intracity buses are passing through the Central business district. Identification of new bus routes relieving the intensity of traffic in commercial area should be done utilizing the available traffic carrying capacity of other roads including NH47A. The bus routes originating from Fort Kochi and Mattanchery with destination to Northern and eastern part of the district should be diverted through NH 47 utilizing the proposed terminals at Kundanoor and Edappalli.

#### **5.3 INTERMEDIATE PUBLIC TRANSPORT**

Intermediate Public Transport system is widely used as mode of transport taking the passengers to the remote corners which are inaccessible to public transport



system. Inter mediate public transport system can be used as stage carriers n the crowded narrow streets of Fort Kochi and Mattanchery

#### **5.4 IMPROVEMENT MEASURES TAKEN UP AND PROPOSED.**

##### **5.4.1 SHORT TERM MEASURES**

Several short term measures have already been taken up to improve the traffic system in Kochi. The nature of the projects taken up under Kerala Sustainable Development Programme include upgradation of roads, improvement of junctions and road safety improvements. The list of works included in KSUDP are listed below.

##### **A. Upgradation**

1. Upgrading Karshaka road linking eastern side of south Rly. Station -600m
2. Palarivattom road linking St. Mary Church to NH bypass.

##### **B. Improvements to priority roads**

1. M.G.road –Desumannur to Madhava pharmacy Jn. -4km.
2. Palarivattom Vytila road -4km.

##### **3. Other major roads.**

1. M.G. road –Edappally road
2. SA road
3. Chittoor road.
4. All cross roads between MG road and Chittoor road.
5. Thoppumpady Beach road.
6. Thoppumpady Mattancherry road.
7. DH road.

8. Hospital road.
9. Mullassery canal road.
10. TD road and Church landing road.

**C. New Infrastructure.**

1. Stadium link road to connect Thammanam Pullepady road 1.5km.
2. Twin carriageway bridge over canal on SA road

**D. Junction Improvement**

1. Pallimukku.
2. Jose Jn.
3. M aharajas Jn.
4. Padma
5. Madhava Pharmacy.
6. Kacheripady.
7. Judge Avenue
8. Manorama Intersection.
9. Park Avenue with Hospital road.
10. Kathrakadavu Jn.
11. SA road with Kaloor Kadavanthara road.
12. Kaloor Jn.

**5.4.2. MEDIUM TERM MEASURES.**

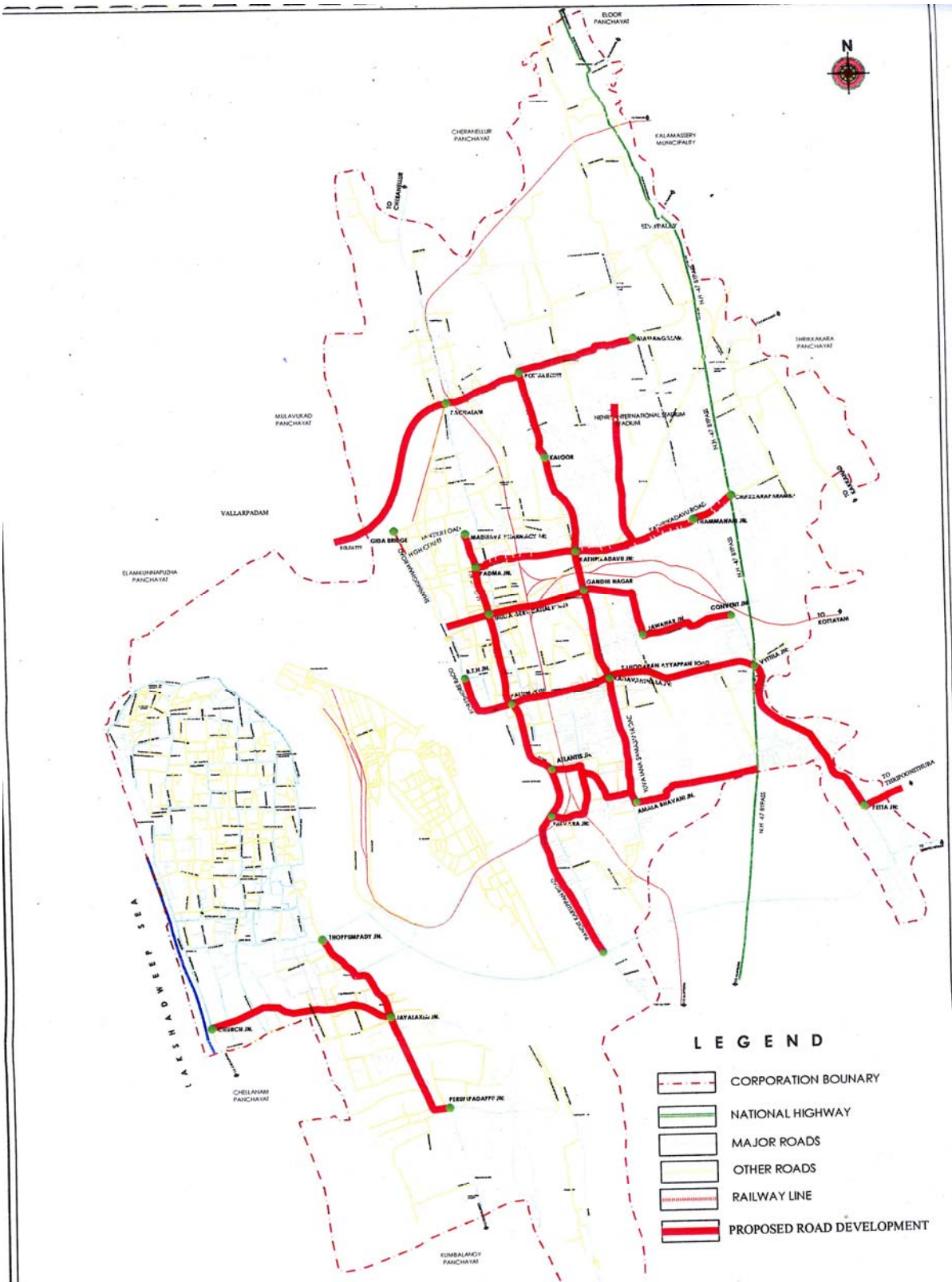
Medium term measures recommended are the rectification of deficiencies in the road network of the city. The road network of the central area is of broken grid iron pattern. The major North south corridors are connected with several narrow link roads. The traffic along the two comparatively wide roads viz. Banerji road and SA road are huge and beyond their capacity. More over recently the area between NH bypass and railway line has grown in to a crowded urban extension necessitating improvement of the NH Bypass and its link roads to the city. In the medium term measures it is recommended to improve all these roads and under road fund board 16 roads in this area have been identified for improvement including widening of carriageway with geometric improvement, providing grade separators at intersection and construction of ROBs at level crossings. Major

trunk routes connecting Kochi to other cities and other parts of the country are NH47, connecting Thrissur and Alapuzha, NH17 connecting Kodungallur and Calicut, NH49 connecting Munnar and Ettumanoor road connecting Kottayam and Vaikom. The completion of Gosree bridges have opened a new inter city corridor. The old NH through Edakochi is still used by the residents of Mattancherry as easy connectivity to the southern part of the state. All these roads require improvement of widening carriageway, construction of fly overs at busy inter sections, construction of ROBs, reconstruction and widening of bridges etc. NH 47 and NH17 are included in the development programme of NHDP Phase 3. The improvement of other roads including construction of Edakochi Bridge has to be taken up.

