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CONTACTS

State : Kerala District : Ernakulam

Sl. No.	Name of Local Bodies	Address	C.D. Block	Phone No.
01.	Kochi Corporation	Park Avenue, Cochin 682011 cochinmayor@eth.net		0484- 2369007
02.	Thripunithura Municipality	Tripunithura P.O. Ernakulam		0484- 2780318
03.	Kalamaserry Municiplity	Kalamaserry P.O. Ernakulam		0484- 2540170
04.	Elamkunnapuzha Grama panchayat	Malipuram P.O. Ernakulam 682511	Vypeen Block	0484- 2493363
05.	Njarakkal Grama Panchayat	Njarakkal P.O. Ernakulam 682505	Vypeen Block	0484- 2492351
06.	Mulavukadu Grama Panchayat	Mulavukadu P.O. Ernakulam 682504	Vypeen Block	0484- 2750880
07.	Kadamakkudy Grama Panchayat	Pizhala P.O. Ernakulam 682027	Edappally Block	0484- 2430344
08.	Cheranalloor Grama panchayat	South chittor P.O. Ernakulam 682027	Edappally Block	0484- 2430441
09.	Eloor Grama Panchayat	Udyogamandal P.O. Ernakulam	Alangad Block	0484- 2545559
10.	Varapuzha Grama Panchayat	Chettibhagam P.O., Kochi, Ernakulam 682007	Alangad Block	0484- 2513003
11.	Thrikkakkara Grama Panchayat	Kakkanad P.O. Ernakulam 682030	Edappally Block	0484- 2422383
12.	Thiruvankulam Grama Panchayat	Thiruvankulam P.O., Ernakulam 682305	Mulanthuruthy Block	0484- 2786750
13.	Maradu Grama Panchayat	Maradu P.O. Ernakulam 682304	Vytila Block	0484- 2706544
14.	Kumbalam Grama Panchayat	Panagad P.O. Ernakulam 682506	Vytila Block	0484- 2700260
15.	Kumbalangi Grama Panchayat	Kumbalangi P.O. Ernakulam 682007	Palluruthy Block	0484- 2240249
16.	Chellanam Grama Panchayat	Andikadavu P.O., Kandakadavu, Ernakulam 682008	Palluruthy Block	0484- 2247450

EXECUTIVE SUMMARY

The City Development Plan (CDP) for Kochi has been prepared after a series of consultations with the key stakeholders, consisting of Senior Citizens, Mayor, Ex- Mayors, M.L.A.s, M.P.s, Industrialists, Environmentalists, N.G.O.s, councillors and experts in various fields. The process of formulating vision for the city also includes vide consultations amongst all key stakeholders The introduction of the 73rd & 74th CAA, gives powers to the Local Bodies to formulate their long term, & short term plans. (The Vision Document for Kochi has been prepared in 2002 and the preparation of Master Plan for the city is in its final stages.)

Apart from the verbal aspirations evolved during the workshops and seminars, each local body of CDP area submitted its specific requirements in various sectors. The Rapid City appraisal and analysis of the, strengths, weaknesses, opportunities and threats specific to Kochi have given a clear picture of the sectoral priorities and the interventions required in each sector. The vision as evolved from the aspirations of the people can be expressed as below.

Vision for Kochi: *'An economically productive, effective and egalitarian metropolis which will provide to all sections of society the desired level of services, and attract world wide attention as a preferred destination for Health care, Heritage, Tourism, IT and Port based services'.*

The procedure adopted for the preparation of CDP is detailed below:

(i) Key challenges facing the city are identified under various sectors of priority. (ii) The National and State Govt. policies and International development trends have been considered in prioritizing the key sectors. (iii) After analyzing the current situation, strategies have been formulated and action programmes have been worked out, so as to bridge the gap between the existing facilities and the future requirements. (iv) Financial, physical and administrative interventions required have been identified and an investment plan has been prepared.

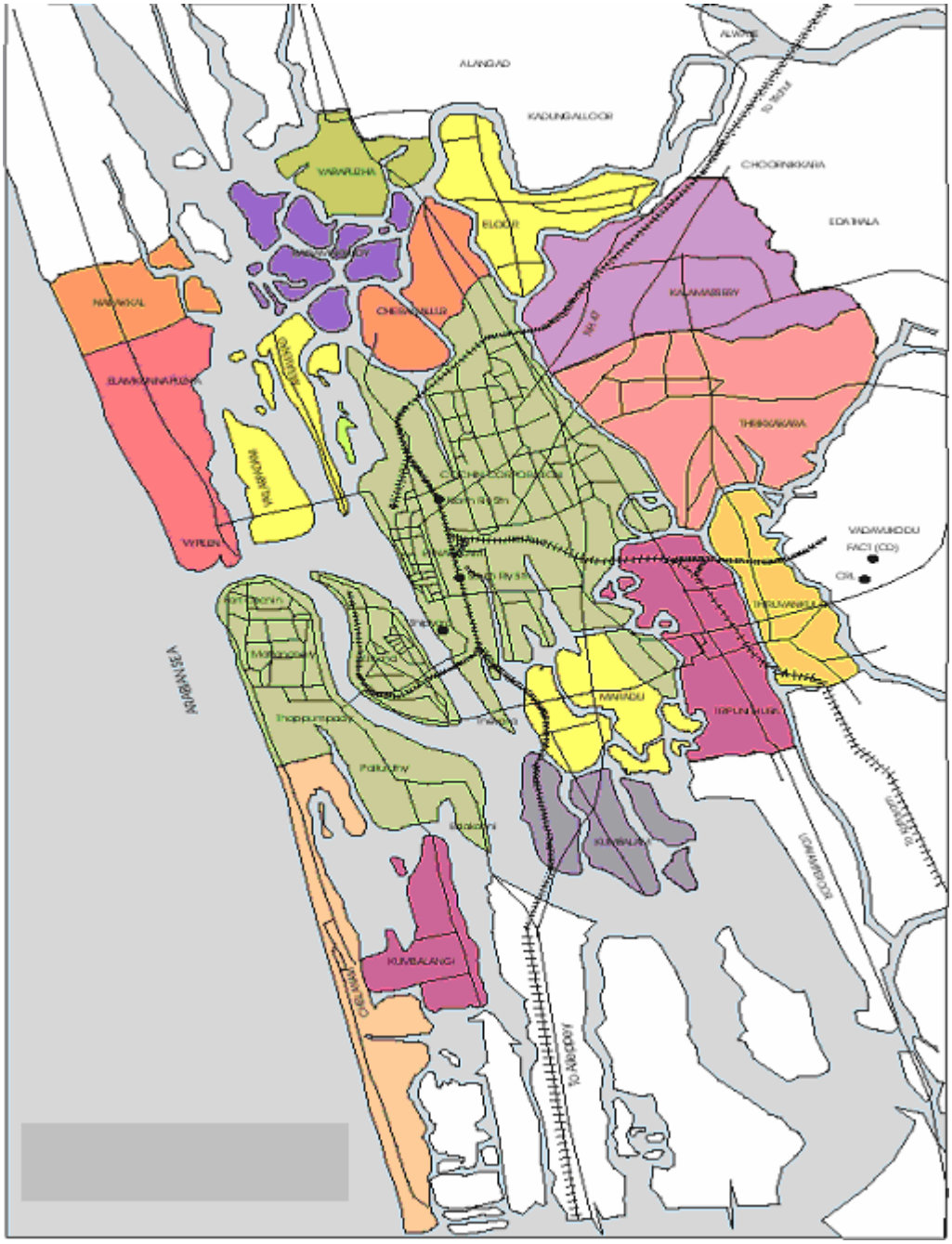
1. Demography

Kochi, the largest agglomeration in Kerala, is the nerve center of all commercial and economic activities in the state of Kerala. This area is characterized by comparatively flat terrain and a large expanse of backwaters and canals with small and large islands scattered in the backwaters. The coastal areas are densely populated with a density of 6300 persons per sq.km. in the city compared to the average density of 819 persons per sq.km. in the State.

Delineation of Kochi City for the purpose of CDP (CDP Area). Urban expansion during the past few decades out grew the limits of Kochi City. Immediate hinterland of Kochi Port has been delineated as the Greater Kochi Region, which covers 731 sq.km. which is almost 8 times the area of the city. From 1981 census onwards an Urban Agglomeration area has been identified. 2001 census has identified an urban agglomeration consisting of the City, 5 Municipalities and 15 Panchayats. For the purpose of the preparation of the City Development Plan, an area extending to 330 sq.km. with in the Greater Kochi Region, predominantly falling under the Kochi UA has been delineated based on the criteria which are explained in detail in chapter 1. The CDP area covers Kochi City, 2 adjoining Municipalities and 13 contiguous Panchayats. The population of

the CDP area comes to 11.38 lakhs as per 2001 census. The map showing the CDP area of Kochin is given in the figure below.

Kochi CDP Area



Population Projection. Projected population of the CDP area based on natural growth trend is estimated to be **12.52 lakhs** in 2011, **13.69 lakhs** in 2021 and **14.29 lakhs** in 2026. Also, once the major projects planned materialize, some migration can be expected. There is a large percentage of floating population who commute daily to the city from a radius of about 100 kms. The total population including the expected migration and the floating population is estimated to be **17.52 lakhs** by 2011, **21.69 lakhs** in 2021 and **25.29 lakhs** in 2026 in the CDP area.

Economic Base. The economy of the area is dependent on the activities of the Kochi Port. More than 60 percent of the tax revenue of the State comes from Kochi and hence Kochi is rightly called the **'Commercial Capital of Kerala'**. A number of industries are located in this district and the proximity and development potential of Kochi Port attracts private and public investments in port related activities.

Infrastructure. The economic activities and the population growth exert pressure on the available infrastructural facilities. This calls for the analysis of key sectors of infrastructural development to assess the extent of intervention needed to achieve the desired living and working condition in the area.

The vision, the key issues and the strategy adopted for meeting the challenges are indicated in each of the development sectors separately. The identified key sectors are:

1. Water Supply;
2. Sewerage;
3. Solid Waste Management;
4. Strom Water Drainage;
5. Traffic and Transportation;
6. Urban Poverty alleviation;
7. Social Amenities and Urban Renewal;
8. Heritage;
9. Tourism;
10. Environment; and
11. Spatial Growth Trends and Land Utilization.

2. Water Supply

The sub vision is to *'Provide adequate quality water supply in an environment friendly and sustainable manner'.*

The **Key issues** were identified as:

- Gap between demand and supply –397 mld;
- Intermittent water supply – limited from ½ an hour a day to 8 hours. Twice a week only in certain areas;
- Non-availability of local spot sources due to salinity;
- Distant perennial sources - makes water supply costly;
- The availability of water in the 2 rivers may not be sufficient in the long run; and
- Salinity of the environment causes corrosion of pipes.

The **Strategy**:

- Complete Piped Water supply System;
- Setting up of Desalination Plants in the Coastal Parts of CDP area;
- Special water supply project for the Coastal Areas; and
- Rainwater Harvesting in Public Buildings and Special Water Supply Scheme for specific areas.

The goal is to supply water at 150 lpcd by 2011 and to increase the supply to at least 8 hours a day by 2011. The strategy covers aspects of policy level planning, reforms, institutional strengthening and service delivery system.

The estimated cost for providing water supply and improving services is **Rs.1,216.70 crore**.

3. Sewerage

The Sub Vision is to *'Provide for efficient sewerage system and wastewater disposal facilities in an environmentally safe manner'*.

The **Key Issues** in this sector are:

- Lack of Coverage –only 5% of the corporation area is covered serving only 20,000 people;
- Old and dilapidated Sewage Treatment Plants;
- No Revenue – No monthly billing;
- High water table – septic tanks, two pit latrines, etc. do not function properly;
- High cost of sewerage –flat terrain makes natural gravitational flow difficult; the soil is mainly loose sand and clay, making open cutting difficult. High water table necessitates sewage-pumping stations at frequent intervals; and
- Within the urban areas, residential and other activities are so densely located, that the septic tank system does not work leading to water and soil pollution.

The **Strategies**:

- Undertaking contour survey to assess the slope and obtaining public participation in adopting the sewerage system in lieu of the existing septic tank system.
- Preparation of a Master Plan for Sewerage System,

For enforcing the planning reforms and to construct Sewage Treatment plant and service delivery system, the total estimate works out to Rs.2,629 crore. The 1st phase is to cover the City Corporation area, 2 Municipal areas and Thrikkakkara Panchayat (the administrative head quarters of the District) the 2nd phase is to cover the remaining Panchayat areas adopting suitable sewerage system.

The estimated cost for the 1st phase is **Rs.2,064 crore** and for the 2nd phase it is **Rs.565 crore**.

4. Solid Waste Management

The SubVision is *'To implement economically productive and effective Solid Waste Management with accountability and transparency to transform Kochi and suburbs to one of the cleanest places in the world by the year 2010.'*

Key Issues are:

- Poor waste collection system;
- No segregation at source;
- No planned reuse/recycle;
- Poor frequency of waste collection;
- Inefficient collection and disposal at temporary transfer locations;
- Obsolete waste handling and transportation system;
- Street cleaning utterly inadequate;
- No scientific and modern waste processing at any stage;
- Water logging due to choking of drains with waste;
- Mosquito menace due to stagnation of water in drains;
- Filthy Environment not congenial to a tourists' destination; and
- Misery of the poor who are the worst affected due to poor waste Management.

The **strategy**:

- Awareness creation; and
- Proper management of collection, transportation, treatment and disposal of solid waste through a well designed system.

The estimated cost for the works is **Rs.152.40 Crore**.

5. Drainage

'A clean and flood free city scape with proper drainage system' is the sub vision in regard to Drainage.

Key Issues are:

- Inadequate drainage –only 60% of the Kochi Corporation area is covered by drainage leading to frequent flooding of roads;
- Inefficient system – The flat terrain of the region, high water table and the nearness to sea make the tidal water flow inwards;
- Lack of a comprehensive drainage Master Plan;
- Barriers to drainage – Railway lines; and
- Lack of proper co-ordination – In Kerala, provision of drainage is carried out by the concerned local bodies, State Irrigation Department, National Highway, Southern Railways and the State PWD. Lack of proper co-ordination among these agencies leaves gaps in this sector.

The **Strategy**:

- Rehabilitation of primary drains; and
- Protection of secondary drains and Construction of area drains to ensure complete drainage.

Estimated Cost for all the components is **Rs.902 crore**.

6. Traffic and Transportation

The Sub Vision *'To attain an integrated transport system which leads to efficient, speedy, smooth, comfortable, and safe traffic flow with high priority to public transport which is environment friendly and easily accessible to physically challenged.'*

Key Issues are:

- The city is divided into two parts by the Railway line;
- Improper traffic junctions & inadequate lane widths;
- Chronic parking problems in core areas;
- Road side parking cause traffic block;
- The absence of bus bays causes considerable reduction in road capacity;
- Roads obstructed by transformers and hoardings;
- High volume of traffic in comparison to road capacity;
- Narrow bridges and inadequate number of railway over bridges;
- Encroachment of road by footpath vendors and petty shops;
- Absence of integrated terminal for different modes of transport;
- Lack of utility ducts in roads;
- Absence of truck terminals; and
- Declining share of public traffic.

Strategy:

- Improvement of the existing road network to facilitate free flow of traffic;
- Completion of the traffic network;
- Integration of different modes of transport by creation of terminal and interchange facilities;
- Constitution of Greater Kochi Transport Authority;
- Traffic and transportation management using GIS & GPS technologies;
- Creation of Urban Transportation Development Fund;
- Encouraging Water Transport;
- Improving the share of public transport;
- Introduction of MRTS, Streamlining and regularising the heavy cargo transport; and
- Junction and Traffic signal improvement and Parking management.

The **total estimate** of all the projects is **Rs.4,252 Crore**.

7. Basic Services to the Urban Poor

Our Sub Vision is *'A slum free city by the year 2016'*.

Key Issues are:

- Insecurity of tenure and housing;
- Poor sanitary facility;
- Acute scarcity of Potable water;
- Poor standards of Health & Nutrition;
- Social Security-Threat faced by women headed families, physically and mentally challenged, bedridden, chronic ill patients and street children;
- Poor standards of Education and Literacy;
- Poor transportation facilities from remote slum settlements to the mainstream;
- Extremely limited employment and income earning opportunities; and
- Limited provision of Environmental services and infrastructure.

Strategy includes:

- Creation of database about the urban poor sector,
- Institutional strengthening,
- Environmental improvement,
- Ensuring provision of amenities and security of tenure and Provision of housing to all urban poor families.

A total outlay of **Rs.885 Crore** is envisaged.

8. Social Amenities and Urban Renewal

The Sub Vision is, *'To bring in accessibility to all services at desired level to all sections of society and to rejuvenate the urban core areas to become more productive*'.

Key Issues are:

- There are gaps in delivery of urban social amenities - urban poor are the worst affected; and
- Decaying urban core areas.

The **strategy** includes:

- Augmentation of facilities in govt. owned educational, health and social institutions;
- Improving the facilities in the stadia, play fields and open spaces available;
- Re organizing the congested city center by decentralizing activities like wholesale trade and truck parking; and
- Reconstitution of decayed areas with public participation.

The total estimated cost works out to **Rs.259.5 Crore**.

9. Heritage

The Sub Vision is *'A city proudly presenting the rich and varied heritage it possesses and a population who love and conserve/preserve their natural and cultural heritage.'*

Key Issues are:

- Degeneration of old heritage areas;
- Pulling down and modification of heritage structures;
- Lack of proper development guidelines leading to destruction of harmony in heritage areas;
- Too much dependence on tourism leading to displacement of original citizens;
- Beautiful water edges are under the ownership of private individuals denying access to the public;
- Ill maintained canal network system; and
- Harmful drainage water is being discharged into Mangalavanam, the wonderful piece of forest right in the heart of the town.

Strategy:

- Preparation of Heritage Master Plan;
- Creation of awareness about Heritage among the children & the public;
- Protection of Heritage precincts in urban core areas & providing necessary guidelines for renewal;
- Develop a Programme for preserving cultural heritage; and
- Formulation of enabling legal provisions for conservation and Projecting heritage for economic benefit.

The **Estimated** cost of project works out to **Rs.76.10 crore**.

10. Tourism

The Vision is, *'An area vibrant with tourists from world over, enriched with all the facilities in tune with our natural and cultural heritage.'*

Key Issues are:

- Lack of publicity;
- Lack of transportation linkages among tourism spots;
- Under utilization of canals, lack of performing art centres, recreational activities; and
- Absence of tourism facilities such as wayside amenity centres and qualified guides.

Strategy

- Creation of signages and tourist information facility in all transport terminals;
- Creation of facilities to cater to both domestic & foreign tourists;
- Proper marketing of the strengths of the places especially backwaters to attract tourists; and
- Provision of different options of travel circuit planning.

Estimated Cost: A total outlay of **Rs.284.75 Crore** is estimated.

11. Environment

The Sub Vision is *'To make this gifted land an abode friendly to nature and salubrious to the inhabitants through activities with community participation.'*

Key Issues are:

- Undesirable waste management practices – the local water resources are contaminated by human activities, inadequate sewage treatment and nutrient discharge into the water bodies;
- Lack of community participation;
- Depletion of natural wetlands; and
- Lack of statutory control.

Strategy for improvement include:

- Assessment of the environmental parameters at frequent intervals;
- Awareness creation strategy from school level;
- Steps for sea shore, water resources and ecologically sensitive area protection;
- Modernization of all waste disposal systems to ensure that the environment is not adversely affected; and
- Setting standards and enforcing the same, Frequent health status survey.

Estimated cost: A total outlay of **Rs.291crore** is estimated.

12. Spatial Growth Trends and Land Utilization

The Sub Vision is *"To bring in developments which will make the city livable and efficient by introducing essential land use controls making use of planning tools."*

Key Issues are:

- High densities in and around the core city;
- Growth trends indicate urban expansion towards North, North –East and West;
- Demand for land for urban expansion results in conversion of water basins and paddy fields;
- Deficiency is felt in infrastructural facilities;
- Accurate land use data base yet to be created;
- Proper land use planning is absent in areas surrounding the city;
- The existing legal tools are not sufficient to control the haphazard developments; and
- The Town Planning Act needs amendments.

The **Strategy**:

- Development of land use data base for the entire Greater Kochi Region;
- Preparation of Perspective Plan for the Greater Kochi Region;
- Preparation of Master Plan for the CDP area;

- Preparation of Area Development Schemes with priority for individual sectors of development; and
- Water bodies being the biggest asset of Kochi, special schemes for protection of the asset and land use development control on the waterfront.

The Estimated cost worksout to **Rs.30 crore**.

13. Municipal Finance

The Sub Vision is *'A city with financial propriety and high level accountability'*

Key Issues are,

- Municipal expenditure is increasing day-by-day; and
- Need for increasing the revenue to sustain costs of development activities.

Strategy include

- Shift to accrual based double accounting system;
- Overall expenditure control;
- Preparation of balance sheets;
- Budgetary control to be enforced strictly; and
- Efficient management of assets and debts and Introduce private sector participation in service delivery.

14. Urban Reforms and E-Governance

The Sub Vision is *'A City administration with capacity to provide high level of services to the citizens'*.