The roads listed in the above paragraph are the major travel corridors or arterial and sub arterial roads. For better mobility the internal areas are to be connected to these travel corridors. The improvement of link roads, ring roads, radial roads constructions of roads for new connectivity etc. have to be taken up for the completion of a proper Network. Construction or improvement of 35 km of ring road, 42 km of internal ring road, 17 km of ring road, 34 nos of secondary roads, 55 bridges, 10 fly overs, 11 parking areas, 15 bus terminals 4 truck terminals, and 5 peripheral parking areas are recommended for taking up under medium term measures. Since the number is very large this can be taken up in stages.

### **5.4.3 LONG TERM MEASURES**

The Kochi agglomeration is going to expand up to Thrissur, Kottayam and Moovattupuzha and M.C.road. major high speed road corridors are to be envisaged for the better mobility. First a long term master plan has to be formulated for Kochi taking in to account the entire area. New connectivity to M. Croad and Aluva Perumbavoor road are to be taken up under long term plan.



**Details of road projects proposed by Road Fund Board**

## **5.5 RAIL NETWORK**

Rail transport system caters mainly to the needs of inter-city passenger and goods traffic. Kochi city is connected to major urban centers in the State as well as to the up-Country destinations through two major railway lines. They are the Thiruvananthapuram-Thrissur railway line via Kottayam and the railway line from Ernakulam to Kayamkulam via Alappuzha. The total railway track length within the City limit is 28 Km. Thiruvananthapuram-Shornur railway line has double track and electrified facilities between Ernakulam and Thrissur. The track towards Kottayam as well as Alappuzha has only single line track without electrification.

### **5.5.1 DETAILS OF TRAIN SERVICES**

At present, Kochi City has the benefit of two major railway stations viz.,Ernakulam Town (North), and Ernakulam Junction (South). Of these two stations Ernakulam South is the most frequently used, as maximum number of trains touch this Station. Ernakulam South station handles about 65% of traffic generated from the city and the rest is handled by Ernakulam North station.

There are 46 pairs of Express trains and 24 pairs of passenger trains operated from Ernakulam City. Out of the 46 pair of Express trains, 21 pair of trains is operated on daily basis and 25 pair of trains on weekly trains. On an average 16 goods trains are operated daily through Ernakulam City.

### **5.5.2 PASSENGER AND GOODS MOVEMENT**

A large number of inter-city passengers travel to and fro from the city from South and North Railway stations in Kochi City. The passenger traffic during the year 2005 was estimated from the sales of daily and season tickets sold from these two Railway stations in Kochi City. It was found that about 51.91 lakh passenger trips

were originated from the South and North Railway Stations, of which the share of South railway station was 66 per cent. **Table 5.1** shows the sale of daily and season tickets and the estimated originating passenger traffic from these two railway stations in Kochi City.

**Table 5.1**

No.	Month	Daily tickets-Nos.	Earnings	Season tickets-Nos.	Earnings	Total originating passenger traffic
<b>A</b>	<b>South</b>	<b>Rly.Station</b>				
1	January	181903	11776421	4410	270765	270765
2	February	182107	10801056	4575	275805	275805
3	March	198828	12121184	4610	895798	291014
4	April	189228	12121184	4610	895798	282120
5	May	200158	13347144	4788	890235	296636
6	June	183095	10725850	4638	924370	276551
7	July	147406	9723380	4915	917125	246443
8	August	156503	10131409	5053	927345	258321
9	September	191551	11399334	4795	901140	288170
10	October	194083	11395878	5091	937240	296667
11	November	192857	12131151	4925	885875	292096
12	December	242406	15103254	5216	958860	347508
	Total	2260125	138944129	57666	10876718	3422095

No.	Month	Daily tickets-Nos.	Earnings	Season tickets-Nos.	Earnings	Total originating passenger traffic
<b>A</b>	<b>North</b>	<b>Rly.Station</b>				
1	January	108611	6314895	1967	441360	148246
2	February	85196	444232	1747	389775	120398
3	March	94012	4593655	1946	430920	133224
4	April	118219	6112685	1574	427895	149935
5	May	123801	6380556	1719	406320	158439
6	June	109630	5327829	1897	430145	147855
7	July	107256	5599844	2002	448585	147596
8	August	113765	5920263	2067	453490	155415
9	September	115704	5934173	1767	417385	151309
10	October	113601	5789897	2035	451880	154606
11	November	85102	5848820	1988	293090	125160
12	December	135567	7145677	2043	481290	176733
	Total	1310464	69412526	22752	5072135	1768917
	G.Total	3570589	208356655	80418	15948853	5191012

The goods traffic in Kochi was handled at Eranakulam Goods Yard and at Kalamasserry Good shed. The data collected from the above stations showed that on an average about 86 MT and 518 MT of goods were handled at the Goods Shed at Eranakulam and Kalamasserry.

### 5.5.3 RAILWAY OVER BRIDGES AND LEVEL CROSSINGS

The Thiruvananthapuram-Thrissur railway line passes through the heart of Kochi city dividing it into two parts. The older parts of the city are located on the

western side of the railway track, while new developments are in the eastern side of the railway line. Four major Railway Over bridges (ROB) located at various parts of the city provide uninterrupted flow of traffic between western and eastern parts of the City. These ROB's are:

- (i) North Railway Station on the Bannerji road
- (ii) Near Manorama Junction on Sahodaran Ayyappan road
- (iii) Near Kathrikadavu on Kaloore-Kadavanthara road
- (iv) NH-47A Kundanoor-Thevara bridge

There are a number of railway level crossings within the city, which remain as major bottlenecks to the free flow of vehicular traffic along certain travel corridors. Frequent gate closures at these level crossings result in traffic hold ups and under utilization of these corridors. Of these, seven level crossings are located along major travel corridors and are listed below;

- (i) Edappally on NH-17
- (ii) Pulleppady on Pulleppady-Kathrikadavu road,
- (iii) Ravipuram on Panampilly Nagar road to Chittoor road,
- (iv) Pachalam on Chittoor road
- (v) Vaduthala on Chittoor road
- (vi) Ponnurunny on Thammanam-Vyttila road and
- (vii) Atlantis on Panampilly Nagar to MG road.

Construction of ROB's are in progress at Pulleppady and Edappally level crossings, which, on completion, would lead to the diversion of traffic through these corridors from other connected roads.



#### **5.5.4 RECOMMENDATIONS FOR RAIL CONNECTIVITY**

All the neighbouring District Headquarters are only less than 100 km away from Kochi and rail connectivity is available from Kochi to all these three cities viz. Thrissur, Alapuzha and Kottayam. Introduction of suburban rail traffic will satisfy the intercity travel demand to a greater extent. Construction of a new railway line connecting Angamali or Aluva to Thripunithura through Kakkanad and formation of a circular route will open a new inter city as well as intra city mass transport system. Provision of a spur line from Ernakulam South to Ernakulam Goods and convert Ernakulam Goods as a terminus for suburban train service.

#### **5.6. AIR TRANSPORT NETWORK**

Kochi is well connected to the rest of the country and other parts of the world by air transport through Cochin International Airport located at Nedumbasserry, nearly 28 km from Ernakulam city. This airport caters to the needs of domestic and international passengers of Kochi and surrounding regions. Another airport located at Willington Island, is under the control of Defence Department.

##### **5.6.1 AIRPORT TERMINAL**

Due to the limitations in the operation of international flights, the erstwhile Kochi airport was shifted from the Willington Island to Nedumbasserry, away from the City. This is the first International Airport in the Country, which was built outside the ambit of the Government of India. The airport is located very close to the three National Highways such as NH-47, NH-17 and NH-49. The main railway line from Kanyakumari to Delhi is adjacent to the airport and is situated between Aluva and Angamaly Railway stations. The Cochin Port is connected to International Airport by a newly developed link called Airport-Seaport road. The Kochi International Airport is managed by a group of personnel drawn from the Government Departments, Industries, NRIs, and Financial Institutions. The Airport is suitable

for operations of wide-bodied Boeing-747 type of aircraft. The runway is of 3.4 km length with 3,000 ft parallel taxiway and has a premise of 1,300 acres. An International cargo terminal is also functioning with an area of 6,000 sq.m, and is well equipped to handle all type of export and import cargo.

### **5.6.2 AIR ROUTES**

Kochi International Airport is connected to all major Cities in India by domestic flights and to all Gulf countries, Columbo and Singapore by International air flights. Airlines such as Indian Airlines, Air India, Jet Airways, Oman Air, Silk Air, Kuwait Airways, Emirates Airways, Qatar Airways, Srilankan Airways, Saudi Airways, Gulf Air and Air Sahara are operating from the airport to various destinations inside and outside the Country. At present, there are daily flights to major Cities like Chennai, Bangalore, Mumbai, Delhi and Hyderabad. The international air services are mainly concentrated in the Gulf region catering to people employed in various Gulf countries.

### **5.6.3 DETAILS OF FLIGHTS AND AIR PASSENGERS**

A total of 440. flights are handled by the two terminals namely International and Domestic terminals at the Cochin International Airport in a week. In the domestic terminal, 220 arrivals and departures are handled per week from and to important Cities in India. The daily operation of the flights varies from 15 to 17. An average of 14,054 domestic passengers arrive and depart weekly from the airport. In the international terminal, at present there are 220 arrivals and departures per week to various destinations outside the Country. An average of 24,430 international passengers arrivals and depart weekly from this airport. Table 7.1 gives the details of passenger arrivals and departures from Cochin International Airport.

**Table 5.2: Details of passenger arrival and departure.**

No.	Day	Domestic Arrival	Departure	Total	Inter Arrival	Nationa Departure	Total
1	Sun	781	1047	1828	1513	1925	3438
2	Mon	850	904	1754	1575	1451	3026
3	Tues	1131	924	2055	1906	1688	3594
4	Wed	993	974	1967	1985	1794	3779
5	Thu	1031	1055	2086	1982	1759	3741
6	Fri	1084	1261	2345	1545	1537	3082
7	Sat	1075	944	2019	1844	1926	3770
	Toatal	6945	7109	14054	12350	12080	24430

#### **5.6.4 AIRPORT CARGO TRAFFIC**

The data collected from the Airport shows that the Domestic section handled about 300 MT of cargo per year. The cargo handled by the Airport includes General Cargo, Fruits and Vegetables, News Papers and other valuables. About 18,250 MT of cargo was handled by International flights during the year 2005. The Airport authority is planning a full-fledged cargo village. The construction of center for perishable cargo is in full swing and is expected to be commissioned in 2006.

#### **5.6.5 SUPPORT INFRASTRUCTURE DEFICIENCIES.**

The airport is situated very near to NH 47 having four lane carriageway and is connected with a good quality link road. But the Airport is far away from the city centre the journey time required is considerable. A high speed corridor is a necessity and can be formed by improving Banerji road either by widening or by constructing a two tier road. Even though M.C road is very near to the Airport quick access is not possible due to the poor quality of the link road. An adequate link road to M. C. road has to be constructed. Improvement of the nearest railway

stations of Aluva and Angamali has to be taken up including providing regular public transport facilities. A new railway station has to be constructed near the Air port and the same should be connected with regular mini bus service.

## **5.7 WATER TRANSPORT NETWORK**

Kochi has a good network of inland waterway system consisting of backwaters, canals, lagoons and estuaries. National Waterway No.3 connecting Kollam and Kottappuram pass through the region. The State Water Transport Department (SWTD), Kerala Shipping and Inland Navigation Corporation (KSINC) and private operators are providing passenger and cargo boat services to the adjoining islands and industrial centers.

### **5.7.1 IWT ROUTES**

Water transport is on the decline due to the construction of bridges connecting islands on the western part of the City. There are very limited passenger boat services operating from Eranakulam jetty and High court jetty. The main routes served by the water transport are Eranakulam-Fort Kochi, Eranakulam-Mulavukadu, Eranakulam-Bolghatty, Eranakulam-Varapuzha, Eranakulam-Mattancheny and Eranakulam-Vyppin. Private boats operate sightseeing trips from Eranakulam, depending on the demand of tourists. KSINC operates one luxury cruise boat 'Sagara Rani' from Eranakulam jetty to cater to the tourists based on demand.