Key Issues are:

- Spatial and functional fragmentation;
- Overlapping functions;
- Lack of accountability;
- High service delivery gaps; and
- Increasing urban poverty.

The **Strategy** include:

- Spatial integration of Kochi Corporation, the nearby Municipalities and Panchayats for better planning and service delivery;
- Establishing clear lines of accountability of all service delivery agencies;
- Constituting separate service delivery agencies in different sectors;
- Performance based memorandum of understanding between the city administration and various service delivery agencies focusing on targets and outcome;
- Evolving inclusive E-Governance mechanism;
- Institutional integration;

- To carryout the mandatory reforms as required by the JNNURM guidelines
- Establishing Co-ordination mechanisms to overcome spatial and functional fragmentation;
- Outsourcing of services;
- Rationalization of Municipal Man Power; and
- Simplification of regulations and systems and Training to functionaries.

15. Financial Outlay of the CDP

A consolidated statement of the year wise expenditure proposed under different sectors is given below:

Table 1: Year Wise Outlay Proposed Under Different Sectors (Rs. Crores)

Investment Sector	FY-1 (05-06)	FY-2 (06-07)	FY-3 (07-08)	FY-4 (08-09)	FY-5 (09-10)	FY-6 (10-11)	FY-7 (11-12)	Total
Spatial Growth & Land utilization	0.00	11.50	10.00	4.50	3.50	0.50	0.00	30.00
Water Supply								
a. Conventional	0.00	1.63	84.01	210.12	216.89	332.06	327.59	1,172.30
b. Desalination	0.00	6.50	23.50	0.00	0.00	0.00	0.00	30.00
c. Special Water supply Eloor & Kalamaserry	0.00	1.00	2.00	2.00	5.00	1.20	0.00	11.20
d. Rain Water Harvesting	0.00	0.84	2.36	0.00	0.00	0.00	0.00	3.20
Sewerage	0.00	18.25	223.25	562.80	1,102.75	315.00	406.95	2,629.00
Drainage	0.00	142.85	183.40	208.15	166.60	128.50	72.50	902.00
Solid Waste Management	0.00	40.41	45.57	27.79	14.71	11.96	11.96	152.40
Traffic & Transportation	0.00	692.00	1,041.00	1,093.00	847.00	519.00	60.00	4,252.00
Basic Service to the Urban Poor	0.00	206.15	184.93	183.73	142.13	92.13	75.93	885.00
Heritage	0.00	11.42	11.42	15.22	19.01	11.42	7.61	76.10
Tourism	0.00	42.20	51.20	66.60	67.00	36.20	21.55	284.75
Environmental Protection	0.00	7.05	64.80	64.01	63.90	48.70	42.45	291.00
Urban Renewal & Social Amenities	0.00	31.10	64.20	65.20	51.00	40.00	8.00	259.50
O & M – Institutional strengthening	0.00	2.00	0.60	0.60	0.60	0.60	0.60	5.00
Total	**0.00**	**1,214.90**	**1,992.24**	**2,503.81**	**2,700.09**	**1,537.27**	**1,035.14**	**10,983.45**

1. INTRODUCTION

Back Ground. Kochi, popularly known as the Commercial Capital of Kerala, is one of the two cities of Kerala State identified for being developed under Jawaharlal Nehru Urban Renewal Mission (JNNURM). A City Development Plan (CDP) for Kochi would serve as a basis for the Government of India to sanction funding under JNNURM. A City development Plan prepared for Kochi analysis the present status assesses the future requirements based on growth potential and provides a systematic plan for a sustained growth to the city and its environs.

Cities are the generators of economic momentum. They play a vital role in the development of the nation. In order to sustain the high economic growth, cities have to be efficient and competitive. In our country, urban population growth is almost 2½ times that of the population growth at national level. We also have an increase in the total number of urban poor. In order to cope with the massive problems that have emerged as a result of rapid urban growth, it has become imperative to formulate strategies for selected cities on a priority basis.

Improving the physical and financial bases of the city, which necessitate additional urban investments, can equip the city to face the challenges of urbanization. The strategy should include provision of basic amenities and services and the introduction of a proper and efficient system to manage these. Improvement of the living conditions of the urban poor is considered crucial in the strategy for the overall improvement of the Quality of Life, which is the fundamental purpose of City Development Plan.

Kochi, had recognized the need for planning and taking into account the responsibilities vested with the local bodies as a consequence of 73rd and 74th Constitutional Amendment Act, steps have been taken from 1997 onwards to obtain and consolidate the suggestions and aspirations of the different sections of the society with a view to arrive at a vision for the city. Sector wise workshops were held in environment water supply, heritage, poverty alleviation etc. Aspirations of the people's representative viz. the M.P, M.L.A.s, Corporation Councillors, Elected Representatives of Municipalities and Panchayats, Members of Residents Associations, Neighbourhood Units, Ward Committees and Gramasabhas were consolidated and a vision workshop was held in 2002 and arrived at a Vision Document. Institutions like KILA, CUSAT, CESS, Chambers of Commerce and news papers like MalayalaManorama and Mathrubhumi also held seminars considering the growth potential of the city. In addition to this, the suggestions and proposals derived from representatives of various sections of society, the recommendations evolved during the workshops and seminars and the studies conducted by M/s.RITES, NATPAC, Rajagiri Institute of Social Sciences, Kerala Road Fund Board, Esteem Developers, Kochi Port Trust, Greater Kochi Development Authority, Goshree Island Development Authority, Roads and Bridges Corporation , the papers presented by experts in various fields and the guidance given by Sri. S.M. Vijayanand I.A.S, Sri. T.K. Jose I.A.S., Dr. Jayathilak IAS,Sri. Anand Singh I.A.S., Sri. Muhammed Haneesh I.A.S. have been made use of in finalizing the vision.

Recently several meetings and meetings with experts and stakeholders were held to finalize the City Development Plan formulation. The Jawaharlal Nehru National Urban Renewal Mission is expected to give the Kochi City an opportunity to translate the people's vision into concrete proposals and programmes to be implemented in a time bound manner.

1.1 City Development Plan Framework and Process

1.1.1 City Development Plan - Objectives

The CDP aims at achieving equitable development by addressing the issues of economic growth, infrastructure, poverty, good governance and service delivery to all through a consultative process of strategizing and visioning. The action plan aims at improving urban governance and management, increasing investments to ensure employment potential and expand services including systematic and sustained urban poverty reduction.

The C.D.P. comprises of plans for the identified sectors of development with in a period up to 2026 AD, outlining the policy framework and investment interventions with in a 7 year period to achieve the vision. The objectives of CDP are:

- To develop a city development framework for Kochi City and environs;
- To formulate a Strategic Action Plan (SAP) and City Association Programme (CAP) based on the city development framework;
- Prioritization of sectors and identification of short, medium and long-term goals; and
- Preparation of implementation plans.

1.1.2 Scope of CDP

The C.D.P. outlines the strategic policy and investment interventions to achieve the vision for Kochi including formulation of plans for the identified sectors. The scope of work is to:

- Assess the present state of the city in respect of demographic and economic growth, infrastructure, services, finance etc,;
- Identify the gaps in service delivery;
- Identify the issues faced by the urban poor;
- Prepare a vision and strategic framework outlining the goals, strategies, interventions and projects to achieve the vision;
- Formulate a city investment plan with appropriate financing strategies and an implementation action plan; and
- Focus on the reforms to be carried out on local level and state level in accordance with the vision and a strategic plan outlined to sustain the planned interventions.

1.1.3 The Process

The CDP outlines the critical issues of city development, undertakes a deficiency analysis and formulates a management framework outlining strategies and guidelines for future growth. The plan provides a distinctive thrust introducing restrictive regulatory mechanism through realistic planning and management interventions within the overall regulatory and institutional framework. A development implementation action plan comprising of implementation schedule, role of stakeholders, regulation and institutional strengthening mechanism are formulated. It also aims at regular and effective monitoring mechanism. The CDP takes into account the current status of municipal services; its fiscal status, and operational and management procedures. The

CDP also considers the works and plans of other Govt. and Semi-Govt. organizations and agencies contributing towards the growth and development of the city. The CDP is prepared after undertaking the following tasks.

- Visioning exercise;
- Formulation of goals and strategies;
- Situation analysis;
- Stakeholder discussions;
- Sectoral group workshop;
- Capital investment plan and project scheduling; and
- Action and operating plan and reform.

The entire exercise is carried out with stakeholders' participation in various stages as explained earlier.

1.1.4 Orientation to Key Stakeholders

The Secretary to Local Self Government Department, Govt. of Kerala, initiated discussions to familiarize to the key stakeholders the process and the expected outcome of the CDP and build enthusiasm, understanding and commitment to the CDP. One-day session was organized for this. This activity helped in familiarizing the process of evolving a structured programme. This was followed by intensive consultative process to finalize the proposals of CDP.

1.2 Kochi Profile

Kochi, the commercial capital of Kerala lies at 9°58' N latitude and a longitude of 76°16'E. The development of Kochi as the commercial capital of Kerala is closely linked with the political and administrative history of Malabar Coast.

1.2.1 Early History

Kochi Port was formed in 1341, when the heavy floods of that year silted up the mouths of the Musiris harbor and the surging waters forced a channel past the present inlet into the sea. The old merchants of Musiris shifted to Kochi as soon as the new outlet became more or less stable. As the harbour gained prominence, the then ruler of the region shifted his capital also to Kochi, giving impetus to the growth of the town.

The early settlement of Kochi was at Mattanchery, facing the protected lagoons in the east, which provided safe anchorage to country crafts in all seasons. Mattanchery was linked to the entire coastal stretch of Kerala through this inland waters. Thus gradually it grew into a busy settlement. Nicolo Conti recorded that, by 1440, Kochi was a city 5 miles in circumference and that Chinese and Arabs carried on brisk trade with the natives of this town.

1.2.2 Colonial Settlement Fort Kochi

From 16th Century, Kochi witnessed the rapid changes through the trading and colonizing attempts of European powers. Portuguese were the first to arrive in Kochi. They founded Fort

Kochi established factories and warehouses, schools and hospitals and extended their domain in the political and religious fronts. The fall of the Portuguese in Kochi came with take over of the Fort by Dutch in 1663. The Dutch East India Company tried to persuade the local rulers into giving them monopoly in pepper trade. In this attempt, they came across varied interests of other forces viz. English, French and the Dutch. For hundred years therefore Kochi became the center of political and commercial battle. In 1795, The British took over Kochi from the Dutch. Fort Kochi thus became British Kochi. It became a Municipality in 1866.

1.2.3 Market Town - Mattanchery

Mattanchery, meanwhile, had developed as a typical oriental market town, with commercial activities distributed along the waterfronts. The agricultural produce from the vast hinterland flowed to its markets to be sold or exchanged for textiles, metals, and other products of European Countries. Jews and Muslims had their settlements here. The trading communities from Gujarat and the emigrants from Goa too established themselves in Mattanchery along with the native Hindus and early Christians. As far as the rulers were concerned, this helped to strike a balance of economic power with the European traders.

1.2.4 Administrative Centre - Ernakulam

By 1840, Mattanchery was so much crowded that the Kochi rulers shifted their capital to Ernakulam on the eastern side of the backwaters. Public buildings and educational institutions were set up in Ernakulam befitting the splendor of Maharajas. Roads were laid out. Markets were established. Temples were renovated. Railways came to Ernakulam in 1905. Ernakulam thus gradually started developing as an administrative town. Mattanchery rose to the status of Municipality in 1912 and was followed by Ernakulam in 1913.

1.2.5 Development of Kochi Port

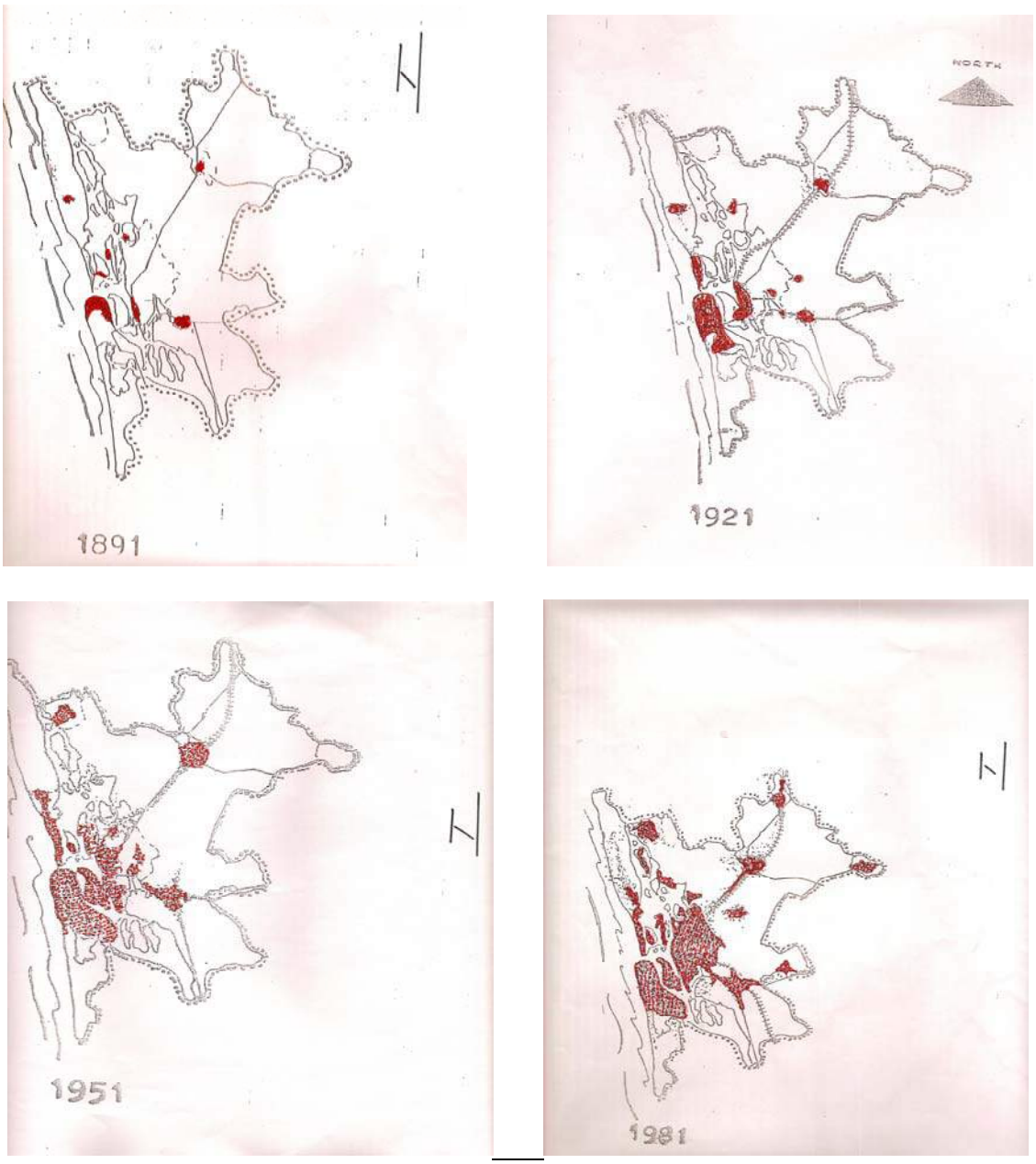
In those decades the existence of a sand bar in the sea mouth prevented large ships from entering safely into the backwaters of Kochi. With industrialization in the west there came the revolution in overseas trade with the wrought iron ships of greater draught and the consequent need for deeper and safer harbours and stronger moorings. The opening of Suez Canal in 1869 further emphasized the importance of this port as a coaling station for this route. The idea of making great harbour, out of the unique lagoons in Kochi was thus originated as early as 1870. But Kochi presented a case for dredged channel leading to the inland harbour, unfortunately the science and art of dredging was not fully developed in this period. Hence it was only in 1920 that the port works were initiated. Under the direction of Sir Robert Bristo, the sand bar at sea mouth was cut open and a deep shipping channel was dredged to the backwaters. The spoils of the dredging was used to the reclaim Wellington Island from the backwaters. Road connection to the main land on the west and road-rail connection to the east from the island was completed in 1940 when Kochi was declared as a major port by the Government of India. Wellington Island developed with its wharfs, quays and other infrastructure as terminal complex of transportation.

Kochi port gradually became the focus of the city. Centered around the port facility grew large number of business and commercial establishments providing the economic base to the city and the environs.

1.2.6 Genesis of Kochi Corporation

The industrialization inturn resulted in population increase and consequent urban growth. Kochi thus witnessed unprecedented trends of urbanization during the past four decades. The growth of population and activities has necessitated efforts to tackle urban problems, to regulate city building and to guide future development. While the Municipal Govt.s of Fort Kochi, Mattanchery and Ernakulam were able to exercise their powers and evolve schemes in their respective areas of jurisdiction, they were not in a position to perceive the problems of urban growth as a whole and to plan for it. In order to streamline the municipal administration, the Kochi Corporation was formed in 1967, incorporating the three Municipalities (Fort Kochi, Mattanchery and Ernakulam). Wellington Island and few surrounding areas in the suburbs. Growth Pattern of Kochi is shown in **Figure 1.1**.

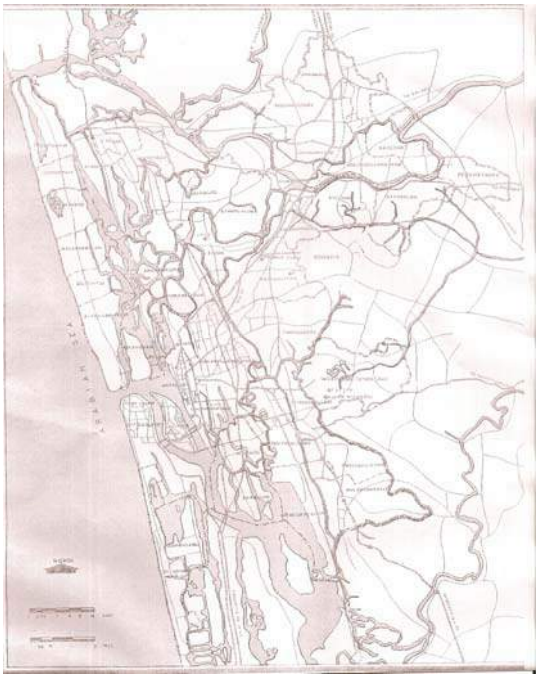
Figure 1.1: Growth Pattern Kochi Region



1.2.7 Regional Outlook

A comprehensive approach to the planning of the urban areas of Kochi and its environs was initiated after the Kerala state was reorganized (1956) and the Department of Town Planning was constituted (1959). The Region was scientifically delineated to include the primary influence zone of Kochi City consisting of 6 municipalities and 33 panchayaths. The Development plan for Kochi Region was formulated in 1976, as a comprehensive policy document to stimulate balanced growth of the Region with respect to its long term needs.

Figure 1.2: Greater Kochi Region



1.2.8 Concept of the Development Plan for Kochi Region

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. Consequently urban development has been more rapid in the City and in its immediate suburbs. Five other Municipal towns included in the Region are small urban enclaves, as compared to the core City. They are linked to the core city through the transportation corridors. Spatially the intervening villages separated them.

The villages in the region present a dispersed settlement pattern with high density of population. Many of the urban characteristics have diffused in these villages.

The Development Plan laid emphasis on evolving a settlement structure for the region. The pattern conceived a central city confining concentrated urban development within its limit. The central city was to be surrounded by a peripheral belt of planned panchayaths. The secondary urban centers were to function as growth centers absorbing the overspill of urban population of the region. A Structure Plan for the Central City was prepared and the same was published and sanctioned by Govt. in 1991. The map showing Greater Kochi Region is given vide **Figure 1.2**.

1.2.9 Delineation of the Kochi City for the Purpose of CDP

Urban expansion during the past decades outgrew the limits of the central city. Census reveal that growth trend of settlements of the region have been different from what was anticipated. Primarily the population growth in some of the rural areas and the Municipalities adjacent to the city Corporation exceeded that of the urban areas. The suburbs showed higher growth rates than the city proper. Kochi Urban Agglomeration, as per 1981 census included the Kochi Corporation, Trippunithura Municipality and census towns of Eloor and Kalamassery and Thrikkakara an urban outgrowth.1991 census showed a larger area of Urban Agglomeration. The Urban Agglomeration as identified by the 2001 census consists of the following local bodies.

Table 1.1: Population of Kochi Urban Agglomeration

2001 Census

Urban Agglomeration	Population
Kochi (M.Corp.)	596,473
Kakkanad (OG)	22,486
Aluva(M)	24,108
Choornikkara (CT)	36,998
Edathala (CT)	67,137
Paravur (M)	30,056
Chennamangalam	21,729
Kottuvally (CT)	37,884
Alangad (OG)	40,585
Varapuzha (CT)	24,516
Kadungaloor (CT)	35,451
Eloor (CT)	30,092
Cheriyakadavu (OG)	8,326
Cheranallur (CT)	26,330
Mulavukad (CT)	22,845
Kalamassery (M)	63,176
Vazhakkala (CT)	42,272
Thiruvankulam (CT)	21,713
Thripunithura (M)	59,881
Maradu (CT)	40,993
Angamali (M)	33,424
Chengamanad (CT)	29,775
Chowwara (CT)	13,603
Kadamakkudy (CT)	15,823
Kureekkad (CT)	9,730
Kochi (UA)	1,355,406

Urban agglomerations with population ranging between 1 million and 4 million are eligible for funding under JNNURM.