### **5.7.2 PASSENGER MOVEMENT**

Passenger boats mainly operate from two boat jetties namely High Court jetty and Corporation jetty in the city. From High Court jetty, as many as 89 passenger boat trips are operated to destinations such as Varapuzha, Mulavukadu, Bolghatty and Fort Kochi. From Corporation jetty, passenger boat services numbering 77 are

operated to Fort Kochi, Mattancherry and Vypin Island. It is estimated that about 16,000 passengers are attracted daily to Kochi

Three major jetties and 21 minor jetties are proposed. They are:

(a) Major Jetties

- 1 Marine Drive Jetty
2. Fort Kochi
3. Chittoor Jetty

(b) Minor Jetties

- 1 Varapuzha
- 2 Kadamakkudi
3. Mulavukadu
4. Elamkunnappuzha
5. Narakkal
6. Mattanchery
7. Fort Vypeen
8. Eda Kochin
9. Thevara
10. Kumbalam
11. Kumbalangi
12. Chellanam
13. Edappaly Canal
14. Kakkanad, Palachuvadu
15. Perikkadu
16. Thripunithura
17. Valanthakadu, Maradu
18. Chithartrapuzha
19. Nettoor
20. Chambakkra
21. Nedumbassery Ernakulam

### **5.7.3 GOODS MOVEMENT**

Goods transport through waterways is also on the decline due to development of road transport facilities. Goods traffic movements are mainly handled from Murukkupadom jetty and Thevara jetty. There are three oil barges and four-water barges operating from Thevara jetty and two water barges operating from Murukkupadam jetty. Other goods movements include 16 barges operating from Thevara to FACT by KSINC.

### **5.7.4 KOCHI PORT**

Kochi port is an all-weather protected port with midstream mooring facilities in the channels and wharfs on either side of Willington Island facing the channels. It is the only major port in Kerala State with an ISO 9001-2000 certification. Facilities offered by the port are berths for handling cargo and passenger ships, cargo handling equipments, storage accommodation, dry dock, bunkering facilities, fisheries harbor, etc. Passenger ships are operated to Lakshadweep Islands from the Kochi Port. The entrance of Kochi Port is through the Cochin Gut between the peninsular headland Vyppin and Fort Kochi. 1,126 ships called at this port in 2004-05 with a net tonnage of 8.18 million. Total traffic handled at this port in 2003-04 was 13.574 million tones, of which 18 per cent of cargo was exports. 314 container vessels were handled at the port in the year 2004-05 with total container traffic of 1.75 million ton.

### **5.7.5 RECOMMENDATIONS**

About 170 trips are operated carrying about 16000 passengers and giving employment to large number of people in addition to providing a cheap mode of traffic. Considering the socio economic aspects development of Inland Water Transport services are to be improved. Improvement measures attracting passengers and tourists include

- Construction of jetties and terminals with adequate passenger amenities and aesthetic appearance.
- Introduction of high speed sophisticated transport vessels like Hover crafts.
- Introduction of high speed transport vessels to all nearby islands.
- Introduction of regular goods service To Alapuzha ,Kollam and Kodungallur.
- Construction of goods terminals.

## **5.8 MASS RAPID TRANSIT SYSTEM**

### **5.8.1 GENERAL**

An integrated mass transport network of Road, Rail, Inland Water transport and Mass Rapid Transit System with suitable interchange facilities will be ideal for Kochi to satisfy the high concentration of travel demand on the transport net work. Based on the peak hour peak direction traffic in the horizon period a MRT network should be identified which would cater to the estimated traffic demand.

### **5.8.2 SELECTION OF MASS RAPID TRANSIT SYSTEM**

The proposed improvement of the road network will not be able to cater the expected trave demand after 20 years. It is expected that the passenger loading on some of the corridors will be very high to be catered by any road based mass transport system. Road based conventional mass transport system can carry up to 10000 trips in peak hour peak direction trips. But the peak hour peak direction traffic will be as high as 33000in some of the roads. The daily traffic along peak hour peak direction traffic (PHPDT) on various road sections in the Business As Usual scenario is presented below in Table No.5.3 Out of the 23 sections the PHPDT on more than half the sections will be more than 10000 requiring a rail based MRTS. More over introduction independent bus corridors will lessen the capacity of road traffic since the ROW is limited and scope for widening is limited.

**Table No. 5.3**

<b>S.No.</b>	<b>Section</b>	<b>Daily Traffic (Lakhs)</b>	<b>PHPDT</b>
1	M.G.Road	4.31	28000
2	Shanmugham Road	3.75	25000
3	Banerji Road	4.95	33000
4	NH 47 (ByPass Jn.-Kalamassery)	4.78	31000
5	NH 47 (Kalamassery-Aluva)	3.03	20000
6	S.A.Road	4.24	28000
7	Edappalli road	2.29	13700
8	NH 17	1.68	11000
9	Thammanam-Pulleppady road	0.92	6000
10	NH Bypass(Bypass Jn-Vyttila)	1.09	7000
11	NH Bypass(Vyttila –Kundanoor)	2.12	14000
12	Vypin road	1.89	12000
13	Kakkanad road	1.17	8000
14	Kaloor-Kadavanthara road	1.27	8300
15	Edakochi road	1.13	7400
16	P.T.Jacob road	1.96	12900
17	Moulana Azad road	0.44	2900
18	W.Island	0.45	2900
19	W.Island –Petta Jn.	1.26	8300
20	Angamali-Perumbavoor road	0.92	6000
21	Aluva –Perumbavoor road	0.82	5400
22	Vyttila –Petta Jn.	0.74	10100
23	Thripunithura –Vaikom Road		4800



### **5.8.3 RAIL BASED SYSTEM.**

#### **5.8.3.1 Light Rail Transit Systems**

Light rail transit systems using Light Rail Vehicles (LRV) operate on surface in mixed traffic ,with no signals or with signals giving preference to LRV sat road crossings or with exclusive right of way with partly elevated or wholly elevated and fully signal controlled. The vehicles are of light weight articulated construction, available in various sizes. LRT generally consist of twin cars with articulated joint, which enables operation on sharp curves. The route alignment can therefore pass through congested areas on elevated structures and follow the road alignment on sharp bends. Since LRVs are of lightweight construction, the cost of elevated structures will be moderate. Generally a twin car articulated vehicle is about 25-30m long ,2.65m wide and 3.4m high and can carry up to 375 passengers under dense crush load of 8 passengers per square metre with axle load not exceeding 12 tons. Under mixed traffic operation capacity of 10000PHPDT can be achieved, but on exclusive right of way it can be increased to 20000 to 25000PHPDT. Stations are spaced at 750to1000m intervals.

#### **5.8.3.2 High Capacity Metro Rail System.**

There are high acceleration and high retardation rail based systems similar to conventional railway systems using vehicles with axles not exceeding 16 t. per axle. More than half of the axles are motored to gain acceleration necessary for an urban transit system having halts at 700to 1000m apart. These have separate right of way and in metropolitan cities these are frequently run underground or elevated structures. Their capacity can reach up to 60000 PHPDT.

### 5.8.3.3 Kochi Metro

A study was conducted by Delhi Metro Rail corporation for the Government of Kerala during 2005 for the introduction of a rail based mass transport system named “Kochi Metro”. The objective was to identify the most feasible travel corridor. Three alternate travel corridors were identified for for evaluation of traffic demand. These are:

1. Aluva –Vyttila
2. Kalamassery –Thripunithura.
3. Aluva – Thripunithura.

Based on the expected travel demand Aluva –Thripunithura was selected for introduction of mass transport system. However it was found that construction of Petta to Thripunithura section of the corridor was not feasible till improvement to existing road infrastructure between these two places is done by concerned authorities.therefore the the alignment of metro rail corridor was limited between Aluva and Petta.

A light Metro rail system from Aluva to Petta was proposed at an estimated cost of Rs. 22390 million. it was estimated that Kochi Metro would have a patronage of 38187persons per hour per direction in the year 2011.a detailed Environment Impact Assessment study was also carried out for the project. It is visualized that the project will have positive environmental impacts like reduction in traffic congestion,savings in travel time, reduction in air and noise pollution , lesser fuel consumption, esser accidents etc.

**6.0 ESTIMATES FOR ROAD NETWORK PROPOSAL WHICH CAN BE TAKEN UP UNDER JNNURM**

List of roads proposed by Road Fund Board

<b>Sl. NO.</b>	<b>Name of Projects</b>	<b>Length in Km/No.</b>	<b>Amt. In Rs. Crores</b>
1.	Kaloor- Kadavanthra Road	3.30	7.00
2.	Sahodaran Ayyappan Road and extension up to .Model Road	4.50	7.00
3.	Goshree North end - Pachalam - ROB- Pottakuzhi- Mamangalam- NH47	5.00	12.00
4.	Padma intersection- Pullepady road- Kathrikkadavu Road- Thammanam- N.H. Bypass	3.00	8.00
5.	Banerji Road - North over bridge- NH-47 upto Edappally	8.00	24.00
6.	Bund road from Chilavanoor to NH Bypass (Chambakara) on the East upto M.G. Road through ROB at Atlantis on the west.	3.00	17.00
7.	Vyttila- Tripunithura Road upto S.N junction.	5.00	15.00
8.	Mathai Manjooran Road from Marine Drive (High Court Jn) to Goshree - Pachalam- Mamangalam Road	4.00	6.00
9.	Subash Chandra Bose Road,(Road from Karshaka Road to Ponnurunni)	6.00	6.00

10.	Extension ofKaloor Kadavanthra Road upto Bund Road (K.P.Vallon Road)and towards north Perandoor Road Upto NH 17 via Ponevazhi.	6.00	8.00
11.	Stadium Link Road upto old NH	2.50	3.00
12.	M.G. Road from Madhav Pharmacy to Thevara and developing up to Thoppumpady	8.00	18.00
13.	Widening of Edakochi road from old Thoppampady Bridge up to Edakochi -Aroor	10.00	15.00
14.	Pandarachira Rd linking Edakochi Road to Beach Road (upto Fort Kochi- Chellanam road)	3.00	4.00
15	Fort Kochi- Chellanam Road upto Pandarachira Road	25.00	10.00
16	Kumaranasan Road from Kaloor Kadavanthara Road to SA Road	2.00	3.00
	Total'		163.00

#### Under JNNURM

Sl. No.	Name of Project	Length in Km/No.	Amit in Rs. Crores
1.	Outer Ring Roads Outer Ring Road.Ghosree Bridge (Chathiathu) - cheranallor- Kadamakkudy- Varappuzha, Athani.Chemaganad, Sreemulanagaram, Keezmadu,	35.00	140.00

Edathala, Kizhakkambalam, Vadavodu Puthenkurush,  
 Chottanikkara, Thiruvankulam, Udayamperoor,  
 Kumbalam linking Manne Drive N.H.I 7 at Varappuzha,  
 Emakulam-Thrissur Road at Athani, Aluva-Munnar Road  
 at Keezmadu, Muvattupuzha Road, Industrial Belt at  
 Vadavukodu Puthenkurushu Panchayat, N.H.49  
 (Madhura Highway), Cochin- Kottayam Road at  
 Udayamperoor and joining N.H. at Kumbalam (Cochin-  
 Alleppey Road) Only for Designated Cochin area

**Total**

**1. Inner Ring Roads**

	Improvements to Irimpanam - Kalamassery Rd and Extension Up to Nedumpassery on North end and Extension upto NH 49 on south end	25.00	50.00
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**Only for Designated Cochin area**

2.	Improvements to Panampally Nagar Avenue Rd and Extension of Avenue Road to NH 49 through Konthuruthy.	7.00	15.00
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3.	Kumbalangi Aroor Road, Kumbalangi Panchayath	10.00	20.00
	<b>Total</b>		<b>85.00</b>

**Link Roads**

1.	Road from Outer Ring Road at Vaduthala & Passing through Moolampally. Pizhala, Valiya Kadamakkudi, & Chathanad (Detailed Sy completed ant Fund allocated for land Acquisition) Only for Designated Cochin area	6.00	.30.00
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2.	Road starting from Puthussery passing through Cheriyam	2.60	40.00
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Thuruth, Chennur, Pizhala, & meeting Vaduthala  
Chathanad Road, Kadamakkudi panchayath

3.	Interlinking Sea Port Air Port Road and Ambalamugal Road from Chitrapuzha area.Thiruvankulam Panchayath	7.00	20.0
4.	Kundanoor Chilavanoor Link Road	1.60	3.00
	Total		93.00

Sl. No.	Name of Project	Length in Km/No.	Amit in Rs. Crores
<b>Road Through CBD Area</b>			
1.	Model Road, Shanmukam Road (from High Court Jn. To fine Arts Hall Jn.)	4.00	8.00
2.	Chitoor Road (Ravipuram to Vaduthala)	15.00	20.00
3.	TD Road, Improvement	3.00	4.00
4.	Market road Improvement	4.00	5.00
	Total		37.00