Kochi Urban Agglomeration as identified by the census of India in 2001 comprises of the urban local bodies i.e., Kochi Corporation, 5 Municipalities, 15 full Panchayath areas and part of 3 Panchayaths. This extends up to Angamali in the north, Chowara and Edathala in the east, Maradu and Cheriyakadavu in the south. No part of the Vypin group of Islands is included.

1.2.10 Basis of Delineation of Kochi City – CDP Area

The proposed Kochi City/Region for the purpose of the CDP is to include the entire area of the

designated 'Central City' as per the Government sanctioned structure plan area (Annexure 1) plus the area lying contiguous to this core urban area and having potential for the urban development due to the additional infrastructural inputs already planned and the large scale investments already committed which are likely to increase the urban characteristics and considering the administrative/ geographical boundary.

The major investments proposed by Kochi Port Trust with a vision to emerge as the International Maritime Gateway of the Indian Ocean Region are listed in Annexure 1, which further justifies the delineation of CDP area.

As the JNNURM lays emphasis on rejuvenating the decaying parts of the urban agglomeration and the core city and on instilling new development thrust to areas, which would otherwise deteriorate, the proposed Kochi city has been re delineated on the following criteria. The constituent areas thus decided to be included in the proposed Kochi city are based on the norms listed below.

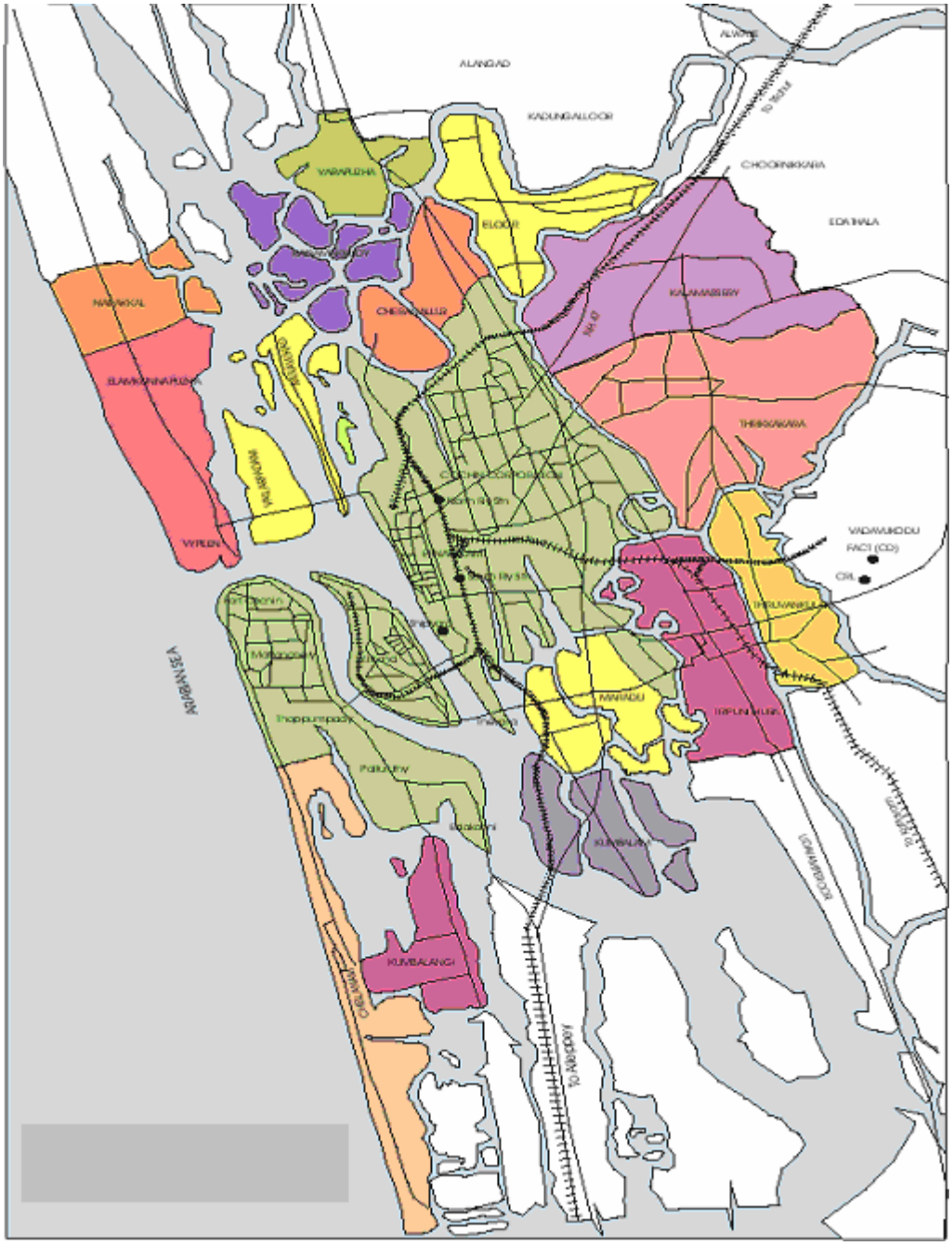
Table 1.2: Constituent Areas of the Kochi City - CDP Area

Constituent Areas	Reasons for inclusion in the proposed Kochi CDP Area
Present Kochi Municipal Corporation	Core city forming part of UA
Kalamassery Municipality	Part of UA lying contiguous to the present Corporation
Thripunithura Municipality	Part of UA lying contiguous to the present Corporation
Elamkunnapuzha Panchayat	An island panchayat lying close to the city and linked by new Gosree bridge. New developments and investments planned by the Kochi Port Trust& Kochi Refineries renders new impetus to the development of this panchayat. Was part of the designated Central City Kochi 2001.
Njarakkal Panchayat	An island panchayat brought closer to the city by the new Vypin Bridge. Forms part the designated Central City Kochi 2001. A coastal panchayat with potential for urban growth.
Mulavukad Panchayat	An island panchayat brought closer to the city by the new Vypin Bridge. Forms part of the designated Central City Kochi 2001.

Constituent Areas	Reasons for inclusion in the proposed Kochi CDP Area
	Part of UA 2001. International Container Transhipment Terminal, Vallarpadam is proposed here. An island panchayat forming part of UA 2001 and part of the designated Central City Kochi 2001- Geographically contiguous to the city.
Kadamakkudy Panchayat	Forms part of UA 2001. Was part of the designated Central City 2001.
Cheranallur Panchayat	Forms part of UA 2001. Was part of the designated Central City 2001and many large scale industries are located here.
Eloor Panchayat	Forms part of UA 2001. Was part of the designated Central City 2001.
Varapuzha Panchayat	
Thrikkakara Panchayat	Forms part of UA 2001. Was part of the designated Central City 2001. District Head Quarters. An urban out growth with vast potential for development. Centre of IT & ITES development.
Thiruvankulam Panchayat	Forms part of UA 2001. Was part of the designated Central City 2001.
Maradu Panchayat	Forms part of UA 2001. Was part of the designated Central City 2001. Fast developing commercial center.
Kumbalam Panchayat	Lying contiguous to the city separated by a water body. The only Panchayat in between the Corporation and the district boundary
Kumbalangi Panchayat	Lying contiguous to the city, though it does not

Constituent Areas	Reasons for inclusion in the proposed Kochi CDP Area
	form part of UA. It has a great potential for the tourism & is already developing. This lies between the Corporation and the District boundary.
Chellanam Panchayat	Lies contiguous to the Kochi Municipal Corporation. Part of the Panchayat already included in Kochi UA2001. Coastal Panchayat with necessity for infrastructural upgradation.

Figure 1.3: Kochi CDP Area



A few panchayats/ Municipal areas on the northern parts of the region, which form part of UA 2001, have been excluded in the CDP. The concept adopted here is to identify the future Municipal Corporation area and to equip this area, which will be designated as Kochi City for concentrated urban development.

As explained earlier in the report, Kerala is marked by a rural- urban continuum and the smaller urban centers have their influence over the surrounding 'urban villages'. The major cities are to function as specialized centers for higher order services. There is no distinct boundary, which segregate this dependency. The population growth trend is showing increase in north, northeast and western directions. Considering the need for additional infrastructural inputs to sustain the developments envisaged, the proposed city limit is redefined excluding certain areas on the north

& north east portions of the urban Agglomeration as these areas show a greater dependency on the secondary urban centers closer to them than to the core city, the central business district.

Table 1.3: The constituent areas, population and the extent of the proposed "Kochi CDP area"

			Area in Sq. Km
1.	Kochi Corporation Area	596,473	94.88
2.	Kalamassery Municipal Area	63,176	27.00
3.	Thripunithura Municipal Area	59,884	18.69
4.	Thrikkakara Panchayath	65,984	27.46
5.	Thiruvankulam Panchayath	21,717	10.49
6.	Maradu Panchayath	41,012	12.35
7.	Mulavukadu Panchayath	22,842	19.27
8.	Kadamakudy Panchayath	15,824	12.92
9.	Varapuzha Panchayath	24,524	7.74
10.	Cheranalloor Panchayath	26,316	10.59
11.	Eloor Panchayath	35,573	14.21
12.	Elamkunnapuzha Panchayath	50,563	11.66
13.	Njarakkal Panchayath	24,166	8.60
14.	Kumbalam Panchayath	27,549	20.79
15.	Kumbalangi Panchayath	26,661	15.77
16.	Chellanam Panchayath	36,209	17.60
	Total (based on 2001 census)	**1,138,413**	**330.02**

The map showing the Kochi CDP area is given in Figure 1.3.

1.2.11 Major Thrusts Given in the CDP

Kochi Corporation has implemented Urban Poverty Alleviation Programme through slum improvement with support from the DFID, Govt. of U.K. This programme is now continuing as a part of the Kerala State Poverty Alleviation Mission.

In continuation of its citizen friendly and pro-poor approaches, the Kochi Corporation has prepared this City Development Plan (CDP) for the above area enabling poverty reduction and comprehensive development up to 2026.

Kochi Corporation is on the way to incorporate and implement Information Technology as a tool for providing better services to the citizens and to improve the administrative efficiency.

The quality of life of the citizens is a major concern, thus emphasizing the need for dependable urban services. The CDP proposals are evolved mainly for the urban basic services sector, which includes Water Supply, Sewerage, Drainage, Solid waste disposal system, Traffic and Transportation with special emphasis to the urban poor, at the same time preserving the character and the heritage of the city. Considering the natural assets, human resources, medical facilities available and cultural heritage of the area, priority is given to develop Kochi as a world health care center, tourism destination and an IT and ITES center.

As Kochi has developed from a small market town to its present stage, it has a historic past and the urban core areas are characterized by narrow lanes flanked by old buildings. Urban renewal programmes are essential to rejuvenate the central core, at the same time conserving its heritage value. Most of the markets in all the constituent areas of the Kochi city need renovation and improvement. The urban renewal programme is also an important component of the CDP. The spatial growth trend of the city has been analyzed and the need for a Master Plan for the CDP area is felt with in the framework of a Perspective Plan for the Greater Kochi Region in order to achieve the goals envisaged in the CDP.

The co-ordinated institutional support of the following departments/local bodies would be mobilised to implement the proposals in the CDP.

- All local bodies in the CDP area;
- Greater Kochi Development Authority;
- Gosree Island Development Authority;
- Kerala Water Authority;
- Kerala Public Works Department & NHAI;
- Residential Associations;
- Kudumbasree;
- State Town Planning Department; and
- Kerala State Pollution control Board.

The city development plan would address all the thrust areas mentioned above to ensure the implementation of the main ‘vision’ and the sub-vision and envisaged while preparation of the plan.

2. STRENGTHENING DECENTRALIZATION AND URBAN LOCAL GOVERNANCE

THE PIONEERING INITIATIVES OF KERALA

2.1 Introduction

After the 73rd and 74th Amendments to the Indian Constitution, Kerala has achieved rapid strides in realizing the constitutional vision of transforming Local Bodies into institutions of Local Self Government. Among the States in the country, Kerala is the acknowledged leader in strengthening and institutionalizing decentralized governance both in rural and urban areas, with several pioneering innovations and basic reforms.

Kerala Municipality Act which came into being in 1994 and was fundamentally restructured in 1999 reflects the spirit of the 74th Amendment. It has made the elected Council the executive authority of the Urban Local Governments. In addition to ensure that local governments are not just creatures of a single legislation and give them space in different Acts related to their area of functioning, thirty odd State Acts were amended in 2000. This legislative innovation is a unique feature of Kerala's decentralisation.

As part of decentralization in addition to the traditional functions of street lighting, water supply, solid waste management and secondary roads, a range of functions has been transferred to Urban Local Governments. They manage primary and secondary health institutions, primary and secondary schools, anganwadis, care institutions, krishi bhavans and veterinary hospitals; i.e., the core of the human development responsibilities is now with the Urban Local Governments including the City Corporations. In addition poverty reduction, women and child development and a major portion of the responsibility for development of the disadvantaged groups have become Local Government functions. Local economic development is also fast becoming a subject of Local Governments.

In order to match the functions, the functionaries previously carrying out the functions have been placed under the control of the Local Governments. Also commensurate funds have been transferred to them to discharge the functions effectively. Thus beyond civic duties and running of utilities, Corporations have become veritable City Governments in charge of overall development.

Kerala has used decentralization as a vehicle for bringing about fundamental reforms in different spheres. These are outlined below:

2.1.1 Development Reforms

Participatory budgeting has become a reality in Kerala and a sound methodology has been evolved applicable even in the urban environment including needs assessment through Ward Sabhas, situation analysis through comprehensive Development Reports akin to City Development Plans, consultation with stakeholders, involvement of professionals from within and outside the Government in plan and project preparation. This has helped the Corporations in understanding the development issues confronting them and given them capacity to deal with

them strategically. An important component of participatory development is poverty reduction. Every poor family within the City Corporation is identified through a socially understood set of transparent non-monetary criteria. At the local level all such families below poverty line are brought together into a Neighbourhood Group (NHG), with each family being represented only by a woman, making the system a vehicle for empowerment of women as well. NHGs in a Ward are organized into an Area Development Society (ADS) and all the ADSs within a city are federated into a registered organization called Community Development Society (CDS). At each level of this three-tier networked organization there are a set of volunteers from among the women who look after health, education, community infrastructure, economic development and general management. Thus this inclusive organization of the poor has become a powerful medium for poverty reduction. It has strengthened the poor to access entitlements and gain capabilities to move towards social and economic empowerment. It is this community based organization of the poor which plans from below for an integrated Anti Poverty Sub-plan in the Corporation. It has succeeded in generating well-articulated demand for pro-poor public services.

Ten percent of the Government grants given to a Corporation has to be set apart for a Women Component Plan. This has opened up possibilities of engendering development at the local level. Similarly a good portion of the allocation to the Corporation is earmarked for development of Scheduled Castes for which it has to prepare a Special Component Plan. The City has also to develop a proper plan for the children, the aged and the challenged. A new initiative has just been launched to identify the destitutes who are expected to constitute about two percent of the population and prepare an integrated plan to tackle it. This initiative called “Asraya” has the potential of inducing the City Corporation to be compassionate and care giving.

All Corporations now have to prepare a Service Delivery Plan listing out the various services which they provide to citizens, determining the present quality and quantity of the services, setting realistic target for their improvement and developing a plan of action for attaining them.

Since a lot of assets have been transferred from Government to the Corporations in addition to their own assets, Corporations have been directed to prepare Maintenance Plans for managing their physical assets in a scientific manner utilizing their own funds as well as the earmarked Maintenance Fund devolved by Government.

2.1.2 Financial Reforms

In order to strengthen the financial position of Corporations Government of Kerala provides grants in three streams – Development, Maintenance and General Purpose. The allocations have been finalized for five years starting from 2006-07 and the flow would be as follows:

(Rs. Lakh)

Corporation	Year	Development Fund	Maintenance Fund		General Purpose Fund
			Non-road Assets	*Road Assets*	
Thiruvananthapuram	2006-07	3276.75	495.20	254.81	1098.09
	2007-08	3604.42	544.72	280.29	1207.89
	2008-09	3964.86	599.20	308.31	1328.68
	2009-10	4361.35	659.12	339.15	1461.55
	2010-11	4797.49	725.03	373.06	1607.71
Kochi	2006-07	2121.78	350.46	476.97	880.16

	2007-08	2333.96	385.51	524.67	968.17
	2008-09	2567.36	424.06	577.14	1064.99
	2009-10	2824.09	466.46	634.85	1171.49
	2010-11	3106.50	513.11	698.34	1288.64

These funds have been earmarked on the basis of transparent criteria. The Local Government-wise allocation is shown in a separate document of the budget ensuring legislative approval and preventing whimsical diversions or non-transfer by the executive. The funds are given in monthly installments and are untied and the Local Government can decide their application. Thus the devolution satisfies the key criteria of fiscal decentralization like predictability, sufficiency, freedom of use, equitability of sharing and timely flow.

Kerala is the only State where three State Finance Commission Reports have been submitted and action taken on all of them. Some of the important ongoing fiscal reforms emerging out of the State Finance Commissions are:

i. Introduction of plinth area based Property Taxation to be effective from the second half of 2006-07;
ii. Introduction of seating capacity-linked taxation for Entertainment Tax;
iii. Introduction of presumptive taxes for certain categories of professions under Profession Tax;
iv. Introduction of a new Service Tax to realize the cost of providing special services to localities, as a kind of benefits tax;
v. Linking general non-tax revenues like rents, license fees to the value of money through a system of graduated automatic increases linked to indices reflecting value of money;
vi. Linking devolution of a portion of the Development Fund to increased revenue efforts on the part of the local governments;
vii. Tax mapping to reduce escaped tax; and
viii. Updation of asset registers.

As part of the ADB supported Kerala Sustainable Urban Development Product (KSUDP) a Technical Assistance programme has just been approved to convert the cash based accounts of City Corporations into a modified accrual system. This exercise is to be preceded by updation of accounts.

In order to concurrently audit Local Governments a Performance Audit system is in vogue headed by an officer of the Indian Audit and Accounts Service. It works within the Local Self Government Department and audits, all Local Governments once in six months with the primary objective of ensuring that the financial processes and procedures are adhered to and registers and accounts are properly written up.

To enable the Local Governments to tap institutional finance as well as funds from the market, the Local Authorities Loans Act is in force. Also there is a Kerala Urban and Rural Development Finance Corporation (KURDFC) which was set up in the early seventies, the first of its kind in the country exclusively for Local Governments. Now a policy decision has been taken to restructure it into the Kerala Local Government Fund on the lines of the Tamil Nadu Urban

Development Fund.

In order to improve fiscal governance and ensure fiscal accountability certain important initiatives are currently on. They include:

1. Preparation of modern manuals for budgeting, accounting and auditing; and
2. Preparation of a new procurement manual for local governments.

Government have decided in principle to set up a independent Audit Commission for Local Governments on the lines of the Audit Commission for Local Governments in UK.

Thus the fiscal reforms of Local Governments undertaken in Kerala are fundamental and pioneering with the potential of transforming fiscal governance.

2.1.3 Governance Reforms

Several participatory structures have been set up as appropriate to the urban scenario. These range from Neighbourhood Groups and Community Development Society to Ward Sabhas and Ward Committees. The composition of Ward Committees is as follows:

Composition of Ward committee. – The Ward Committee shall consist of the following members, namely:-

1. The Councillor of that ward who shall be its Chairman;
2. Fifteen persons to be elected in the manner prescribed, from among the members of the resident's association of that Ward, which are registered in the Municipality;
3. Twenty members to be elected in the manner prescribed from among the members of the registered neighbourhood groups of that Ward which are registered in the Municipality;
4. One person each nominated by every political party having representation in the Municipality;
5. The Heads of all recognized educational institutions functioning in that Ward;
6. Twenty persons nominated jointly by the Chairperson and Councillor of the Ward, of whom, -
    - Ten shall be from the persons representing the cultural organizations, voluntary organizations, educational institutions, industrial – commercial establishments which are functioning in that Ward;
    - Five shall be from persons representing those working in that Ward as professionals (experts in agriculture, industry, health, education, engineering etc.); and
    - Five shall be from persons in the registered trade unions:

Provided that, the members nominated under items (i) and (ii) need not be the residents of that Ward."

This shows that Ward Committees are democratic institutions representing different stakeholders

and there is very less of nomination. Even in big cities Ward Sabhas are held to elicit suggestions for development schemes akin to the Grama Sabhas in rural areas. In order to ensure involvement of non-government professionals and activists in the local planning process Working Groups are set up by the City Corporations consisting of elected councilors, officials and experts from all walks of life including practitioners and activists. This helps a kind of triangulation of development ideas and project proposals.

These mechanisms have enhanced Citizen engagements and improved citizen interface with Urban Local Governments. But the quality of participation in urban areas still needs considerable up gradation. To address this focus is on evolving city- specific models of practice, through carefully- structured action research with special reference to micro- planning, social audit and community- based monitoring.