**Radial Road**

1.	Extension ofPullepady Thammanam Road from NH47 to Sea Port Air Port Road, Infopark	7.00	14.00
2.	Elevated Road (Manorama Jn to Church landing Road) The Elevated road starts with two single lane bridges on either side of the existing South over bridge, joins together after the bridge portion and cross the MG Road as Fly over landing near Fine Arts Hall. This will not	1.50	70.00

	disturb the existing corridor to MG Road		
3.	Improvements to the Road from Emakulam – Vyppin (Ghosree Road) along with a two line Bridge parallel to Bolgatty Bridge	2.00	5.00
4.	Coastal Road (Beach) P.T.Jacob Road to Dutch Cemetry	4.00	6.00
5.	Road from Vyppin to Munambam Only for Designated Cochin area	10.00	15.00
6.	Pandikudy Chellanam Road	25.00	30.00
7.	Pukkattupady Road (N.H. 47 at Toll Jn. - Pukkatupady), including Branch Rd from Kangarapadi Jn to Thevakkal Jn via Co - Op Medical College and Thevakkal to Thengodu	20.00	30.00
8.	Arkkakadavu Road. From N.H.47 (Anchumana) to S.N. Jn and Vaikom Road Upto Puthiyakavu.	17.00	23.00
9.	Improvements to Palarivattom Jn - Kakkanad Road (old N.H. to Airport Seaport Road)	5.00	9.00
10.	Kakkanad - Manakkekadavu Road up to Pallikkara Jn	8.00	12.00
11.	Mattancherry Road Road From Pandikuddy to Mattancherry, strengtheniny and widening of existing road	7.00	13.00
12.	Palluruthy Rd from Thnppi. imp;i(ly to Knppalandimukku	4.00	6.00
	<b>Total</b>	<b>110</b>	<b>233.00</b>

<b>Sl. No.</b>	<b>Name of Project</b>	<b>Length in Km/No.</b>	<b>Amit in Rs. Crores</b>
<b>1.</b>	<b>Water Front Roads</b>		
	Thevara Foreshore road from Vedunduruthy bridge to new Thevara bridge. CoC	3.00	20.00
2.	Vallarpadam Ring Road, Mulavukadu Panchayath	7.50	20.00

3.	Road through the Eastern coast of Bolgatty Island Mulavukadu panchayath	5.00	10.00
4.	Vimala Hridaya Sea Shore Road, Maradu Panchayath	5.00	15.00
5.	Kundanoor Sea Shore Road, Maradu Panchayath	4.00	12.00
6.	Coastal road from Kumbalam Jetty to Aroor Bridge (NH 47), Kumbalam Panchayath	3.50	5.00
7.	Vypeen Munambam Coastal Road, New Road, Elankunnapuzha Panchayath	12.00	50.00
	Total		132.00

### **Secondary Roads**

1.	Connecting Eastern Entry of South Railway Station to Salim Rajan Rd on north and SA Road on south	3.50	5.00
2.	Lourdes Hospital Road up to Vaduthala	2.00	3.00
3.	Deshabhimani Road	4.00	6.00
4.	Kannangattu-Madhura Co., Road	3.00	4.00
5.	Poisha Road From N.H. 17 to the proposed Chittoor Coastal road via Peeliyadu.	6.00	9.00
6.	Darbar Hall Ground Road(from Park Avenue Road to South Railway Station) and Hospital Road (Park Avenue Road to Eyattu Jn)	3.00	5.00



7.	St. Reethas Road to Arakkakadavu Rd	3.00	5.00
8.	Link Road from Sea port Air port Road via Inmpanam Manakkapady, Vyttila.	8.00	10.00
9.	Vyttila - Palarivattom Road Via. Thammanam	4.70	7.00
10.	Kunnumpuram Kalamassery (N.H. 17 – South Kalamassery across Muttarpuzha)	6.00	8.00
11.	T.C.M. Road. South Kalamassery Over Bridge to Premier	5.00	7.00
12.	Thrippunithura Chottanikkara Road (East Fort Jn. - Thimvankulam Kottayathu Para)	8.00	12.00
13	Stadium Link Rd extension to Pottakuzhi Mamangalam Rd and Up to BTS Rd	3.00	6.00
14	Palluruthy - Chellanam Road From Nambiyapuram Jn. To Chellanrm Via. Kari. Forming, Strengthening, widening of 2 lane traffic road including well designed drains, foot path etc	4.00	7.00
15.	Palluruthy Water land Road from Palluruthy ind Estate to manassery Jn in Beach Rd via Pandarachira	4.00	5.00
16.	Kacheripadi Perumpadappu Rd( From Kacheripadi Jn to Perumpadappu via AKG Vayanasala Kollassery and Konam)	5.00	6.00
17.	Improvement to Chilavanooor Road from Elamkulam to Bund Rd	3.00	5.00

18.	Santo Gopalan Rd from P.T.Jacob Rd to Jawahar Rd	3.00	4.00
19.	Manthara Canal Road from Convent Rd to Cherlayi	2.00	3.00
20.	HMT Quarters Road, Kalamassey Municipality	3.00	5.00
21.	Edapally Methanam road, Kalamassery Municipality	5.00	7.00
22.	HMT Boundary Road, Kalamassery Municipality	3.00	5.00
23.	Parallel Road to railway Line, HMT Jn towards south, Kalamassery Municipality	5.00	5.00
24.	Road from Kuthirakkur Kari to Palluruthy Konam, Chellanam Panchayath	3.00	4.00
25.	Road from Kandakadavu towards Alleppey, Challanam Panchayath	3.00	3.00
26.	Perumpadappu Ezhupunna Ferry Road	3.00	3.00
27.	Other Internal Roads in Cochin City 497 KMs	497.00	200.00
28.	Internal Roads in Kalamassey Municipality	215.00	86.00
29.	Internal Roads in Thripunithara Municipality	230.00	92.00
30.	Internal Roads in 13 Adjoining Panchayaths	260.00	104.00
31.	Pandit Karuppan Road Up to Thevara Ferry	5.00	10.00
32.	Mattanchery Foreshore Road	6.00	20.00
33.	Panangadu foreshore road	4.00	4.00
34.	Thevara-Perandoor Coastal road (Pottakuzhi – Amritha Hospital	5.00	10.00
	Total		675.00

Sl. No.	Name of Project	Length in Km/No.	Amount in Rs. Crores
	<b>Rail Over Bridges</b>		
1.	Atlantis	1	50.00
2.	Ponnurunni	1	10.00

3.	Pachalam	1	30.00
4.	Vaduthala	1	36.00
5.	Near KSRTC	1	40.00
6.	South Over Bridge, Renovation, Conversion of Foot Pat on one side	1	1.00
7.	North Overbridge, Reconstruction	1	35.00
8.	Vathuruthy	1	20.00
9.	Eroor, Thripunithura Municipality	1	10.00
10.	Kampivelikkakam, Thiruvankulam Panchayath	1	10.00
11.	Kurekkad, Thiruvankulam Panchayath	1	10.00
12.	Sea Port Air Port Rd, 2 Nos, NAD lane, Tripunithura	2	20.00
13.	Outer Ring Road, 2 Nos, Thiruvankulam. Kumbalam	2	20.00
14.	Kathrukadavu, 2nd Bridge	1	10.00
15.	Ponekkara	1	20.00
16.	Methanam, Kalamassery Municipality_____	1	10.00

Total 332.00

**Fly overs/ Sub Ways**

1.	Sub way on N.H.47 at Cochin University Jn.	1	10.00
2.	Sub way at Menaka with connection to Broadway	1	15.00
3.	Edapally, Fly over	1	60.00
4.	Palarivattom, Fly Over	1	70.00
5.	Vytila, Fly Over	1	60.00
6.	Kundanoor Jn, Fly Over	1	60.00
7.	SN Junction at Tripunithura	1	20.00
8.	Fly over at NH 47 (Thammanam Pullepady Rd extensiol to Sea Port Air Port Rd	1	60.00
9.	Sea Port Air Port Rd, Near Collectorate, Sub way	1	60.00
10.	Fly over at Pallimukku		

Total 415.00

## Bridges

1.	SB Road, Chettichira (Match point), 2 Nos	1	4.00
2.	Pandarachira Bridge (Valummel)	1	1.00
3.	Giri Nagar Panampilly Nagar Bridge	1	1.00
4.	Culverts and Bridges for existing crossings of rails across Railway line from Thevara to Edappally (13 Nos.,	1	13.00
5.	Kurungotta Bridge, Cheranallor Panchayath	1	3.00
6.	Santhom Convent Road Bridge	1	1.00
7.	B.T.S. Road Bridge across Chengadampokku Thodu	1	3.00
8.	Vaduthala Perandoor Bridge near Chinmaya School	1	5.00
9.	Peeliyadu Bridge across Chengadampokku Thodu	1	5.00
10.	Pashnithodu Bridge	1	5.00
11.	Thevara Mattummel Bridge	1	20.00
12.	Thevara Kumbalam Bridge	1	100.00
13.	Ponekkara Bridge	1	25.00
14.	Chambokadavu at Kalamassery Municipality	1	2.00
15.	SA Road 2 Nos, Puthiya Palam, TP Canal	1	30.00
16.	Gosree Mamangalam Rd, 2 Nos	1	6.00
17.	Pullepady Thammanam Rd, 2 Nos	1	5.00
18.	Bund Road, 2 Nos	1	20.00
19.	Vytila to SN Jn, 2 Nos, Chambakkara and Petta	1	40.00
20.	Chellanam Rd, 2 Nos	1	10.00
21.	Kumaranasan Rd,	1	1.00
22.	4 Bridges for Kothad Chathanad new Road	4	160.00
23.	Puthussery to Vaduthala Chathanad Rd (New), 2 Bridges	2	6.00
24.	NH 47 to Sea Port AirPort Rd (Extension of Thammanam Pullepady Rd)	1	3.00
25.	Panamapally Nagar Extension to NH 49, 2 Nos	1	65.00
26.	Emakulam Vypeen, Bolgatty Bridge	1	30.00
27.	Irimpanam Kalamassey Extension,	2	10.00

28.	Model Rd, Mullasery Canal	1	3.00
29.	Poisha Rd, Near Amrutha Hosp.	1	2.00
30.	Deshabhimani Rd, Near Circle Manor, BTS Rd 2 Nos	2	1.00
31.	Vypeen, Munambam Rd, 4 Nos	4	12.00
32.	Pandikudy Chellanam Road, 2 Nos	2	6.00
33.	Chalikkavattom Rd, Punchathodu	1	1.00
34.	Extension of Kaniyampuzha Rd	1	2.00
35.	Kunnumpuram Kalamassery Rd	1	5.00
36.	Pukkattupady Rd, 2 Nos	2	3.00
37.	Arakkakadavu Rd, 3 Nos	3	6.00
38.	Thripunithura Chottanikkara Rd	1	2.00
39.	Kumbalangi Aroor Rd	3	12.00
40.	Palarivattom Kakkanad Rd, Edapally Thodu	1	2.00
41.	Mattanchery Rd	2	2.00
42.	TD Rd, Mullasery canal	1	1.00
43.	Market Rd, 2 Nos	2	2.00
44.	Palluruthy Thoppumpady Rd	1	1.00
45.	Santogapalan Rd	1	1.00
46.	Nettoor Kadavanthara Bridge	1	45.00
47.	Kundanoor Chilavannoor Bridge	1	25.00
48.	Vallarpadam - Vypeen Bridge, Paralllel to existing Bridge	1	30.00
49.	Manthara Canal Rd	1	1.00

50.	Kothad Kadamakkudi 2 Bridges	1	40.00
51.	Stadium Link Road	1	1.00
52.	Link Road, Chithrapuzha, 3 Nos	3	45.00
53.	Eloor - Chowka Ferry, connecting Cheranalloor and Eloor Panchayaths	1	15.00
54.	Kannangattu W.Island (NH 49)	1	60.00
55.	Eloor manjoomal bridge	1	15.00
Total			915.00

### **Multi Level Parking**

1.	SA Road 4 Nos	4	6.00
2.	MG Road 8 Nos	8	12.00
3.	Chittoor Rd near South area, Rajaji Rd, Padma	3	5.00
4.	Marine Drive 4 Nos (Shanmugom Rd)	4	6.00
5.	Banerii Rd 4 Nos	4	6.00
6.	Kaloor - Kadavanthra Road 4 Nos	4	6.00
7.	Kaloor Old NH 2 Nos	2	3.00
8.	NH 47 Bye Pass	4	6.00
9.	Thoppumpady	2	3.00
10.	Fort Cochin	2	3.00
11.	Palarivattom 2 Nos	2	3.00
Total			59.00

## Public Comfort Centres

Kadavunthara, Pallimukku, Padma, Marine Drive, Banerji Road, Subash Bose Park, North Railway Station	7	2.00
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## Moffusil Bus Terminal

1.	Vyttila – major Bus terminal (Short and long distances)	1	30.00
2.	Kakkanad	1	15.00
3.	Thrippoonithura along with Depot	1	15.00
4.	Edakochi	1	2.00
5.	Fort Kochi	1	2.00
6.	Kalamassery along with depot	1	15.00
7.	Collectors Square (High Court), along with Depot	1	20.00
8.	Perumpadappu at 0.4 Heetors Land free surrendered	1	6.00
9.	Mattanchery	1	5.00
10.	Kumbalangi along with depot	1	5.00
11.	Palluruthy	1	3.00
12.	Chellanam	1	3.00
13.	South railway Station, eastern entrance	1	3.00
14.	Vypeen (Improvement)	1	3.00
15.	Maradu	1	3.00
	Total		130.00