Even before the Right to Information Act, the Kerala Municipality Act had provisions since 1999 for guaranteeing the right to information which is almost total. Matching this right is a legal provision to come out with Citizen Charters. This process is undergoing refinement with the involvement of the Centre for Good Governance Hyderabad. Naturally in such a scenario service delivery assumes importance and all Corporations are experimenting with the Service Delivery Plans. Social audit completes the picture of citizen control. Here again an action research project is under way to evolve a suitable methodology facilitating easy and effective practice.

The Kerala Municipality Act has provision for a Code of Conduct governing the relationship between officials and elected members. The Code of Conduct is now being elaborated. Interestingly it is an enforceable Code of Conduct. Formal engagement of NGOs in development matters is another innovative feature in the local government system in Kerala. Eminent NGOs having expertise in different fields like water supply, sanitation, slum development, non-conventional energy, cost effective engineering etc., are accredited after a due process and such NGOs can take up implementation of works related to their expertise on a no-profit no-loss basis without going through the open bidding process. The Community Development Society of women below poverty line is deemed to be an NGO in this respect so that it can take up small works for the development of the poor especially in slums.

As part of improving governance a system is under development for a modern Office Management system. Also a new, Public Works Manual facilitating community contracting and total transparency is under finalization. Gradually e-governance is being introduced in Corporations. Already Birth and Death registration has been made almost on-line through the system of hospital kiosks. Soon monitoring of development works and accounting would be computerized. An interesting area of work taken up for electronic application is e-verification of building plans.

The Trivandrum City Corporation has tied up with the Quality Circle Forum of India to develop quality circles and bring about an improvement in the overall functioning of the office. This has had very promising initial results. The Government of Kerala as part of its Modernizing Government Programme has launched an initiative called Sevana Mudra, akin to the Charter Mark initiative of UK. This has been tried out in some Village Panchayats and is to be up-scaled to be applied Corporations also.

The Local Governments in Kerala enjoy a high degree of autonomy. The Government has no direct executive control over the Local Governments. In order to ensure accountability two unique institutions are in place. The first is the Ombudsman for Local Self Government institutions who is a High Court Judge. All issues related to mal-administration, corruption and non-performance of duties are referred to Ombudsman who has sufficient power to direct rectification and in cases involving corruption, even to disqualify elected members. Appeals against administrative / regulatory decisions of Local Governments like issue of licenses, permits and punitive action have to be preferred before the Appellate Tribunal who is a District Judge. A recent initiative has been to develop a grievance redressal system in local governments.

2.1.4 Policy Back-up

In order to improve the performance of local governments several policies have been formally enunciated by the State. They include the following:

1. A Service Delivery Policy stipulating preparation of Service Delivery Plans through a participatory process to improve the quality of delivery of public services;
2. A Social Audit Policy to facilitate transparency and accountability to citizens;
3. A Training Strategy to strengthen the capabilities of elected members and officials;
4. A Strategy for Community-Based Monitoring of poverty to track the performance of anti-poverty programme which empowers the poor by enabling them to track public expenditure meant for their benefit;
5. An Asset Management Policy to ensure that every Local Government is able to ensure the upkeep of its public assets including the one transferred by the Government through preparation of proper Maintenance Plans;
6. A framework for Public-Private Participation in Local Governments has been developed which enables Local Governments to enter into different kinds of Public Private Partnership (PPP) arrangements; and
7. A Sanitation Policy is under preparation to provide for total sanitation covering different aspects like solid and liquid waste management, environmental hygiene and overall cleanliness.

2.1.5 Institutional Back-up

Several institutions and mechanisms have been set up to ensure local level development and help in strengthening of Local Governments. The constitutionally mandated institutions like the State Election Commission, the State Finance Commission and the District Planning Committee of Kerala have been rated as the most effective in the country. The State Election Commission is in full control of the election process right from delimitation up to disqualification of members for defection or non-submission of accounts. Even the DPC is elected by the State Election Commission which also oversees conduct of no confidence motions in Local Governments. As regards the State Finance Commission the State has so far had three SFCs and the third one has also submitted its report, the first to do so in the country. Practically every recommendation of the three SFCs has been accepted by Government and the Action Taken Reports placed in the Legislature. As far as the DPC is concerned it coordinates preparation of development plans by local governments and clears them at its level without sending it to Government. DPCs in Kerala have been fully functional from 1995.

In order to add to the technical expertise of Local Governments there are two Committees – a Technical Advisory Committee which has experts drawn from different walks of life including from outside government to vet the projects prepared by Corporations and a Technical Committee which accords Technical Sanction. Technical Committees consist of engineers drawn from Government, academic institutions and non-government organizations. Issue of Technical Sanction by a joint Committee has the advantage of multiple check by responsible professionals. These arrangements facilitate the induction of any professional to upgrade the quality of technical vetting and approval of projects- a unique way of strengthening Local Government capacity of Kudumbashree.

The State Poverty Eradication Mission is a top quality organization of national acclaim which acts as a live wire facilitator of anti-poverty programme in Local Governments. It has a team of highly dedicated and competent officials. The Mission has been declared as the nodal agency for IHSDP and will play a central role in the BSUP Sub-Mission under JNNURM. A similar organization is the Information Kerala Mission which is dedicated solely for the development of IT-based solutions and e-governance initiatives in Local Governments. It has a rich domain expertise and has succeeded in developing 15 IT-based applications for Local Governments. It is the key facilitator of computerization in the Corporations.

A new Mission to provide technical assistance to Local Governments in preparing an implementing waste management plans is the Clean Kerala Mission.

For building capacity of elected members and officials, the State has a unique institution called the Kerala Institute of Local Administration. It is rated as the best institution in the country for providing training to elected representatives with special emphasis on participatory planning and local governance. It is fast developing into an international institution with regular tie up with the Government of Sri Lanka for training its Councillors. Efforts are on to raise it to the level of a South Asian Centre of Excellence for capacity building of Local Governments.

Kerala has a rich tradition of Local Government Associations which are gaining in importance in acting as a collective of elected local governments. The Chamber of Municipal Chairpersons and the Mayors Council are effective organizations, assigned an expanding role in giving policy feed back to government and expressing the demand for capacity building.

Kerala also has a unique institution for Local Governments called the State Development Council modelled on the lines of the National Development Council, headed by the Chief Minister. Its members include all the Cabinet Ministers, Vice Chairman of the State Planning Board, Chief Secretary, all Mayors, Presidents of the District Panchayats and representatives of Local Government associations at the Village Panchayat, Block Panchayat and Municipality levels. This is a forum for discussing policy issues and coordination issues.

A very effective mechanism to sort out issues related to decentralization, almost on-line, is the Coordination Committee headed by the Minister for Local Self Government and having the Secretaries in charge of Local Self Government, Finance, Planning and SC/ST Development as permanent members and other Ministers and Secretaries as invitees when issues related to their portfolio are discussed. It has been empowered by the Council of Ministers to take all decisions necessary to sort out issues related to decentralization and Local Governments except creation of

staff. This has been a very effective institution in pushing decentralization to the current levels of achievement.

2.2 Summing up

Continuous policy support in favour of decentralization right from 1995 spanning across the ten years of different governments of different political persuasions has been the strong point of Kerala's decentralization. Though it followed a big bang approach the State was quick to settle down to the tasks of developing suitable process and procedure, and setting up appropriate systems and institutions. After deliberately adopting, a 'learning by doing' approach, now it has started crafting appropriate operating systems to run its local governments efficiently. After a successful People's Plan Campaign which set the agenda, the institutionalization phase is on.

As clear from the above description, it is clear that the classical principles of devolution of functionaries, powers and funds to Local Governments have been fully followed in Kerala- and ONLY IN KERALA. Thus the state has gone a long way in realizing the core objectives of JNNURM, that of transforming the 74th Amendment into a replicable and sustainable model- with critical lessons for all states and cities in decentralization reforms.

The Local Governments of Kerala have attained adequate capacity for participatory development and the JNNURM offers the right opportunity for attaining their full potential.

3. DEMOGRAPHY AND ECONOMIC BASE

3.1 Decadal Growth of Population

The state of Kerala is a green strip of land located in the southwest corner of India. It is only 1.18% of the total area of the country, but houses 3.43% of the country's population. It is one of the most densely populated states in the country with a density of population of 819 persons per Sq. Km. As per latest census figure, the state has registered a total population of 31.80 million and more than 25% of the population live in urban areas. Demographically the state enjoys a very advanced status with rapidly declining birth and death rates, low infant mortality and very high literacy and health delivery system.

Kochi, the largest urban agglomeration in Kerala, consists of the Municipal Corporation of Kochi, adjoining Municipalities GramaPanchayaths. The CDP area of Kochi city consists of the Kochi Municipal Corporation, Two Municipalities and thirteen adjoining Panchayats (refer Figure 1.3).

The Kochi City has a flat topography characterized by small and large islands scattered in the area within the Vembanad Lake.

Kochi witnessed a rapid population growth during the past 30 years. The average decadal growth in Kochi Corporation is 7.83% whereas the nearby municipal areas registered decadal average of 18.65%, and the adjoining Panchayaths had an average decadal growth of 12.13%. The Semi-urban areas around the city is showing high rate of population growth and also fast developing trends.

Table 3.1: Population Growth of Kochi City

Name of Local Body	Area in Sq. KM	Population			Decadal Growth Rate (%)	
		1981	*1991*	*2001*	*1981-91*	*1991-2001*
Kochi Corporation	94.88	513,249	564,589	596,473	10.00	5.65
Kalamassery Municipality	27.00	43,767	54,342	63,116	24.16	16.15
Thripunithura Municipality	18.69	43,646	51,078	59,884	17.03	17.24
Elankunnapuzha Panchayath	11.66	43,911	47,878	50,563	9.03	5.61
Njarakkal Panchayath	8.60	21,672	22,322	24,166	3.00	8.26
Mulavukadu Panchayath	19.27	21,397	22,322	22,842	4.32	2.33
Kadamakkudy Panchayath	12.92	13,696	14,668	15,824	7.10	7.88
Cheranallur Panchayath	10.59	18,381	21,407	26,316	16.46	22.93
Eloor Panchayth	14.21	32,011	34,455	35,573	7.63	3.24

Name of Local Body	Area in Sq. KM	Population			Decadal Growth Rate (%)	
		1981	*1991*	*2001*	*1981-91*	*1991-2001*
Varapuzha Panchayath	7.74	20,917	22,514	24,524	7.63	8.93
Thrikkakara Panchayath	27.46	38,318	51,166	65,984	33.53	28.96
Thiruvankulam Panchayath	10.49	15,517	18,412	21,717	18.66	17.95
Maradu Panchayath	12.35	28,749	34,995	41,012	21.73	17.19
Kumbalam Panchayath	20.79	22,826	24,143	27,549	5.77	14.11
Kumbalangi Panchayath	15.77	22,376	24,601	26,661	9.94	11.98
Chellanam Panchayath	17.60	29,536	32,978	36,209	11.65	9.60

The above details are represented graphically in the Pie diagram in **Figure 2A** in **Annexure 2**.

The contributing factors of population growth in the area are mainly the natural increase and the in migration from nearby villages for trade and employment. The population of Kochi Urban Agglomeration increased from 10.41 in 1991 to 11.41 lakhs in 2001.

3.2 Age Structure

The age wise distribution of population in Corporation of Kochi in 2001 is given below:

Table 3.2: Age Structure - 2001

Age Group	No. of persons	Percentage
0-4	46,942	7.87
5-19	139,276	23.35
20-59	349,116	58.53
60-79	54,518	9.14
80	6,621	1.11
Total	**596,473**	**100.00**

The trend projection study on age structure conducted by the department of statistics of CUSAT reveals that, child population along with youth and middle aged population will consist of a major portion of total population, whereas percentage of old age population will be quite small in 2006.

3.3 Sex Ratio

In 2001, the Corporation of Kochi had 290095 males to 295764 females, which is in favour of females.

3.4 Literacy

The sex wise education status of the population in the categories of most vulnerable (MV), just above vulnerable (JV), urban poor (UP), low income group (LIG), middle income group (MIG) and high income group (HIG) are given in **Table 2A** in **Annexure 2.** The educational status of

the constituent areas was evaluated based on a sample survey. There is only negligible percentage of the population who are illiterate. About 2 % of the populations even in the most vulnerable group are graduates.

3.5 Spatial Distribution of Density of Population

The intensity of population in various parts of the CDP area is depicted in the table below.

Table 3.3: Spatial Distribution of Density of Population - 2001

Sl. No.	Name of Local Body	Area in Hectare	Population 2001	Density Persons per hectare
1.	Kochi Corporation	9,488	596,473	63
2.	Kalamassery Municipality	2,700	63,176	23
3.	Thrippunithura Municipality	1,869	59,881	32
4.	Elamkunnapuzha Panchayat	1,166	50,563	21
5.	Njarakkal Panchayat	860	24,166	12
6.	Mulavukad Panchayat	1,927	22,842	28
7.	Kadamakkudy Panchayat	1,292	15,824	43
8.	Cheranallur Panchayat	1,059	26,316	25
9.	Eloor Panchayat	1,421	35,573	25
10.	Varapuzha Panchayat	774	24,524	32
11.	Thrikkakara Panchayat	2,746	65,984	21
12.	Thiruvankulam Panchayat	1,049	21,717	33
13.	Maradu Panchayat	1,235	41,012	13
14.	Kumbalam Panchayat	2,079	27,549	17
15.	Kumbalamngi Panchayat	1,577	26,661	12
16.	Chellanam Panchayat	1,760	36,209	24
	Total	**33,002**	**1,138,413**	**35**

3.6 Population Below Poverty Line

The percentage of population below poverty is higher in the coastal areas, where fishermen constitute a major share of the population. Thrippunithura, the capital of the erstwhile kingdom of Kochi has the lowest number of urban poor – 12% of the total population. The in **Annexure 2** shows the number of people below poverty line in the constituent local bodies.

3.7 Economic Base

3.7.1 Occupational Pattern

34.3% of the population of is the work force of the city. The percentage of male work force is greater than the female work force. A detailed composition of the work force is enumerated in **Table 2C (Annexure 2)**

3.8 Demography: Emerging Issues and Concerns

Even though the natural growth rate of population does not show an exorbitant increase, the floating population in Kochi is to be considered while earmarking the infrastructural requirements. There is no intensive migration to any of the cities in Kerala mainly due to the following reasons.

- Employment opportunities in the main cities are not sufficient to exert a pulling effect
- High land values in cities prohibit establishment of residences in cities especially among the middle and low-income categories.
- The homestead nature of holdings in sub urban areas allows fragmentation of property for new family housing.
- Availability of transport facilities allows daily commutation to the city from out lying areas and districts with in a radius of about 100 k.m.

It must be noted that the daily commutation adds to the increased number of floating population in the core city. A transportation study conducted has shown that nearly 2.5 lakhs of people commute to the core city daily thereby increasing the pressure on civic amenities and congestion on major traffic corridors.

The Kochi City is experiencing population growth higher than the state average. In the next 2 decades it is expected to touch 2 million mark. Most of the growth is taking place out of the Kochi Municipal Corporation boundary within the Kochi city. This coupled with the high level of floating population, necessitates integrated planning development and service delivery.

3.9 Future Population

Kochi being the industrial and commercial capital of Kerala, the population growth in Kochi Municipal Corporation alone is expected to be 10% per decade. But the growth of population of the remaining areas of KUA is expected to be to the tune of 19 % in ten years.

Table 3.4: Projected Population of Proposed Kochi City Based on Natural Growth Trend

Sl. No.	Area	2001	2011	2021	2026
01.	Kochi corporation	596,473	618,348	640,379	648,398
02.	Municipalities-2	123,000	142,360	159,233	165,750
03.	Panchayaths -13	418,940	491,317	569,927	615,521
	Total	**1,138,413**	**1,252,025**	**1,369,539**	**1,429,669**

Source: Center for Population Studies CUSAT.

In addition to the natural growth, there will also be migration from other areas to the city. The large-scale projects already in progress and those envisaged in this area will be the deciding factors. It is assumed that for every 10 Lakhs investment in development projects, there will be a migration of one family. Analyzing the current scenario it is estimated that investment to the tune of Rs.15,000 Crores will materialize with in the CDP area during the span of coming 20 years. Accordingly, an in-migration of 1.5 Lakhs families or 6 Lakhs population, will have to be accommodated with in the CDP area, which comes to 20.29 lakhs persons. This whole population will not be concentrated in the City but distributed in the various local bodies based on the type and intensity of developmental activities coming in each area and the transportation facilities available.

Table 3.5: Population Projection Including Expected Migration in CDP Area

Year	2001	2011	2021	2026
CDP Area	11.38	14.52	17.69	20.29

Table 3.6: Total projected population including migration and floating population (in lakhs)

Year	2011	2021	2026
CDP area	17.52	21.69	25.29

Considering the migration component and the large number of floating population, as revealed by the outer corden survey conducted as part of the comprehensive transportation study carried out by M/s RITES, the infrastructural amenities will have to cater to a total population of **17.52 lakhs** by **2011**, **21.69 lakhs** by **2021** and **25.29 lakhs** by year **2026**.

3.10 Conclusion

Population growth rate is showing a declining trend in the Corporation area during the past three decades. The suburban area around the city included in CDP shows considerably high population growth. The projected population is based on natural growth, expected migration & the floating population.

The density of population in the Corporation area is 63 PPH compared to the average f 35 PPH in the CDP area taken as a whole. The share of urban poor (BPL) population is 34% in the CDP area. The sector wise workforce shows that the highest percentage of main workers is in Trade & Commerce, which shows the characteristic feature of the area.

4. SPATIAL GROWTH TRENDS AND LAND UTILIZATION

4.1 Spatial Growth

Though originated as a modest market harbour town, during the last six hundred years, Kochi has emerged as one of the eleven major ports of India and as the nerve center of commercial and industrial activities of Kerala. Kochi has grown beyond the limits of the city to become Kerala's industrial and commercial capital.

Physical, social, political and economic factors have played their decisive roles in the formation of land use pattern in Kochi City. The landforms and lagoon system contributed to the concentration of economic activities on the water front areas. Ethnic and religious grouping of people dictated the development of distinct residential zones, spatially separated from each other. Political jurisdictions of different authorities were experienced in Kochi and its environs clearly influencing the location of major facilities such as wharfs, public buildings and industries.

The shifting of the capital from Mattancherry to Ernakulam was an important milestone in the development of Kochi. The constitution of the Corporation of Kochi combining the Municipal areas of Fort Kochi, Mattancherry and Ernakulam and a few settlements adjoining Ernakulam was another important milestone. Gradually urban expansion out grew the boundaries of the city. The developments were mainly along the traffic corridors leaving small pockets of undeveloped areas in between. However the rural urban continuum pattern prevalent in Kerala resulted in non-availability of large vacant areas for major organized developments. Hence the urban expansion is contiguous along the arterial corridors resulting in urban agglomeration.

4.2 The Emerging Concerns of Spatial Growth

4.2.1 Population Growth Rate

The population growth rate of the areas falling within the Greater Kochi Region was assessed. The table showing the growth of population during 81, 91 & 2001 is furnished in **Table 3A** in **Annexure 3**.

4.2.2 Density Pattern

Another parameter studied was the change in density of population in each local body. The details are furnished in **Table 3B** in **Annexure 3.**

4.2.3 Growth Direction

The urban growth trends have been analysed based on various parameters. The parameters considered were:

- The potential for growth in terms of investments already proposed;
- Land availability for development;
- Availability of infrastructural facilities like Water supply, Sewerage, Communication network;
- Environmental quality;

- Population growth rate;
- Density patterns; and
- Contiguity to the main city.

A combined growth index was worked out for each of the local bodies taking into consideration all the above parameters. Environmental constrains and restrictions in developments were given a negative weightage.

The study has shown that the urban growth trends are towards north, northeast and west. Due to the major projects proposed by Kochi Port, the Western Islands Zone is likely to show more urban character and growth.

The growth trends indicate the need for spatial allocation of economic activities and proper planning of the CDP area. Analysis of the land utilization and land use pattern assumes importance before allocating major activities.

4.2.4 Land Utilization Pattern

The characteristic feature of the land utilization pattern in the Kochi City is the predominance of water bodies and wetland. The water body consists of canals and backwaters. These canals and backwaters served the purpose of transportation of men and materials earlier. Now a number of such canals have deteriorated as mere drainage channels. The total area of the canals has thus reduced due to encroachments and siltations. The share of the backwaters alone constitutes almost 95% of the water sheet. Vast stretches of this water is navigable, but adjoining the land mass and tiny islands, it is very shallow Reclamation of land from backwaters is an obvious solution to increase the supply of dry land for urban uses with the classic example of reclamation carried out by Sir. Robert Bristow for the port creating the Willington Island. But unplanned reclamation is likely to affect the ecological balance. In addition, there is restriction in reclamation of water body as per CRZ rules except for Port related activity. However encroachment of water bodies continues by private people, especially by those who have their properties adjoining the water bodies. Most of the water bodies lie contiguous to the paddy fields/ prawn farms and hence the clear boundary is not visible. The land utilization pattern shows that the land under water and paddy/fish farm is getting converted to developed land.

The present land use pattern has resulted from the complex interactions of varied factors in the urban structures.

Table 4.1: Land Utilization Pattern of Kochi City

Year	Water Sheets		Agricultural & Marshy Area		Developed Land		Total	
	Area in Hect.	*% of total land area*	*Area in Hect.*	*% of total land area*	*Area in Hect.*	*% of total land area*		
1981	2,220	23.40%	1,195	12.6%	6,073	64%	9,488	100%
1996	1,878	19.80%	788	8.45%	6,822	72.75%	9,488	100%
2001	1,735	18.30%	765	8.05%	6,988	73.65%	9,488	100%

Table 4.2: Land Utilization Pattern of Peripheral Areas Included in CDO - 2001

Land Utilization	Area in Ha	% to total area
Water Sheets	3,861	16.42
Agricultural/Marshy (Fish Farm)	6,727	28.61
Developed Land	12,926	54.97
Total	**23,514**	**100.00**

Table 4.3: Land Utilization Pattern of CDP Area - 2001

Land Utilization	Area in Ha	% to total area
Water Sheets	5,596	16.96
Agricultural/Marshy (Fish Farm)	7,492	22.70
Developed Land	19,914	60.34
Total	**33,002**	**100.00**

The analysis of the land utilization pattern shows that the areas on the north eastern and western part of this region vary significantly, as the western part comprises of islands surrounded by water bodies and fragmented by canals and backwaters. The per capita developed land holding is only 1.17 sq.m in the city and an average of 1.75 sq.m in the CDP area.

The detailed land use survey of the entire area included in CDP is essential to build up a proper database, so that unwarranted land use conversions can be identified. As part of the Master Plan for Kochi Corporation area, which is under preparation, detailed land use survey is being undertaken. This has to be compiled in GIS format along with land use details of the adjoining suburban areas as well. Hence the main proposal in the Land Use and spatial growth is creation of database, which can be retrieved and updated when changes are made. This will enable the concerned ULBs to control unwarranted development and to enforce collection of cess in allowable land use conversions.

The existing land use pattern has resulted from the complex interactions of varied factors in the urban structures.

4.3 Existing Land use – Kochi Corporation Area

4.3.1 Water Bodies

The land use pattern of the city and its hinterland is characterized by the predominance of area underwater. The water sheet consists of backwaters, rivers, canals, tanks and ponds; altogether forming 23.40% of the gross land of the city in 1981. Due to large-scale reclamations, this has been reduced. Most parts of these vast stretches of water bodies are navigable. But adjoining the major landmass and the tiny islands, it is very shallow due to siltation. The % of water sheets in the CDP area is estimated to be 16.42%.

The city has a very flat terrain with a very gentle slope from East to West. Unlike in other parts of the country, in Kerala, the residential use is widely spread out, intermingling with all other uses, making it difficult to clearly demarcate the boundaries of residential area and other uses. Within this limitation, is the land use analysis carried out.

4.3.2 Agricultural Use

The percentage of land under agricultural use was 12.6% of the gross area in 1981 within the Corporation area. Now it is reduced to less than 9%. Almost all the low-lying wetlands within the city are left uncultivated. But in the coastal panchayats the fields are cultivated for single crop and used for prawn farming during rest of the year. In developing parts of the city, the low lands are getting filled up fast and converted to urban use, both by public and private agencies. The percentage of land under agricultural use (including Marshy land and area under Fish farm) is estimated to be 28.61% of the gross area.

4.3.3 Residential Use

The percentage of residential land to the net dry land was 78.24% in 1981. Considering the existing population, the gross density comes to 62.87 persons per hec. The net residential density in the city is around 166.47 persons per hectare.

Residential areas are evenly distributed all over the area giving a spread pattern of settlement. Most of the residential land is built over with isolated single storeyed/double storeyed buildings. Apartment housing is a trend, which has come up in Kochi during the past 10 years; at present this trend confined to city and immediate surroundings viz., Kalamassery, Thrikkakara, Thripunithura and Maradu only. Changes in the character of land use from residential to commercial use are seen in the CBD area and slowly this tendency is spreading to the planned residential areas as well, mainly near intersections of important roads. Correspondingly, the residential densities also rise. The city is not yet geared to cope up with increasing density in terms of services like water supply and sewerage.

4.3.4 Commercial Use

Commercial use includes retail and wholesale, warehouses and storage professional institutions and commercial establishments. The spatial distribution of commercial land clearly indicates the concentration of this activity in the centre of the city and also at nodal points of transportation network. The share of commercial land in the city has shown a sudden jump during the last year due to conversion of other uses to special shopping complexes and shopping malls.

4.3.5 Industrial Use

A number of small, medium and large-scale industries are located in and around Kochi. In the Kochi City the industrial use was only1.71% of the total land use in 1981. Medium scale industries are concentrated along the foreshore areas and large-scale industries are concentrated at the north – eastern and south – eastern areas, about 10 to 15 km. off the central business district, in Eloor – Kalamasserry belt and Ambalamugal – Karimugal belt. Small-scale industries are spread all over the area. With the establishment of Goshree Bridges connecting the western islands to the mainland, large-scale industries with capital investment worth more than 15,000 crores are at various stages of implementation at Vallarpadom – Puthuvyppu area, the islands north of Kochi gut. IT industries are concentrating more around Kakkanad about 8 km. from the CBD. About 250 acres of land is being set apart for this.

4.3.6 Transport

Roads, bus stations, garages, railway installations, dockyards, port areas, jetties and airports come under this use. The percentage of use under this category was around 6% in 1981. But it does not

speak of a good transportation system or a traffic network in the city. The roads are narrow and the streets are irregular lanes.

The railway line divides the city into two in the north-south direction. The landing facilities for ferry services and for inland navigation services are inadequate. Creation of a road network, widening of roads, improving the terminal facilities and expansion of railway installations will require additional area to be brought under the transportation use. The detailed road network and proposals are separately elaborated.

4.3.7 Public and Semipublic Use

Educational medical, administrative, religious, cultural and utility service installations and land under defence are brought under this use. The spatial pattern of this land use shows a balanced distribution of public and semi-public uses all over the area. Over the past few decades Kochi has developed into an established center of learning and health care. The educational facilities available in Kochi especially for higher education has given Kochi the status of Commonwealth University Centre for E-learning.

The total number of beds available in the 72 major hospital spread over CDP area comes to 6,848. In addition there are Ayurvedic & Homoeopathic hospitals and dispensaries, PH centers, community welfare Centres etc. The health facilities available in proportion to the total population is much above the norms fixed under UDPFI guidelines.

4.3.8 Parks, Open Spaces & Stadia

There appears to be a conspicuous shortage of land under this category of use since only less than 1% of the area of the city falls under this category. However the vast expanse of water sheet and agricultural land provide the lung space requirements. But their use for passive and active recreation is rather limited. There is need for city level parks and playgrounds as well as zonal, community level and neighbourhood level open space. Detailed survey of land use is being undertaken as part of the Kochi city Master Plan that is under preparation. Detailed land use survey for the Corporation area is being done as part of the Master Plan.

But for the area outside the city limits, detailed land use is yet to be worked out

4.4 Land Use

Any development project will have its impact on space and consequently on the land use of that area. A judicial distribution of the land use is essential for the efficient functioning of the city/region. In Kochi, town-planning efforts were active since late 1800s. A comprehensive approach to the planning of the urban areas of Kochi was initiated when the Department of Town Planning was constituted in 1959. They brought out an Interim Development Plan, which conceived an urban form with a Central City of concentrated urban development and satellite townships with in an urban Region. Subsequently the Region was scientifically delineated. It comprised of Kochi City, 6 Municipalities and 33 Panchayats covering the entire Greater Kochi Region. The department brought out a Regional Development Plan for this Greater Kochi Region in 1976. In the meantime several area development schemes were notified and implemented in various parts of the city with emphasis on different sectors of development. The Regional Development Plan conceived a larger city with concentrated urban development surrounded by a

peripheral belt of Panchayats. The secondary urban centers of Angamali, Paravur, Perumbavur etc… were to function as counter magnets to the main city to absorb the over spill of population. The central city as conceived in the Regional Development Plan was studied in detail, and a Structure Plan was prepared, published and sanctioned by Govt. in 1991. As the relevant Town Planning Act provided only for the publication of Detailed and General Town Planning Schemes, the Structure Plan was published as a 'General Town Planning Scheme'. In order to guide the city's development as conceived in the CDP it is necessary to prepare a Master Plan for the Kochi City and a Perspective Development Plan for the Greater Kochi Metropolitan Region. The land use pattern of the Central City in 1981 and the proposed land use pattern as per the sanctioned plan are shown below.

Table 4.4: Land Use Proposal - Structure Plan Area

Land Use	**% of Total Land Area**	
	1981	*2001*
Residential	48.8	38.38
Commercial	0.8	1.22
Industrial	1.46	4.72
Transport	3.54	11.32
Public	2.6	5.71
Parks & Open Spaces	0.45	4.14
Paddy/ Marshy	23.43	17.28
Water sheets	18.9	17.22
Total Area (in Hect)	**27,585**	**27,585**
Total Developed Land (in Hect)	**15,906**	**18,067**

Conclusions. Land is the platform for all physical developments. In Kochi, however, the biggest asset is its vast expanse of backwaters and canals. This special asset also should be conserved and at the same time put to efficient and economic use. The zoning regulations to be worked out as part of the Master Plan will lay emphasis on the land uses permissible especially in water front development areas. It is felt that creation of water front roads all along the water edge will prevent encroachment and open up the water body to public use.

The major interventions required as part of CDP is the preparation of a Spatial Development Plan for the Greater Kochi Region and Master Plan for the CDP area along with specific zoning regulations and development parameters. Special emphasis is to be given to the following aspects:

- Water front development planning including rehabilitation of encroachers on the public land;
- Land use planning based on sound principles of planning;
- Beautification of specific water front areas - Can be taken up directly or on BOT / Public Private partnership basis;
- Water based recreational facility creation (already included as part of Tourism);
- Creation of land and water based open space system; and
- Enhancement of the use of waterways for tourism and inland navigation.

5. URBAN INFRASTRUCTURE

5.1 Water Supply

5.1.1 Background

The state of Kerala is a green strip of land located in the southwest corner of India. It has only 1.18% of the total area of the country, but houses 3.43 % of the country's population. It is one of the most densely populated states in the country with a density population of 819 persons per Sq. Km. As per latest census, the state has registered a total population of 31.80 million and more than 25% of the population lives in urban areas. Demographically the state enjoys a very advanced status with rapidly declining birth and death rates, low infant mortality and very high literacy and health delivery system.

In Kerala, all major public water supply systems are under the control of Kerala Water Authority, a public undertaking for planning, implementing and maintaining water supply and sewerage schemes for Government of Kerala.

In Kerala piped water supply systems started as early as in 1914 and the implementation of the schemes received a significant boost during the International Drinking Water Supply and Sanitation decade (1981 – 1990) with the support from domestic financial institutions like LIC & HUDCO, foreign donors such as Dutch and Danish Governments and the World bank. The trend continued during the nineties. But in view of the massive investment requirements, the State could so far achieve only 78% coverage in urban areas and 57% in rural areas. There are 991 Panchayats in the State having a total of 9776 wards / habitations out of which 994 habitations are still without protected drinking water facilities. 6889 habitations are only partly covered. Inspite of the large assistance received from the Govt. of India for enhancing the rural water supply coverage, the State Govt. has to explore alternate strategies for implementing new schemes in the uncovered areas and augmentation schemes in partially covered areas.

Kochi, "Queen of the Arabian sea" is the headquarters of Ernakulam district. The city is built up on a cluster of islands and peninsulas joined by the bustling town on the main land, Ernakulam. The island zone is going to become the prime commercial center of Kochi as well as that of Kerala with the emergence of new international container transshipment terminal at Vallarpadom and LNG terminal at Puthuvype. Besides Airport, oil refinery, public & private sector industrial units & hill products trading centers make the city the biggest commercial hub in Kerala.

5.1.2 Major Policy Issues

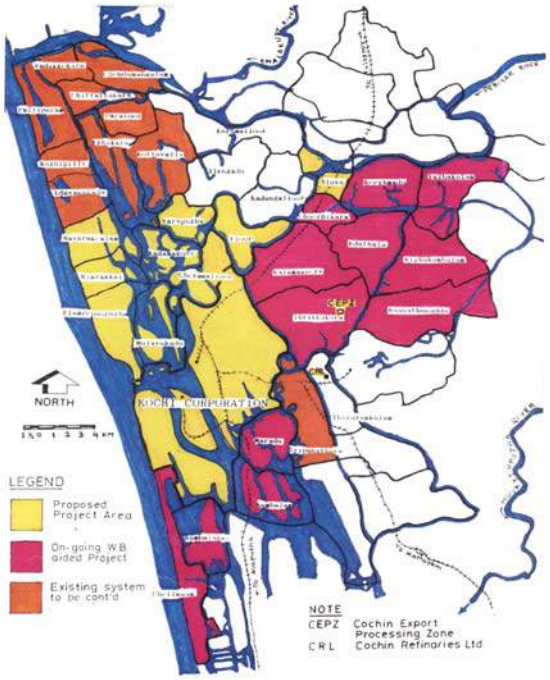
In order to cope with massive problems that have emerged as a result of rapid urban growth, Central Government has drawn up a coherent urbanization policy & strategy to implement projects in selected cities on mission mode under JNNURM. Kochi UA in Kerala state has also been included in the list of identified cities /UA by the JNNURM mission.

The proposed project area for water supply as suproposed by KWA covers Kochi Corporation, 2 municipalities, & 16 Panchayaths adjoining Kochi Metro City.

Note: The CDP area covers Kochi Corporation, 2 Municipalities and 13 Panchayats only. The proposal of the KWA for Water Supply covers 3 more Panchayats. Hence the supply is to be given to these 3 Panchayats also.

The map showing water supply scheme coverage for Kochi region is given in **Figure 5.1Error! Reference source not found.**.

Figure 5.1: Water Supply Project Area



5.1.3 Existing Tariff

At present, water charges are levied on metered consumption. The existing tariff structure is given below:

Consumption/month	Tariff
Domestic connection	
1. Up to 10,000 litre/month	Minimum charge Rs.20/month
2.10,000 to 30,000 litres	Rs.20 + Rs.3/1,000 litres in excess of 10,000 litres
3. 30,000 to 50,000 litres	Rs.80 + Rs.5/1,000 litres in excess of 30,000 litres
Non domestic connections	
1. 0 to 50,000 litres /month	Minimum charge Rs.100/month, Rs.7.35/1,000 litres
2. Above 50,000 litres	Rs.368 + Rs.10.60/1,000 litre
Industrial Connection	Rs.10.60/1000 litre with minimum charge Rs.200

5.1.4 Key Challenges

Based on the review of the current water supply scenario, the following key challenges are

identified. There is a huge gap in water supply due to lack of augmentation and enhancement of production and distribution capacity and the required distribution net work to cater to the increased demand due to urban growth. The city, the surrounding municipalities and panchayaths or outgrowths are in short of adequate water supply network and access to piped water supply. And moreover, the State Government do not have adequate finances to mobilize capital for augmentation of new water supply schemes.

There is a huge demand/supply gap, which is likely to widen drastically in future. Frequency of water supply ranges from 8 hrs to ½ hr every day in Corporation and other surrounding area. Lack of metering, exorbitant illegal connections and Public Stand Posts lead to high reduction in revenue. Another problem is the contamination of water due to leakage in pipes and the resultant infiltration. The regulatory mechanism to oversee the functioning of the sector and to fix service standards as well as tariff to meet capital and operating expenditure is lacking and the available Government mechanism is not functioning properly.

5.1.5 Sub-Vision for Water Supply

'Provide adequate quality water supply in an environmental friendly and sustainable manner'

5.1.6 Mission

'Provide services at every doorstep with a performance of 100% satisfaction with financial self sufficiency'.

5.1.7 Goals and Service Outcomes

Considering the above challenges, the following goals have been identified.

The water supply coverage and access to piped water supply in Kochi city area at 150 lpcd and required pressure to get 100% satisfaction level by the year 2011. The per capita water supply as per CPHEEO norms, at 150 lpcd by 2011 will increase hours of supply to 8 hours a day and finally achieve 24 X 7 by 2021. There is a need to lower the Non Revenue Water (NRW) to 30% by the year 2011, 20% by the year 2016 and 15% by the year 2021. 100% O&M cost recovery is to be achieved by the year 2011.

5.1.8 Objectives of the Project

The objective of the project is to improve the water supply systems in Kochi Corporation, Aluva & Kalamassery Municipalities and adjoining sixteen panchayaths to achieve the Goal "Improve Health and living standards of the people in the project area through safe drinking water at required pressure and hygienic practices".

5.1.9 Need and Justification of the Project

The present water supply service area of Aluva head works comprises of Kochi Corporation, 4 Municipalities and 27 panchayaths covering an area of 574 Sq. Km.

Kochi Metropolitan Area comprises Kochi Corporation, 6 municipalities 33 Panchayats as per Notification G.O. (Ms) No.256/95/LAD. Dt. Tvm. 14th Nov. 1999. A major portion of this area depends on the existing water supply system from Aluva Head Works taking raw water from River Periyar. Photograph of water supply intake point at Periyar shown in **Figure 5.2Error! Reference source not found.**. Kochi Corporation consists of Fort Kochi, Mattancherry, Willington Island & Ernakulam and has an area of 94.88 Sq.Km.

Figure 5.2: Water Supply Intake Point at Periyar

The population of the Corporation area as per 2001 census is 596473. Over and above there is a great inflow of floating population to the Kochi due to the commercial, industrial, social & defence importance.

The filtered water supply system for Kochi city was first introduced in the year 1914 with the development of Chowara water works on river Periyar. The supply to Kochi was augmented in 1965 by constructing new water works of 48 mld capacity at Aluva (situated at about 20 Km . from the city) with Periyar river as source. In 1969 additional facilities for treatment of 72 mld was provided at Aluva.During 1993 a new treatment plant of 70 mld was added to meet the requirement of 12 neighbouring panchayaths under World Bank assistance. Another 35mld treatment plant is also constructed recently as a part of the HUDCO project. Thus the total installed capacity of Aluva head works is 225 mld. Meanwhile supply from Chowara is diverted for rural water supply schemes in surrounding areas. Since Separate schemes were envisaged for two Municipalities (Paravoor and Thrippunithura) and eleven Panchayaths, (Kottuvally ,Ezhikkara, Chendamangalam, Vadakkekara, Chittattukara, Pallippuram, Kuzhuppilly, Edavanakkad, Kizhakkambalam, Kunnathunadu, Vazhakkulam) the service area from Aluva Head works is reduced to Kochi Corporation, two Municipalities and sixteen Panchayaths. The estimated water demand of the above service area in the year 2005 is 360 mld where as the total supply is only 225 mld leaving a gap of 135 mld even at present. The projected demand in 2036

AD is 610 mld considering the domestic, commercial & industrial demands. Detailed proposals for meeting this demand – supply gap have been formulated.

5.1.10 Water Demand

The total water consumption comprises, domestic and non-domestic consumption, including water requirements for industrial, commercial and institutional uses, hospitals, hotels, theaters, gardens etc. To this total consumption, unaccounted water, which includes requirement for fire fighting and an appropriate allowance for leakage losses, is added to calculate the filtered water demand. Water Treatment Plant (WTP) losses are further added to obtain the total raw water demand. As per JNNURM guide lines the domestic demand is taken as 150 lpcd which is in line with the CPHEEO norms for clearing water supply and sewerage projects funded by Government of India. The non –domestic, and other Industrial demand and provision for losses are also as per JNNURM guidelines. All major Institutions existing and proposed in the project area are considered in arriving at the number of consumers to be included under the scope of this project.

Table 5.1: Proposed Service Area and Water Demand

Name	Area in Sq Km	Projected Water Demand (MLD)					
		2001	*2006*	*2011*	*2021*	*2031*	*2036*
Corporation	94.88	193	168	189	227	272	285
Municipalities	34.18	22	24	27	33	39	41
16 Panchayats	223.92	143	167	188	225	270	284
Total	352.98	372	360	403	485	581	610

5.1.11 Project Proposal

At present water demand of the above service area is met from river Periyar. In this project Muvattupuzha River is considered as alternative source, and to reduce the project cost by avoiding the long transmission lines to western part of the project area. 100mld Treatment plant is proposed at Maradu, in Central Store compound, taking water from Muvattupuzha river at Pazhur near Piravom,and a 285 mld plant at HMT compound at Kalamassery taking water from Periyar River.

5.1.12 Components of the Project

5.1.12.1 Project in Muvattupuzha River

Source & Intake Works. The Intake work is proposed at Pazhoor, Kottarappattu Kadavu near Piravom town, which is about 20km away from Kochi Corporation. The proposed intake works should have a capacity of 102.5 Mld. 30 cents of land required for the construction of new intakewell is to be acquired at Pazhoor Padathole Mana compound. Raw water is initially pumped to a GL sump of capacity 43lakhs liters at Arakkunnam where sufficient land is available. For this purpose 2500m2 land is to be acquired. Raw water pump sets of capacity 600HP- 4nos (with one being stand bye). Transformer and connected electrical works are proposed at intake works. The intake well has inside diameter of 12 m and a depth 15 m.