## Peripheral Parking

1.	Goshree	1	3.00
2.	Edappally	1	3.00
3.	Palarivattom	1	3.00
4.	Vyttila	1	3.00
5.	Kumbalam	1	3.00
	Total		15.00

	Truck Terminal		
1.	Kalamassery	1	30.00
2.	Kumbalam	1	20.00
3.	Vallarpadam	1	10.00
4.	Thiruvankulam	1	10.00
	Total		70.00

	Pedestrian crossing with escalator facilities		
1	Kaloor	1	2.00
2	Kacheripady	1	2.00
3	Marine Drive ( Menaka)	1	2.00
4	Thoppumpady	1	2.00
5	Jos Junction	1	2.00
6	Fort Cochin	1	2.00
7	Boat Jetty	1	2.00
8	Kadavanthra	1	2.00
	Total		16.00

	Road Makings and Sign Boards		
1.	Road markings and sign Boards within the CBD		7.00
2.	Outside CBD Area		7.00
	Total		14.00

	Signals		
1	Signals within the CBD		15.00
2.	Outside CBD Area		10.00
	Total		25.00



	Waiting Sheds		
1.	Waiting Sheds within the CBD		3.00
2.	Outside CBD Area		3.00
	Total		6.00

	Waiting Sheds		
1.	Waiting sheds within the CBD		3.00
2.	Outside CBD Area		3.00
	Total		6.00

	Bus Bays		
1.	Providing Bus Bays in Designated area	250	12.00
	Inland Water transport Terminals		
	(a) Major Jetties	1	1.30
1	Marine Drive Jetty	1	1.30
2.	Chittoor Jetty	1	0.50
	(b) Minor Jetties		
1	Varapuzha	2	0.60
2	Kadamakkudi	2	0.60
3.	Mulavukadu	4	1.20
4.	Elamkunnappuzha	1	0.30
5.	Narakkal	1	0.30
6.	Fort Cochin	1	0.50
7.	Mattanchery	1	0.50
8.	Fort Vypeen	1	0.50
9.	Eda Kochin	1	0.30
10.	Thevara	1	0.30

11.	Kumbalam	1	0.30
12.	Kumbalangi	1	0.30
13.	Chellanam	1	0.30
14.	Edappaly Canal	5	0.30
15.	Kakkanad, Palachuvadu	1	0.30
16.	Perikkadu	1	0.30
17.	Thripunithura	1	0.30
18.	Valanthakadu, Maradu	1	0.30
19.	Chithartrapuzha	1	0.30
20.	Nettoor	1	0.30
21.	Chambakkra	1	0.30
22	Nedumbassery Ernakulam	4	1.60

c) Navigational Aids and Improvement of water ways

1	Providing Navigational aids for water transport system		5.00
2	Dredging of water ways		30.00

Total 48.00

Metro Rail

1	Metro Rail cochin City – Viability Gap		635.00
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GRAND TOTAL 4252.00

## 7. CONCLUSION

Kochi which was only the commercial capital of the state is now fast growing to a commercial, industrial and IT destination of the country. The Greater Kochi development Authority area was 16lakhs in 1991and is anticipated to be 25lakhs in 202with a decadal growth rate of 16%.

The number of registered vehicles has increased from 68000 in 1987to 105000 in 1996 giving a decadal growth of about 76%. The road network development CDP area however has not been commensurate with growth in traffic.

The growth in the number of personalized vehicles due to absence of adequate comfortable public transport system has congested the city roads leading to traffic jams in peak hours.

New port based projects costing more than 70000crores are envisaged in the port area which is going to offer large employment opportunities and going to attract a large population growth including floating population. Allied industries will also attract floating population both from all over the country as well as from the neighbouring districts resulting in considerable increase of intercity traffic.

The presence of major information highways through the city will make it as future IT hub in the country. Infopark has already started functioning in the city. The proposed SmartCity is going to generate about 90000 employment opportunities in the IT and ITES sector. In addition to the above projects major industries are envisaged in the eastern industrial areas of Kalamassery, Thripunithura and Kakkanad. The influence of all these projects in this area will be a population explosion and rapid extreme urbanization.

Inland Water Transport system in the city now playing a vital role in the intra urban transit system carrying about 16000 passengers daily is slowly losing its prominence due to inability to give quick access, lack of passenger amenities, lack of integration with other mode of transport, poor quality of the transport vessels etc. Inland water transport is to be rejuvenated to attract more passengers and tourists.

The main public transport system catering the city is bus transport. there are about 350 buses operating in the city on 24 major routes.

The total daily person trips for the area are 1708110 and are projected to increase to 3540900 by 2021.

## **RECOMMENDATIONS**

### **Short Term Proposals**

Short term proposals include the corridor improvements, intersection improvements, provision of pedestrian facilities, and parking management. The improvement measures mainly include:

- Inter Section Improvement and Signalization
- Provision of bus bays
- Traffic signs and Road markings
- Provision of pedestrian crossings
- Off street centralized car parking
- Operation of minibuses from parking area to business area.

### **Medium Term Improvement Proposals**

Medium term measures proposed are improvement of infrastructure to cater the travel demand in the horizon year in the future nerve centres. The medium term measures are to be envisaged with a view to accommodate the expected travel demand which

include up gradation of identified road corridors in the CBD including construction of grade separators and up gradation of inter city corridor to provide quick access to the neighboring cities of Thrissur, Kottayam, Alapuzha, Kodungallur and Muvattupuzha.

Major road development projects proposed include:

- Up gradation of major busy corridors in the CBD including construction of fly overs
- Widening of intercity routes of NH47, NH17,
- Realignment of NH49 and Vypin road ,
- Completion of Seaport Airport road,
- Construction of new corridors to Smart City area,
- Rejuvenation of Old NH through Edakochi by construction of Edakochi Bridge.
- Construction of grade separators in major inter sections
- Construction of ROBs on all level crossings.

#### Public Transport System

Recommendations include:

- Construction of new terminals discarding the existing terminals with a view to have proper integration of all modes of traffic.
- Re routing of buses utilizing existing under utilized corridors like NH47 A through which buses from Mattancherry etc. can be plied to Aluva, Moovattupuzha and Alapuzha direction avoiding busy central area and utilizing the new corridors proposed.
- Introduction of circular bus routes connecting proposed terminals.

#### **Long Term Measures.**

Recommendations for the long term planning include

- Preparation of a master plan for Kakkanad and its surrounding area.
- Introduction of suburban train service

- Construction of a link railway line from Aluva or Angamali to Thripunithura to form a circular rail.
- Introduction of Mass Rapid Transit System.

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