5.1.12.2 Raw Water Transmission

The required quantity of 102.5mld raw water is drawn from Muvattupuzha River at Pazhoor Kadavu, Piravom Panchayath . An intake well cum pumping station is proposed at this point in the land to be acquired. Raw water is pumped to the GL sump proposed to be constructed at Arakkunnam about 4910m from the intake point from where it is transmitted to the TP at Maradu by Gravity. Total length of raw water transmission main will be 20960 m. Most of the proposed alignment passes through PWD, and panchayath roads. Land acquisition is proposed for a length of 5162 m with a width of 5 m in dry land and in 6 m width in marshy area for a length of 2818 m in the alignment. The alignment includes Railway line crossing, river crossings, and irrigation canal crossings etc. Land can be purchased on negotiation since no eviction of households or major structures come along the proposed alignment.

5.1.12.3 Treatment Plant:

The Treatment plant is proposed to be constructed at Nettoor (Maradu), where KWA is having 22 Acres of land. The capacity of the proposed plant is 100 mld.

5.1.13.4 Transmission & Distribution System

Detailed survey has not been conducted for clear water transmission main. Hence approximate distance & levels has been taken for design purpose. Clear water produced at Nettoor TP site is proposed to be distributed mainly to. Kumbalam, Kumbalangy, Chellanam, Willington Island, Western Kochi, Maradu and Thammanam sump.

5.1.12.5 Project in Periyar River

Intake Works. Intake works is proposed for the ultimate stage demand of 2041.The proposed intake works should have a capacity of 300 Mld. Land required for the construction of new intake well is available at Aluva Head Works compound.

Treatment Plant. Water Treatment Plant of capacity 285 Mld have to be constructed to meet the ultimate demand in the year 2036. Within the campus of Aluva Water Works sufficient land is not available for constructing the proposed Treatment Plants. Therefore the part of Land owned by HMT at Kalamassery is proposed for the new TP.

Figure 5.3: Treatment Plant at Aluva

Raw Water Transmission. As mentioned above additional raw water of about 300 mld would be abstracted from river Periyar at Aluva. For this purpose, a new raw water Pumping station is proposed to be developed in the existing plot of Aluva Waterworks for housing suitable vertical turbine pumps Site proposed for the WTP at HMT compound is about 8km. away from this pumping station.

Transmission & Distribution System. Various distribution stations in the service area will be supplied with filtered water from Aluva TP and the new WTP proposed at HMT site. Based on the present distribution system the entire service area is divided into different zones.

The total project cost is worked out to **Rs.1,172.30 crores**.

5.1.12.6 Special Water Supply Project for the Coastal Areas of Kochi

The Coastal areas of Kochi are characterized by high density of Population and scarcity of good drinking water sources. The proximity to the sea and the high water table renders salinity to the ground water sources. When the settlement pattern was dispersed there used to be ponds and water basins, which supplied water for secondary uses. In certain pockets this water was used for drinking as well. But the increase in the population and the resultant contamination from human habitation coupled with the salinity of ground water has rendered this source unusefull for any purpose. Hence, the coastal people depend mainly on piped water supply and water supply through barges and lorries.

As the coastal areas lie away from the water sources in Periyar, the supplied water does not always reach these coastal areas. Hence, the supply is often limited to a few hours a day. One can see long queues waiting for collection of water from the public taps located in this area. The quality of water is also not good as it reaches the end point because of the infiltration of dirt and contaminants through the worn-out pipe system.

The proposal put forth in the previous subsections is for supply of water through the pipe system at 8 hours a day at 150 lpcd by 2011 and to achieve the final target of 24 hours a day by 2021. At present there are areas in the coastal Panchayaths where supply of water is only on alternate days and the supply is sometimes limited to half an hour a day. The coastal people comprise of a major section of urban poor who do not have access to any other water source. However, the recent survey conducted by Greater Kochi Development Authority has shown that they are willing to pay a reasonable amount, if potable water is supplied to them for the essential needs like drinking and cooking. This necessitates a supply of minimum 15 to 20 liters of water per family. The immediate solution is provision of **Desalination** Plants.

Advantages of Desalination Plants

- The plants can be erected with in a short span of time, say, 6 to 8 months;
- As the sea/brackish water is treated there is no depletion of ground water sources;
- Requires only minimum land area for setting up the plant and storage facility;
- Can supply water of WHO standards;
- Part of the production cost can be met by supply of water for commercial uses and the local supply can be subsidized;
- The cost per liter of water supplied will be less than the cost of supply through lorries or tanks;
- The innovative technologies developed elsewhere for treatment using Reverse Osmosis Technology and energy recovery reduces the running cost of the plant; and
- The product water supplied will be of bottled water quality.

Considering the above, it is proposed to set up desalination plants of specific capacities in the coastal Panchayaths as detailed below. The price indicated is for modern reliable fully automatic seawater plants with energy efficiency.

Estimated Production cost	- Rs.0.05/ litre
Transportation cost	- Rs.0.05/ litre (5 ps/ litre)

20 litres of water per family is considered to be the minimum requirement of drinking water per day. For delivering at a distribution centre near the homes from where they have to collect in their own containers, for 20 litres the cost comes to Rs.2/- If a portion of the water is bottled and sold at Rs.20 per 20 litre instead of the market rate of Rs.40 per 20 litre/ can, the water can be given to the local families at a subsidized rate of say Rs.1.50 per family per day @ 20 litre /day

The complete solution to the water problem can be achieved by an Integrated Drinking Water Management Scheme, which includes rainwater harvesting, conservation of ponds and tanks, desalination of seawater and the normal supply through water supply lines. The cost for rainwater harvesting and for conservation of tanks and ponds is included in the sector on environment.

5.1.13 Rain Water Harvesting

Water scarcity is the most important problem of our country. “Drought – 2004” forcefully brought out the need to have a holistic and continuous approach towards extraction, use, conservation and management of water resources in Kerala. Although we have in Kerala about 3,000mm rainfall, 250 openwells/Km2, 44 rivers and so much lakes and thodus we are experiencing the above mentioned crisis. So a well-planned water management is needed to overcome it. Kerala Rural Water Supply & Sanitation Agency put forward several small and isolated initiatives in water management, which relates to harvesting and using rainwater at the household and micro community level.

The various causes that lead to ground water depletion and water scarcity are:

1. The undulated topography sloping towards sea that the rainwater has high tendency to flow towards sea;
2. Forest destruction, which leads to increased velocity of flow of rainwater;
3. Excessive consumption of water;
4. Use of pumping system;
5. Increased water pollution;
6. Removal of sand from river beds; and
7. Reclamation of water basins.

On the other side the good rainfall in the Coastal areas will make available good amount of water if harvested properly. The following table gives this picture.

Table 5.2: Availability of Rainwater in Kerala

Season	Availability of rain water %	Quantity of Rainfall
1 Year (12 months)	100	3,000mm
Monsoon	60	1,800mm
Thulavarsham	25	750mm
Summer	15	450mm

The table reveals the abundance of rainwater and effective rainwater harvesting could solve the water availability problem to a great extent.

Any of the following methods for rain water harvesting could be used:

1. Ground water Recharge;
2. Roof water harvesting; and
3. Judicious management of available water resources.

Groundwater recharge can be achieved in many ways such as contour bunds, bench terracing, stone pitched bunds, check dams etc. Roof water harvesting which has great importance in urban areas. Judicious management of water is an important remedial measure, which can be achieved by the awareness given to the people.

Roof water harvesting

- Methods
    - Recharge pit. Roof water after collection directly enters into the ground through a filter media consisting of aggregates of different grades. This helps to penetrate the rainwater though soil there by raising the level of ground water table. The size of the pit provided is 1mx1mx2m.
    - Roof water collection through storage tanks. Water from roof is collected in tanks of different capacities after passing through a filter and the surplus water is directed to go into the nearby well or soil to raise the ground water table.

The tanks will be in different capacities such as 10000L, 15000L, 25000L, 1 lakh etc. Up to 10000L we can use ferrocement technology, which is cheaper. The size of tank depends upon the storage duration i.e., weather, it is only for summer season or for the full year. The roof may be made of GI sheet, Asbestos sheet, Tiles or Concrete. The storage tank normally consists of (i) Roof; (ii) Drain pipe to collect water from roof; (iii) Roof washer to wash out the roof; (iv) Filter; (v) tank to collect water; and (vi) tap to take water from tank.

Table 5.3: Cost Analysis

Roof Water Harvesting Unit	Cost
1. Recharge Pit	Rs.4,500/each
2. Storage Tanks	
a) Ferrocement tanks (upto 250000 L) below G L	Rs.2.00/ litre
b) Ferrocement tanks (upto 250000 L) above G L	Rs.2.40/ litre
c) Concreate Tanks	Rs.6.00/ litre

Special Water Supply Scheme Proposed by Eloor Panchayat. Eloor Panchayat is surrounded by water body – a branch of Periyar river, which is perennial source of water. The Panchayat area is a predominantly industrial area where major industries such as FACT, TCC, HIL etc are located. Considering the huge demand for water for these industries and for the local population a separate project is proposed by the Panchayat. The raw water source is readily available and land required for setting up the treatment plant is also available. The project comprises of taking 25 mld of water and treating it to drinking water standard by setting up the treatment plant. Laying of distribution lines to the two adjacent panchayats of Kadamakudy and Cheranallur is also envisaged in addition to the supply to Eloor. This facility can also cater to the demand for water by the ships visiting the ICTT at Vallarpadam. Cost is estimated to be **10.30 crores** and the O&M cost is proposed to be met by the Panchayat directly as the operation is proposed to be handled directly by Eloor Panchayat.

Special Water supply Scheme for Kalamassery. Kalamassery Municipality falls mainly in the midland zone and the ground water sources are comparatively good in quality. However a number of wells, ponds and water basins are neglected with the result that the people depend mainly on piped water supplied by KWA. As the supply is intermittent and as the quantity is not sufficient people now depend on water supplied by the tanker lorries by private companies. The Municipality thus proposes the following scheme as additional water supply scheme. The project is proposed to be run by Self Help Groups.

Estimated cost. Improvement of ponds, construction of wells, overhead tanks and purchase of tanker lorries is estimated to be Rs.**0.90crores**.

Conclusion. Under this sector the major proposal is to provide piped water supply to all families at 150 lpcd for at least 8 hours a day by 2011 with the intention to raise the supply to 24 x 7 by 2021. The proposal is to tap the source from Muvattupuzha river also & to construct treatment plants in HMT land & also at Maradu. The project includes construction of intake arrangements, laying of distribution network, rehabilitation of existing lines & modernization of the system. Total cost for this is worked out as 1172.30 crores.

Special water supply scheme for Eloor and Kalamasssery are also proposed by the ULBs themselves by tapping the Periyar branch river source.

For the coastal panchayats, Desalination plants are proposed for urgently meeting the demand for getting at least minimum drinking water considering the acute shortage in these areas.

Another component under this sector is encouraging rainwater harvesting by making it statutory and providing recharge pits and rainwater storage tanks.

The total project cost for the 4 components in the water supply sector is estimated to be **Rs.1,216.70 crores**.

5.2 Sewerage System

5.2.1 Current Scenario

The sewerage system in the Corporation of Kochi is maintained by the Kerala water Authority. The scheme was commissioned in 1970. A comprehensive Sewerage Project for Kochi Corporation was envisaged dividing the Corporation area into four different zones and dividing each zone into different blocks. The scheme as envisaged to cover the entire 94.88 sq.km. could not be implemented fully.

5.2.2 Coverage

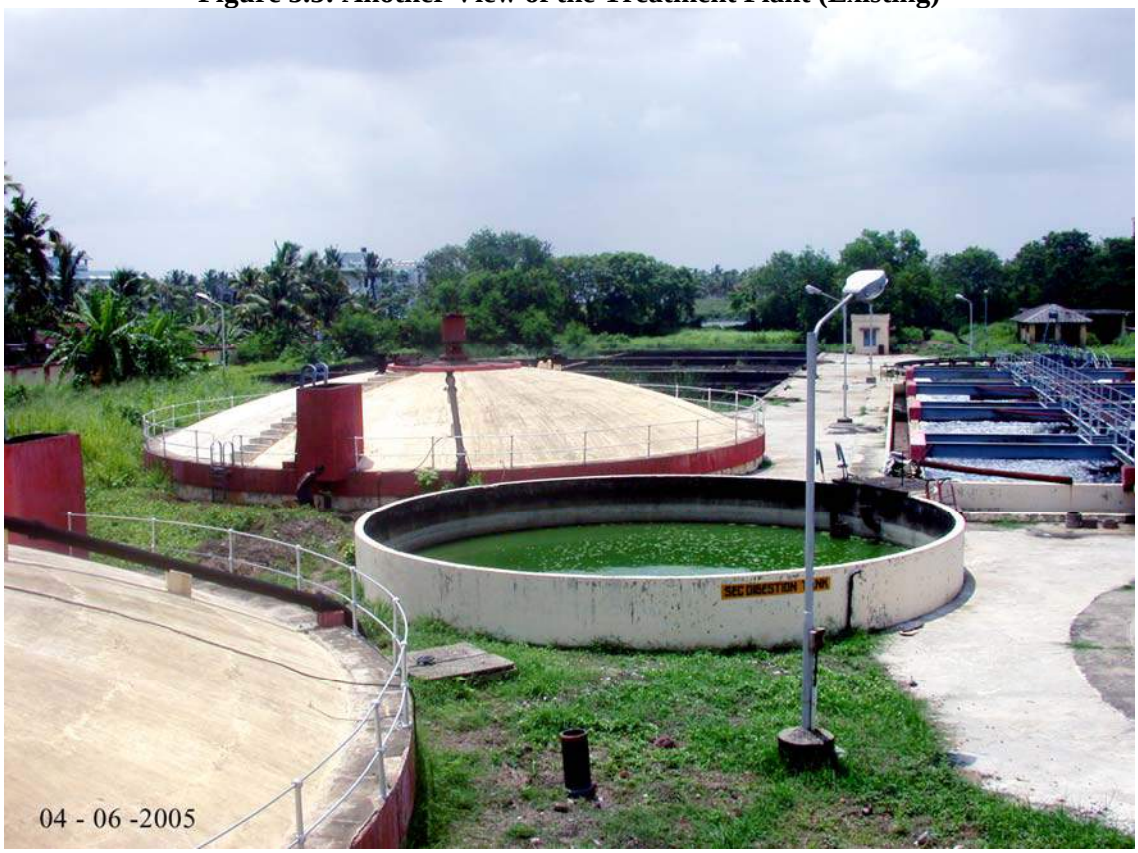
The existing sewerage system covers only 5% of the Kochi Corporation area. An extent of 2.5 sq.km. in the main heart of the city ie. General Hospital area and 1.50 sq.km. in Gandhi Nagar area are covered by the existing sewerage system.

5.2.3 Sewage Treatment Plant

The Sewage Treatment Plant located at Elamkulam is having a capacity of 4.50 MLD (Figure 5.4 and Figure 5.5). The plant works in the activated sludge process of Treatment. The plant was commissioned as early in 1955. The maintenance of the sewage Treatment Plant at Elamkulam is done by KWA with utmost care, and the plant is functioning reasonably well.

Figure 5.4: 4.50mld Capacity Seweage Treatment Plant (Existing at Elamkulam)

Figure 5.5: Another View of the Treatment Plant (Existing)



5.2.4 Financial Status of Kochi Sewerage Scheme:

The Kochi Sewerage System is run by Kerala Water Authority without having any income from it and maintained by the grants obtained from the State Govt. from time to time. A proposal for introducing sewerage cess is pending.

Income. Revenue income from the Sewerage System is very meagre and mainly through the new connection charges. The details of income received are tabulated as below:

Table 5.4: Revenue Income from Sewerage

(In Rs. lakhs)

Sl. No.	Particulars	2005-06	04 – 05	03 – 04	02-03	01-02	2000-01
1.	New connection charges	0.25	0.21	0.19	0.11	0.14	0.10
2.	Sewage Cess Demand	Nil	Nil	Nil	Nil	Nil	Nil
3.	Other income	0.04	0.10	0.03	0.02	0.01	0.03
4.	Interest (on s.c. a/c.)	0.08	0.05	0.02	0.01	Nil	Nil
	Total	**0.37**	**0.36**	**0.24**	**0.14**	**0.15**	**0.13**

Expenditure. The major expenditure items are power, establishment and maintenance charges of the system. The power tariff applicable to Kerala Water Authority is the highest among various other HT tariff. The High Tension tariff applicable to Kerala Water Authority is even more than

the Extra High Tension Tariff rate. The details of the expenditure are given in the following table.

Table 5.5: Revenue Expenditure from Sewerage

(Rs. Lakhs)

Sl. No.	Particulars	2005-06	04 – 05	03 – 04	02 – 03	01 – 02	2000-01
1.	Staff Cost	41.62	36.40	32.02	32.52	32.84	33.33
2.	Power charges	19.20	17.76	18.12	17.37	16.39	13.26
3.	Mace. Of system	24.59	22.62	22.46	21.62	21.40	19.24
4.	Admn. & other charges	1.52	2.02	1.39	1.12	0.95	0.85
	Total	**86.93**	**78.80**	**73.99**	**72.63**	**71.58**	**66.68**

5.2.5 Future Demand

The vast majority of the city area still remains unsewered. The Septic tank and other excreta disposal methods adopted in the unsewered areas are not functioning properly. The feacal matters are left into the drainage canals and finally to the backwaters leading to epidemic and mosquitominaces. The proposals detailed below are to cover the entire Kochi Corporation, Municipal areas of Kalamasserry and Thrippunithura and Thrikkakkara Panchayath as first phase. Rest of the Panchayaaths viz. Eloor, Varapuzha, Cheranalloor, Kadamakkudy, Mulavukadu, Elamkunnapuzha, Njarakkal, Thiruvamkulam, Maradu, Kumbalam, Kumbalangi, Chellanam are included as second phase. According to the topographical features of the project area, the entire area is divided into separate zones.

Vision. 'Provide for efficient sewerage system and wastewater disposal services in an environmentally friendly and safe manner'

Mission. 'Provide services at the doorstep and attain 100% satisfaction level with financial self sufficiency'.

5.2.6 Strategic Aims

- Meet Statutory Obligations
  - Planning;
  - Wastewater standards; and
  - Environmental obligations.
- Operate as a financially, independent self sustaining Scheme
  - Meet financial obligations; and
  - Set out our own internal rules and procedures.
- Improve Commercial and Operational Practices
  - Billing;
  - Cash Collection;
  - Cost reduction opportunities; and
  - Minimize corruption.
- Focus on Customer Services

  - Customer-centred Organisation; and
  - Improve public relations – community, image, consultation with other stakeholders and media.
- Restructure KWA in line with Mission guidelines for operation and maintenance of the system.
- Capacity building of the staff.
  - Link organizational needs and performance targets.
- Plan, invest in and maintain Assets
  - Create a full inventory of assets along with condition. A condition register for continuous monitoring;
  - Minimize cost overruns;
  - Deliver investment projects on time and to budget; and
  - Ensure proper project planning, monitoring and evaluation.
- Operate all our assets efficiently
  - Process optimization;
  - Introduction of new technology;
  - Planned/preventative maintenance; and
  - Supply chain management.
- Making full use of IT and IS for effective management

5.2.7 Objective and Goal

The area coming under CDP for Water Supply and individual water connection to all with in the project period.

Where as Sewerage System will be provided for 100% area in Kochi Corporation, Kalamasserry Municipality, Thrippunithara Municipality and Thrikkakara Panchayath in the first phase. All other Panchayaths will be covered under sewerage network as per site condition in the second phase. In panchayaths, since the density of population is low when compared to Corporation area, the sewer network system is not feasible or viable for 100 % coverage. Instead, after site investigation suitable systems will be identified, either conventional treatment system with sewerage system or low cost sanitation facilities as per norms.

Project Description

Phase 1

1. *Kochi Corporation.* The Kochi Corporation is divided into four zones, for implementing the scheme and separate treatment systems are recommended for each zones to avoid distant transportation of sewage. The different zones comprises:
   (i) Ernakulam North. Includes Edappally - Vennala (part);
   (ii) Erankulam South zone. Includes Vennala (part) and Vyttila;
   (iii) Mattancherry, Fort Kochi. Includes Fort Kochi and Palluruthy zone, Mattancherry and Palluruthy area; and
   (iv) Wellington Island. The total population under Kochi Corporation area worked out to1,143,224 as on 2036. The demand calculation is based on this. All other factors such as ground water infiltration peak factor, design period etc. are as per CPHEEO manual and as per the guidelines of the JNNURM. The total cost of the sewerage projects for Kochi Corporation is estimated to be **Rs.1,565 crores**.
2. *Kalamasserry and Thrippunithura Municipalities.* Kalamasserry Municipality comprises a total population of 63176 as per 2001census.The projected population as on 2036 is 121086 and sewerage capacity is 18mld.The rough cost estimate for implementing sewerage net work for 100% Municipal area based on the design population is worked out to **Rs.174 crores**.

   Thrippunithura Municipality comprises a total population of 59884 as per 2001 censes. The projected population as on 2036 is 114776 and the sewerage capacity is 17 mld. The rough cost estimate for implementing sewerage net work for 100% Municipal area based on the design population is worked out to **Rs.173 crores**.

3. *Thrikkakara Panchayath.* Thrikkakara Panchayath which is the Administrative Centre of Ernakulam District comprises a total population of 65984 as per 2001 censes. The projected population as on 2036 is 126468 and the sewerage capacity is 19 mld. The rough cost estimate for implementing sewerage system for 100% area based on the design population is worked out to **Rs.152 crores**.

*The cost of the Ist Phase of the total Sewerage Project works out to **Rs.2064 Crore**s.*

Phase II

For the adjoining panchayats coming under the CDP, proposals as mentioned in para above, are to be investigated in details, and the technical feasibility is to be ascertained, for covering the sewerage network. As the areas coming under these panchayats are highly undulated, technical and financial viability for implementing 100% sewer network is to be studied in detail. If not feasible, proposals such as low cost sanitation can be recommended in such areas where sewerage network is not recommendable.

*The total project cost is worked out as **Rs.2,629 Crores**.*

The ULB wise estimate of population to be served and cost of improvements is given in the **Table 5.6**.

Table 5.6: Population Projection and Sewage Produced

Name of Local Body	**2001**		**2036**		*Project*
	Population	*Demand*	*Population*	*Demand*	*cost*
Kochi Corporation	596,473	89	1,143,224	171	1,565
Kalamasserry(M)	63,176	9	121,086	18	174
Thrippunithara(M)	59,881	9	114,776	17	173
Thrikkakara(P)	65,984	10	126,468	19	152
Cheranalloor(P)	26,316	3	50,438	5	40
Eloor(P)	35,573	3	57,676	6	48
Varappuzha(P)	24,524	2	47,004	5	40
Kadamakkudy(P)	15,824	2	30,329	3	24
Mulavukad(P)	22,842	2	43,780	4	32
Maradu(P)	41,012	4	78,605	8	64
Chellanam(P)	36,209	4	69,400	7	55
Kumbalam(P)	27,549	3	52,802	5	40
Kumbalangy(P)	26,661	3	51,100	5	40
Thrivankulam(P)	21,717	2	41,624	4	32
Elamkunnapuzha(P)	50,563	5	96,911	10	80
Njarakkal(P)	24,166	2	46,318	5	40
Total	**1,138,470**	**153**	**2,171,538**	**292**	**2,629**

Source of Revenue. At present monthly sewer charges are not being collected from the consumers. One time payment for getting sewer connection is the only revenue obtained. For maintaining the existing system, the maintenance grants obtained from the State of Kerala, is utilized. As in other states, sewerage cess is not introduced in Kerala. A proposal to levy 60% of the monthly water charge from each consumer, where sewerage network is available, is under the consideration of Government. Based on that the revenue income that can be generated from each project area, anticipating the total No. of connections are worked out to study the financial viability.

Total Cost of the Project. The project cost is worked out in two phases. The first phase includes Kochi Corporation and two Municipalities and Thrikkakkara panchayat. The total cost of the project comes to **Rs.2,064crores**.

For 2nd phase, to provide sewerage system in the adjoining panchayats detailed above, the total cost comes to **Rs.565 crores**.

Total cost of the project for entire area envisaged under the CDP for sewerage systems in **Rs.2,629 Crore**.

Key Issues and Challenges

1. The present sewerage system is serving a population of about 20,000 only;
2. Majority of the Corporation area is not covered with commissioned sewerage system;
3. Most of the Units in Treatment Plant are in dilapidated condition, which require replacement; and
4. There is huge gap between revenue and expenditure, the gap being the expenditure itself since practically nil revenue is obtained.

Conclusion. The 1st phase is to cover Corporation, 2 Municipalities and Thrikkakara Panchayat. Here conventional sewerage system is proposed. In other rural areas appropriate sewage disposal scheme is to be adopted. The total cost for 1st phase is 2064 crores & for the 2nd phase is 565 crores. The project proposal includes restructuring KWA in line with the Mission guidelines. The flat terrain, barriers to drainage by the existing railway lines, low level bridges & lack of co ordination are the key issues in the sector.

5.3 Storm Water Drainage

5.3.1 Introduction

Kochi city is the largest urban agglomeration in Kerala situated in the coastal plains with extensive backwater system and tidal canals. Kochi CDP area consists of:

i. Highly urbanized Kochi corporation area;
ii. Two less urbanized municipalities; and
iii. 13 adjoining panchayaths.

The topography of Kochi is almost flat. The average altitude towards the eastern fringes is about 7.5 m above M.S.L but towards west most part of the city is only about 1.00 m above M.S.L. Kochi is characterized by sand bars running in north – south direction with tidal canals in between. In the absence of sufficient wide drains and also because of the general flatness of the terrain, the city is facing acute drainage problems. Several preliminary studies were conducted regarding the drainage of the city, which clearly proved the inadequacy of the primary, secondary and tertiary drains either because of the size, design or maintenance level.

5.3.2 Climate, Rainfall, Run Off

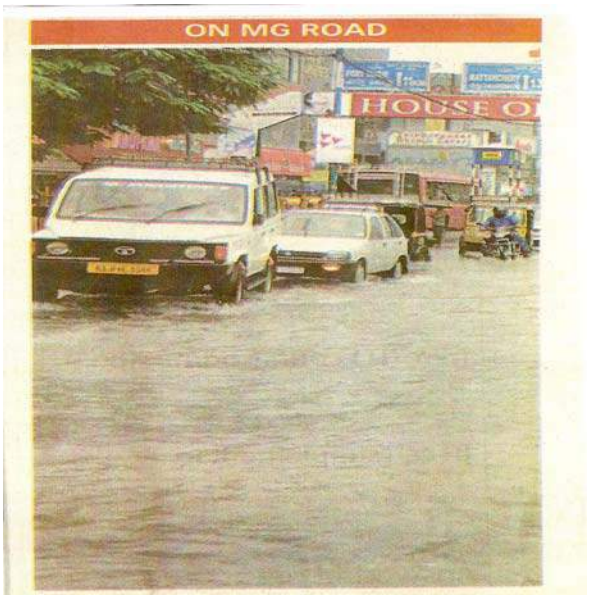
The city area falls with in the tropical climate. The average annual rainfall in the region is about 3,099 mm. The southwest monsoon yields more than 60% of the total precipitation and that of the north –east monsoon is about 25% of the total rainfall. According to hydrological records maximum recorded high tide level for rainy months of mid May to mid November works out as +0.44 m and maximum recorded low tide level is 0.155 m relative to MSL.

The recent study of the run off of the catchment and discharge efficiency of the drains in the Kathrikadavu - Pullepady area (CBD) in Kochi Corporation, it was seen that, the average efficiency of the drain is only 43.31%. Out of the 34 catchment areas studied, 12 have less than 25% efficiency and only one has 100% efficiency among the secondary, tertiary drains. The hydrological characteristics of the region make surface water drainage, an important element of urban renewal efforts.

5.3.3 Present Scenario

The present drainage system depends on canals as primary drainage source, secondary drains which discharge to primary canals or backwaters, the drain along road sides are the area drains with or without covering slabs. The drainage network is not based on a drainage study /plan, but done in an ad hoc and piece-meal manner. The drains are built arbitrarily without calculating run off. The area drains and drains from premises do not have silt pits to intercept silt and solids. They discharge directly into road side area drains these drains are silted to very high degree and clogged due to solid waste especially plastics. The photographs below are examples of present scenario of drainage system in Kochi.

Figure 5.6: Flooding in the City



Three levels of drainage systems can be categorized as:

1. *Primary canals* - major natural canals, which are running in north-south direction and a few natural canals, cut across the sand bars. The primary canals which convey the storm water run off to the back water system are highly degraded because of encroachments, waste dumping, silting, weed growth, low maintenance and lack of protective measures.

   It is found that almost all the tidal canals are in filthy conditions. This is due to the dumping of wastes into the canals and lack of facilities for cleaning them due to inaccessibility of cleaning vehicles and machines. It is very necessary that this canal and the shorelines are protected and maintained properly for better living of the people.

2. *Natural and man made secondary drains.* Natural secondary drains are the feeder drains/canals of primary canal. The man made secondary drain encompasses major roadside drains, which go beyond the level of area, drains and which link with the Primary drains (tidal canals) running in north-south direction.

3. *Area Drains.* The area drains are the drains which discharge the storm and sullage water from a neighbourhood to secondary drain. The city has large network of area drains, which act as major storm water receivers. There is no regular pattern for this and lies along small roads and bye lines. The area drains are absent in many of the areas especially in areas with urban proliferation. These drains need immediate attention. These are the primary cause for water logging in the various neighborhoods in the city. The total length of the area drain is assessed to 1229 kms. Out of this, 330 km in Kochi corporation area and 196 km in municipalities and panchayaths area requires upgradation and are proposed for inclusion in the cost projection.

The quantitative description of drainage systems is tabulated below:

Table 5.7: Canals in Kochi City

Sl. No	Description of item	Quantity (KM)	
		Kochi Corporation	*Municipality & Panchayat*
1	Total length of the primary canal	77	254
2	Total length of the natural and man made secondary drains	222	198
3	Total length of area drains	740	489

Source: Irrigation Division, Ernakulam, CoC, municipalities, Panchayaths.

The city is facing severe water logging problems. A number of places in the city suffer from water logging and flooding due to heavy rainfall in the monsoon. During the period of water logging, normal life and traffic movements of the city gets disrupted. Water logging in some roads persists for few hours whereas flooding in certain lowlands continues for a few days.

The main reasons for flooding in the city are:

1. Flat topography of the area;
2. Clayey nature of the subsoil in most of the area, which prevent water percolation;
3. Lack of adequate slope of the drains and subsidence of the drains;
4. Tidal effect. If the rain occurs during high tide time intruding tidal waters prevents the exits of storm water to the main canals;
5. Decreased carrying capacity of the drains due to the heavy silt deposition, discharge of solid waste in the canals and growth of vegetation;
6. Reduction of canal width due to encroachment;
7. Inadequate vent way of the existing bridges and culverts;
8. Poor condition of the existing canals resulting in over flow and flooding in adjoining area;
9. Missing links in the existing network;
10. Obstruction due to the utility lines, such as water mains, power and communication network cables etc crossing the canals and drains;
11. Lack of awareness among the people in maintaining public drains and canals;
12. Tendency of converting canals and water bodies to provide roads. etc;
13. Meandering of the primary canals which slow down the flow;
14. Irregular and inadequate maintenance of drains/canals; and
15. Inadequacy of existing cross drainage facilities;

5.3.4 Operation and Maintenance

The existing city drainage system lacks proper maintenance. Concerned local bodies, State Irrigation Dept.; National Highway; Southern Railways; State, P.W.D; Panchayats; and municipality in the agglomeration area are jointly responsible for operation and maintenance of the existing drainage system in the city. Better co-ordination among these agencies is essential for maintenance of the over all drainage system. Kochi corporation takes up pre- monsoon removal of water hyacinth, de-silting of major canals and secondary drains during April / May by manual cleaning. The area drains are cleared engaging sanitary workers.

5.3.5 Issues and Key Challenges

Analysis from the drainage sector reveals that 60% of the Kochi city area lacks proper drainage system. The existing network is inefficient, inadequate and majority of the drains are in filthy conditions. A number of identified areas in the city are frequently flooding during even moderate rains. The drainage systems empty their water and waste loads into water bodies and backwaters through the fairly flat terrain subjected to tidal effects.

Key challenges taken into consideration are:

i. Flatness of the terrain;
ii. High rainfall;
iii. Tidal effect;
iv. Non co-ordination of respective departments;
v. Absence of Comprehensive Planning;
vi. Absence of proper Solid waste management; and
vii. Inadequate capacity of Cross Drainage works especially across the N-S running Railway lines.

Vision. *A Clean and flood free city space with proper drainage system.*

5.3.6 Strategies and Action Plan

Strategies and action plans in this proposal are framed for achieving the above vision. Probable solutions for improving primary canals.

- To be made free from siltation, encroachments, deepened, widened and side protected;
- Side roads and access facilities to be provided for maintenance, especially for using vehicle and equipments;
- As the north-south running canals cannot be effective in draining off storm water rapidly, providing intermediate outlets towards back waters are essential. These connections have to be towards west in Ernakulam area, towards east in mattanchery area, fort Kochi area and to east/west in Palluruthy area. The purpose of these is to provide multiple overflow outlets to back waters, which will considerably reduce the storm water build up in lengthy N-S canals; and
- Multiple over flow outlets. The main drains in Kochi are very long becoming deeper at out fall end, out fall end may even be much lower than the high tide level. Due to increased time of concentration, the drains get overloaded and overflow. This can be eliminated by multiple outlets at different points.

Diversion of run off

- Run off need to be diverted partly to relieve the pressure on existing drain; and
- Diversion of run off is also partially possible by interconnecting canals.

Improving existing canals

- Improving the carrying capacity of existing drains by widening & increasing slope. Many secondary drains need improvement.

Improving Cross Drainage Works

- There are a number of cases where present cross drainage works are inadequate.

Regulatory Pumping Systems

- Provision of pumping facility may have to be resorted at certain problem areas where natural flow alone cannot create rapid discharge. Pumps are more effective at drain mouths discharging to back waters. Such pumping system can be used to pump water in during summer to destroy mosquito larvae and to flush canals.

Providing Silt Pits

- Escape of silt and solid waste can be prevented, stagnation can be brought down considerably. Provisions of silt pits at all discharge end of tertiary, secondary drains to be considered.

Controlling Land Development

- Regulations to control land development is not being insisted properly.
- Formation levels of each Zone/sub zones to be fixed and land development to be regulated to ensure positive area drainage.
- The backwater reclamation to be controlled.

Sewerage System

- Drainage carrying sullage and effluent combined together can cause severe health and environmental problems.80% of the septic tanks directly discharges the effluents by overflow to open drainage due to high water table, low permeability of soil. Segregating sullage and effluents from open drains by sewerage system has to be accorded priority.

Upgrading Solid Waste Management

- Large quantity of solid waste contaminates and stagnates the drains now. Hence a system for proper collection & management of solid waste has to be developed.

Eviction and Rehabilitation of Encroachment

- The canal is encroached in a number of places along its stretch. Removal of encroachments and providing resettlement / rehabilitation as required, to maintain the canal width.

In areas where there are no man made secondary drains of sufficient capacity, new drains are to be provided. This is particularly so in the central area of Kochi corporation. A detailed study of individual catchment area of secondary drains is required.

In the context of interlinking of the drainage network certain existing cross drainage facilities will require to be modified. These works are in the jurisdiction of various central / state agencies such as railways, National Highways etc. The modifications are generally undertaken by the concerned agencies on deposit basis. A provision is made in the project towards this expense.

Man made secondary drains and area drains need to be covered with slabs and the provisions of man hole to facilitate the cleaning/ maintenance. About 587 km of drains in the city are required to be covered.

5.3.7 Approach to Up-grading Drainage System

Stage - I Preparation of Master Plan -Detailed study of the existing city drainage system and preparation of drainage master plan for upgrading .The sub components of the study will be:

- Preparation of base map of the city for drainage with contours; and
- Identification of missing links and prioritization of drain works.

Stage - II Preparation of Feasibility Report

- Review available data, maps and reports;
- Mark the drainage zones based on reports and study;
- Locate the problem areas;
- Prepare preliminary engineering proposals; and
- Prepare financial analysis based on implementation schedule.

Stage - III Detailed Engineering Studies

- Protection of both sides and provisions for desiltation before seasons;
- Construction and reconstruction of culverts; and
- Provision for fencing at identified canal-dumping area as case study.

5.3.8 Major canals requiring priority attention

5.3.8.1 Primary Canals

- Thevara-Perandoor canal and its major branches;
- Edappally thodu and its major branches;
- Rameswaram – Kalvathy canal;
- Chilavanoor puzha;
- Champakara canal;
- Changadam poku thodu;
- Karanakodam thodu;
- Ponnethuchal thodu;
- Koyithara canal;
- Railnagar thodu;
- Punchathodu;
- Valavikadavu thodu;
- Pallichal thodu;
- Pandarachal;

- Pushnithodu;
- Chitrapuzha; and
- Konothu puzha etc;

5.3.8.2 Natural Secondary Canals

- Kari thodu;
- Adimuri thodu;
- Karuveli thodu;
- Athirthi thodu;
- Thodu along Major road;
- Kathmbayil thodu;
- Mullassery canal;
- Market canal; and
- Seena thodu etc.

5.3.9 Creating Public Awareness

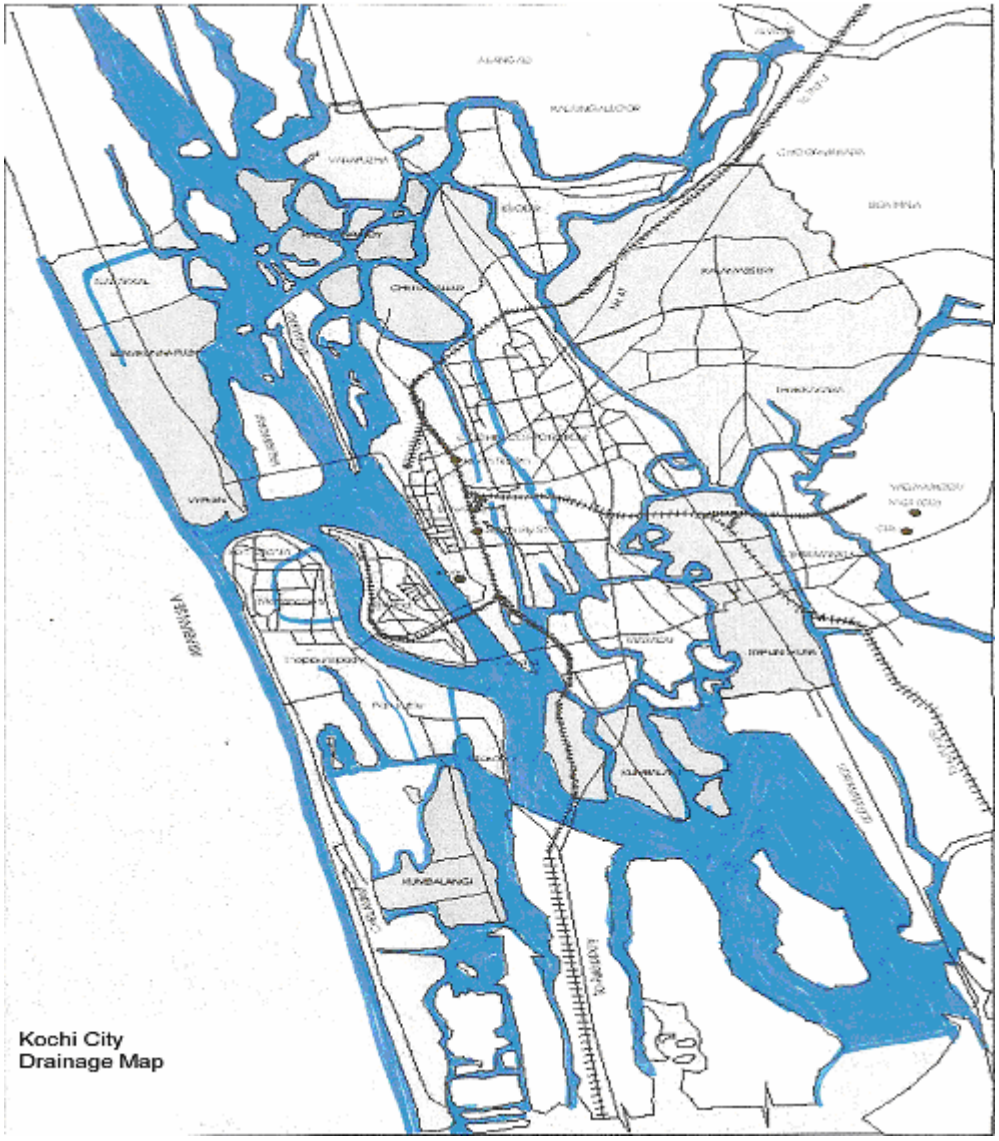
Public awareness is proposed to be created right from the primary school levels, going up to the higher community levels, encompassing the complete spectrum of urban life. The print, electronic and visual media is proposed to be utilized to ensure an enhanced level of public awareness. The propaganda schemes are proposed to be spread over a period of 5 years initially. An evaluation of this level of awareness will be scientifically done at the end of 5 years . If found desirable the propaganda will be extended beyond the 5 year period. The estimate provisions include a projection of anticipated expenses towards this media publicity.

Feasibility of ground charging the rainwater run off in the case of elevated areas of eastern sectors of Kochi agglomeration. Approximately 10% of the eastern sector of Kochi agglomeration is having elevated terrain with ground levels 3m to 6m above M.S.L It is desirable to have a separate study to ensure surface rain water in the sector. A provision is made in the project cost.

5.3.10 Canal Water - Quality Improvements

The Quality of water in the canals of Kochi at present is filthy and hazardous to aquatic fauna. The water is unsuitable for construction and irrigation purposes also in many of their stretches even in the rainy season. This necessitates the improvement of the quality of the water by appropriate techniques especially reducing the biological waste and chemical pollutant input and thereby increasing the dissolved oxygen. This kind of improvement in the quality of the water will facilitate the various above uses of canal water.

Figure 5.7: Outline Map Showing the Existing Canals and Drains



Cost projection, investment plan, strategy to achieve the vision & strategy for implementation are given in the section on estimate of cost.

1. Strom water drainage – Cost projection – Section - Estimate of Cost (Part 4 Table A).
2. Storm water drainage – Investment Plan – Section – Estimate of Cost (Part 4 Table B).
3. Storm water drainage – Strategy to achieve vision and goal 2006-2026 – Section – Estimate of Cost (Part 4 Table C).

List of Drains and Estimated Cost (Local body wise) is given in **Annexure 4**.

Conclusion. The strategy involves desiltation of canals, provision of side roads, provision for multiple overflow outlets, development of canal network system and regulatory pumping systems. The project involves identification of all the Primary, Secondary & Area canals and improvement of their quality to ensure proper drainage. This necessitates detailed contour survey & preparation of a drainage master plan.

The total project is estimated to be **Rs.902 crores**.

5.4 Solid Waste Management

5.4.1 Introduction

Rapid urbanization of Kochi and suburbs are leading to pollution and ecological imbalance. The pressure on infrastructural facilities and core sector services is severely felt not only in Kochi but also in the nearby Municipalities and Panchayats. Urban poor are the worst hit.

Solid Waste Management (SWM), which is an obligatory function of the Urban Local Body (ULB), is in a pathetic state resulting in problems of flood, water logging, mosquito menace, sanitation and environmental and health related problems.

A feed back survey conducted among the residents in the central Kochi, known as Karikkamuri through a Data study, identified some of the major problem areas as under:

5.4.2 Areas of Concern

1. Improper Solid Waste management;
2. Water Logging;
3. Mosquito Menace;
4. Environmental Pollution;
5. Waste duping by a vast number of daily commuters;
6. Poor state of drains;
7. Plying of heavy vehicles through narrow roads;
8. Activities of anti-social elements;
9. Inadequate Sewage system;
10. Open Drains;
11. Unattended Vacant lands;
12. Poor condition of Roads;
13. Lack of proper pedestrian Pathway;
14. Corroded drinking water pipe lines and contaminated drinking water;
15. Frequent interruptions in Power supply;
16. Absence of quality services;
17. Availability of labour; and
18. Poor coordination and institutional mechanisms for implementing development work.

5.4.3 Solid Waste Management-A Thrust Area

Stake holders identified Solid Waste Management as a thrust area, as it is found to be the **ROOT-CAUSE** for many other problem areas like Water Logging, Mosquito Menace, Environmental Pollution etc.

Urban poor, who live in small houses, suffer due to flooding of their dwelling places as the drainage system is clogged by solid wastes especially non-degradable waste. They are also the main victims of various kinds of diseases. Most of them cannot afford to spend their meagre

income on Mosquito repellants, mosquito curtains/nets, mosquito screens etc. Rat menace is also rampant in such areas.

5.4.4 Present Situation

The present pathetic conditions can be, understood from the Photographs below taken from various places of Kochi.

Figure 5.8: Photographs showing unorganized dumping of solid waste

A. Solid Waste Management System in Kochi Corporation. Health Department (HD) of the Corporation is responsible for sanitation facilities, solid waste management and other public health functions. A Corporation Health Officer (CHO), a medical doctor by qualification, heads the HD. The collection, transportation, disposal of MSW is the responsibility of the Health Department while the Engineering Department assists them in planning, formulation of programs and in procurement of vehicles, equipment and developing the landfill site. The Project Engineer is responsible for engineering components of SWM and vehicle procurement and maintenance.

Kochi MC presently has a network of community collection points, a significant number of which are open points. The generators, either through door step waste collection system or through bring system deposit the waste in secondary collection points or throw waste into open spaces / drains / water bodies. Subsequently, the waste from collection points is collected by manual / mechanical loading into fleet of vehicles and finally disposed in an environmentally fragile site at WellingtonIsland close to Vembanad Lake.

For the purpose of solid waste management, the entire municipal corporation is divided into 21 circles. Each circle comprises 1 to 5 wards and is managed by a Health Inspector Grade 2 who is assisted by Junior Health Inspectors. Deployment of vehicles for transportation is managed by the Vehicle Section (Circle 22) headed by a senior HI. This section is also responsible for direct collection of waste from hotels and hospitals in Eastern Zone of the city. Salient features of solid waste management in Kochi are indicated in. The location of major waste generating sources in Kochi are indicated in **Figure 5.9**.

Figure 5.9: Major Waste Generating Sources

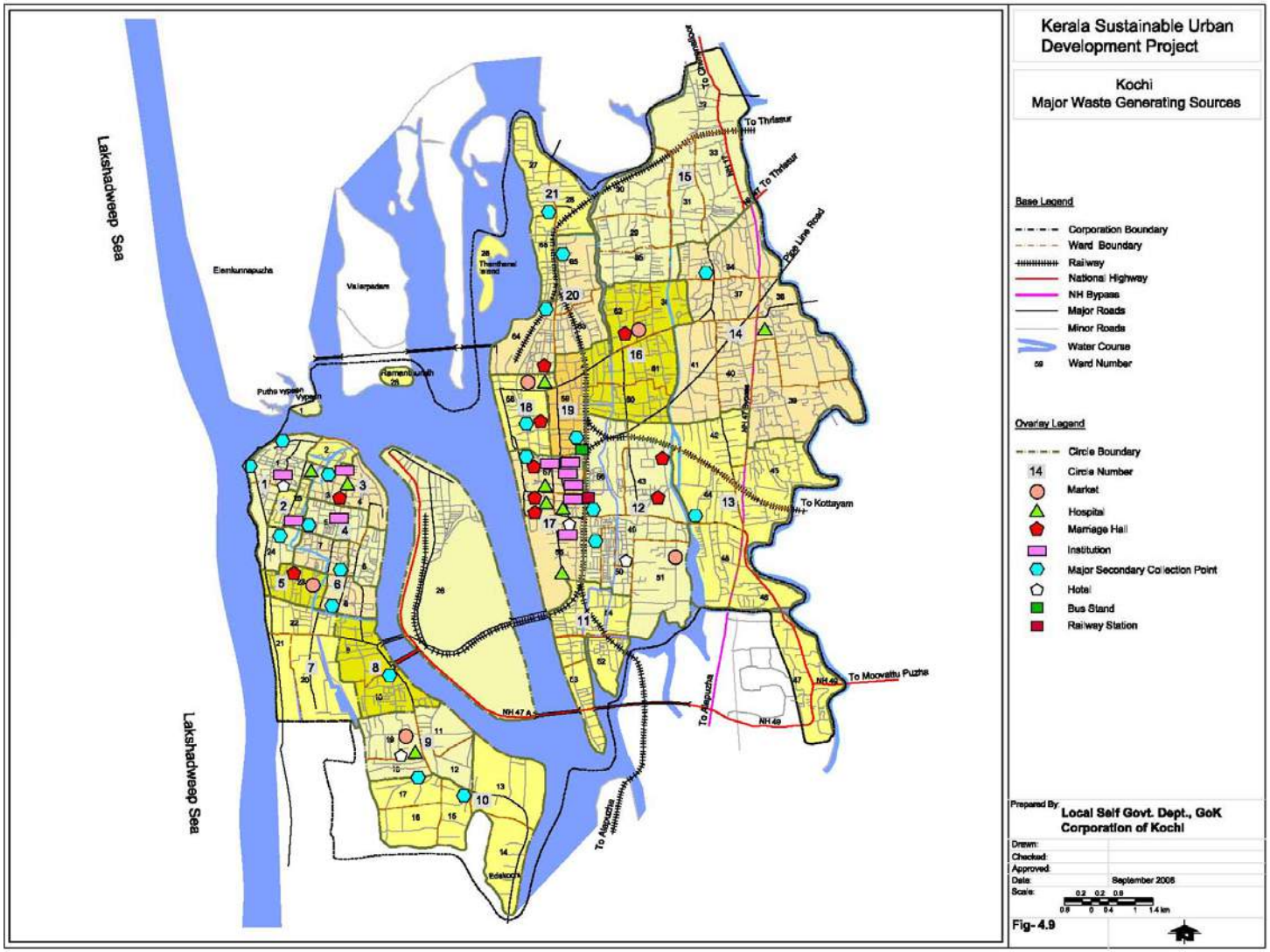


Table 5.8: Salient Features of Solid Waste Management

Functional element	Present Scenario
Waste generation	KMC estimation is around 420 tons at a per capita of 0.707 kg/day
Segregation at source	Generally absent .In Division 61 (Panampilly Nagar), waste segregation is practiced by 3,158 households.
Storage at source	Around 35% of domestic sources store mixed waste in plastic buckets, cartons, bags. 50% of large hotels store in gunny bags and plastic containers, while only about 20% of other non-domestic generators store waste at source.
Primary Collection	Community participated door step collection in about 28% of residential areas. 40-45% of the waste is directly deposited in the community bins and open collection points while the rest thrown to streets, drains and canals and the rest dispose within the premises.
Street sweeping	Daily coverage is less than 10% of the roads (around 50% of major roads). Occasional sweeping done to the tune of 30% and no sweeping in 60% of the roads/public places. Box type cart/wheel barrows (inadequate –only 50% of the requirement) are used resulting in Multiple handling.
Secondary Storage	Container facility only to store about 5% of the city waste. Other storage facilities are, metallic bins, Concrete cylindrical rings and largely in open sites. Collection points are characterized by overflowing waste, invasion of cattle, rats, rodents. Transfer is mainly manual.
Transportation	Largely manual loading, open transport in trucks- Dumper placers operate in few markets and in bulk waste generating areas. On an average 169 tons of waste is transported to disposal site daily.
Frequency of removal	Irregular – only city center is attended regularly. Limited operation during Sundays and holidays.
Processing	Decentralized Treatment –Home, colony level and ward level – coverage is marginal. No city level processing.
Disposal	No sanitary landfill. Dumping of mixed waste at Wellington island close to backwater – daily covering done, No environment protection measures. Construction waste is indiscriminately dumped in low lying areas/Road margins.
Vehicle ,tools, equipment	Primary collection and street sweeping – box type carts, Short range transfer – tractor trailer with open trailers, Transportation – open trucks, dumper placer – Except dumper placer the vehicles used require multiple handling of waste. Landfill equipments used are excavator loaders to unload, push waste and level.
Workshop and repair facility	No MC facility – depend on private workshops – no annual contracts – vehicle availability is only 50%.

Functional element	Present Scenario
Man Power	The day-to-day operation is carried out by 647 workers and 210 CLR workers (Substitute workers).
O & M costs	Rs.1, 887 /ton – 62% salaries, 38% Vehicle operating cost, equipment maintenance/tools, landfill and other costs.
Cost recovery	No User fee is collected for door step collection done by KMC. The private and Kudumbasree units collect user fee (Rs.25-40/ household) directly. The O& M costs are met from the revenue income (taxes).
Community Partnership	250 resident associations are involved in door step collection. Non-domestic generators have no participation in SWM activity. 300 households do home composting.
Recycling activity	Significant informal activity. About 18 tons of recyclable fractions are separated daily. No recycling industry with in the City.
NGO/CBO Partnership	Exnora, an NGO involved door step collection/segregation and home level composting during 2002-2004. Sahridaya Welfare Society - in promoting home composting & bio-gas. Kudumbasree units - in door step collection.
Private partnership	Transportation - Private contractors supply trucks (30 trucks/ day) on hire. Landfill operation - Provision of daily cover at landfill site is contracted.
Management	The day-to-day operation is decentralized – Managed by Health circles. Three departments are involved in SWM – Health, Engineering and accounts department.
Planning & management	No annual, midterm and long term integrated SWM plans done. MIS is not available. The current plan covers for procurement 26 ha land for centralized processing and landfill, setting up a windrow compost plant for 200 tons/day, Vermi compost plant of 50 tons/day and landfill in 1.00 ha area.
Regulatory aspects	The compliance of SWM Rules 2000 is minimal.

B. Solid Waste Management in other CDP areas: Similar or still poorer situation exists in the Municipalties and Panchayats of the Kochi CDP Area.

The present data on waste generation are given in **Table 5.9**.

Table 5.9: Present Data on Solid Waste Generation

	Type of Waste	Quantity in MT per day	% of Total
1	House hold Domestic	330	55
2	Hotels/Eateries	36	6
3	Markets/Slaughter houses	30	5
4	Shops & Commercial Establishments	90	15
5	Building construction waste	30	5
6	Garden trimmings/plantain/tree cuttings	24	4
7	Institutional waste	30	5
8	Industrial waste (non-hazardous)	18	3
9	Hospitals / clinics	12	2
	Total Waste Generated Per Day	**600**	**100%**
	Waste collected per day	240	
	Collection efficiency	40%	

Primary Collection

The “door to door” collection of domestic waste is done by various agencies (mainly by Kudumbasree & private agencies) at a nominal charge of Rs.25/ to Rs.30/.It is purely optional for the residents to take advantage of these agencies.

The data collected during Jan-May 2006, from Karikkamuri area, given in the following table, was used as a sample to cross check the collection efficiency.

Table 5.10: Sample Data to Cross Check Primary Collection

Road Name	Total Houses	Contacted Houses	JAN	FEB	MAR	APR	MAY
1. Carrier Station Road	41	29	17	14	13	12	13
2. Chavara Centre Road	37	31	19	11	9	8	8
3. Karakkat Road	76	71	33	19	20	20	22
4. Chittoor Road	88	74	26	40	41	40	42
5. Monastery Road-South	41	41	15	14	14	15	12
6. Monastery Road-North	69	69	32	34	36	36	39
7. Karikkamuri Cross Road-(South)	53	43	19	20	20	19	22
8. Karikkamuri Cross Road-(North)	50	31	22	17	16	15	16
9. Mahakavi G Road-East	63	55	40	38	39	36	35
10. Mahakavi G Road-West	29	19	15	13	14	13	14
11. Asari Lane	50	42	22	19	18	16	17
Total	**597**	**505**	**260**	**239**	**240**	**230**	**240**

Out of the 597 collection units in the area, only about 40% were found to be giving domestic waste to “door to door” collection agency. Rest are disposing the waste anywhere they please -on the road side, in the drains, in the canals, even outside the Bins where the bins are available.

The domestic waste collected from door to door by the collection agencies is presently transported to certain temporarily identified transfer locations near Bus stand, under bridges etc.

in tricycles provided by the ULB. ULB trucks/trailor containers collect waste from these locations and take it to a temporary Dumping yard.

ULB trucks/trailor containers collect waste dumped in major nuisance spots and take it to temporary Dumping yard.

ULB is removing the waste without any stringent time schedule due to several constraints. Because of this irregularity in lifting waste residents resist placing of waste Bins near their houses.

The collection frequency, which is grossly inadequate, is shown in **Table 5.11**.

Table 5.11: Collection Frequency

Category	Once a Day	Once in Two Days	Once in 3 days	Once in 7 days	Uncertain
Bio-degradable	40%	25%	15%	10%	10%
Non Bio-degradable	40%	15%	15%	10%	20%

5.4.5 Cost of Poor Solid Waste Management System

A major fall out of the present inadequate Waste Management is that, ULB spend large amount of money towards cleaning the drains/canals. Since the drains/canals are not fully covered in most of the places, such cleaning process has only a temporary impact. Water stagnation in drains due to the waste dumping, lead to Mosquito menace, for which ULB is spending large sum of money for Larvicide spraying, fumigation etc.

Currently, ULB is not having a permanent place to process the large amount of waste. In a densely populated state like Kerala, vacant land for waste dumping is either not available or if available is at a high premium price. After decades long marathon efforts, ULB has almost zeroed in a place known as “Brahmapuram”.

For whatever reason discussed above, waste management in Kochi CDP area today is grossly ineffective, leading to very high cost of poor quality (COPQ) both directly and indirectly.

Kochi and suburban areas ,which together is poised for massive investment in various sectors including tourism- needs to embark on an economically productive and effective waste management for better environment , sustainable development, employment, poverty alleviation and economic growth.

Key Issues

- Poor level of waste collection;
- No segregation at source;
- No planned reuse/recycle;
- Poor frequency of waste collection;
- Inefficient collection and disposal at temporary transfer locations;

- Obsolete waste handling and transportation system;
- Street cleaning utterly inadequate;
- No scientific and modern waste processing at any stage;
- Water logging due to choking of drains with waste;
- Mosquito menace due to stagnation of water in drains;
- Filthy Environment not congenial to a tourists' destination;
- Misery to the poor who are the worst affected due to poor waste management; and
- No shared vision for solid waste management.

5.4.6 To-Be Scenario- Where Do We Go?

Considering the "as-is" condition and the related key issues, "to-be" scenario has been envisioned in a medium term perspective.

A "shared vision" has been evolved for the core service of Waste Management" in consultation with stakeholder representatives and voluntary technical experts.

5.4.7 Shared Vision for Solid Waste Management

"To implement economically productive and effective Solid Waste Management with accountability and transparency to transform Kochi and suburbs to one of the cleanest places in the world by the year 2010.

5.4.8 Gap Analysis

Where the Kochi and suburbs are today and where it wants to reach, there exists a big gap to be bridged?

The Strategies,programmes and projects for waste management in a medium term perspective is drawn out by the "SOLID WASTE MANAGEMENT TASK FORCE" consisting of various convergent departments, community based organizations, civil society organizations, voluntary technical experts. Highlights are as under:

1. A well structured comprehensive Solid Waste Management Plan.
   i. Awareness Criteria:
   - Starting from educational institutions. 100% of the students will be covered in a phased manner. This will also be part of the environment training;
   - Other stake holders like house holds, institutions, trading, Industries, ULB etc will be covered in batches with the help of NGOSs;
   - Course design will be done by competent agencies;
   - Legal programes to be conducted by experts in the field;
   - ULB shall issue notice to Public;
   - Citizen rights/duties/responsibilities on SWM will be published along with vigorous campaign;
   - Public warning to be issued by ULB and Police Commissioner; and
   - Monitoring, review and modification mechanism.

ii. Live model demonstration. Demonstration of live models of solid waste management in schools. Besides the canteen waste and other normal solid waste produced in the school and surroundings, night soil waste is also a fine input to the biogas plants planned. About 400 such units are planned to cover about 4 lakhs of students. Efforts will be made for sponsorship by the community/companies/commercial business units.

iii. Institution level solid waste processing will be encouraged in Hotels/Hostels/Multi-storeyed Buildings etc. About 200 such initiatives are expected .Till such time they put up the solid waste processing units, waste will be collected at applicable rates fixed by ULB. Like Rain water harvesting, car parking etc. solid waste processing will also be made mandatory in future.

iv. Residents' Association/Community Public Comfort kiosks attached with solid waste processing will be implemented. 103 Nos .Bio-gas Generation units are planned.71 in Kochi City,10 in two Municipalities, 26 in thirteen Panchayats.

v. Community Biogas based Power Generation unit utilizing community waste and comfort station waste. One number is planned between Ernakulam South railway station and KSRTC Bus Stand to light up the pedestrian path way along the Vivekananda road and to operate the water pump for watering the proposed public garden in the area.

vi. Waste from KSRTC Bus Stand and South Railway stations can also be processed here.

vii. Efforts will be made for sponsorship by the community/companies/ commercial business units. Advertisement revenue will also be available on recurring basis from this strategic area.

viii. Sludge Extraction and transport equipment for 1.3 to 1.5

2. Segregation of Solid Waste At Source

- Domestic Waste Bins: It is planned to get the domestic waste segregated at source itself using two containers –one for biodegradable and other for non-bio-degradable. Containers will be specially designed and standardized to prevent misuse. About 2,60,000 sets are estimated. Sponsors will be found to supply the same. Giving advertisement rights will also be considered. BPL people will be given at nominal cost.
- Domestic Vermi-composting units: These will be supplied at attractive rates to house holds to encourage waste processing at home itself. To begin with 8000units - 7150 units in Kochi, 200 units in two Municipalities and 650 numbers in thirteen Panchayats are planned.
- Door to door primary collection: Kudumbasree/Residents Associations/Self Help Groups will be empowered to collect the domestic solid waste. Every domestic unit shall declare their mode of disposal of solid waste.In any case, all residents shall pay the "betterment levies" to the collecting agency in their respective areas. *This will generate employment opportunities for urban poor, including rag pickers*.

In other words, dumping of any kind of waste on the road side or some one else's vacant land will not be allowed. IN FACT, IT WILL BE A PUNISHABLE OFFENCE.

3. Special Purpose Vehicles (SPVS) for door to door primary waste collection:
   - 3.1) Special Purpose Vehicles (SPVs) for door to door waste collection will be encouraged with initial fund from ULB and to be returned in installments. Maintenance/running expenses will be borne by the Kudumasree units/residents' association/Self Help Groups, as the case may be. 260 such SPVs are estimated.
   - 3.2) Cleaning Service for SPVs: After delivering the solid waste at the identified transfer locations, it will be thoroughly cleaned. About 27 such transfer stations (10 in Kochi city, 4 in two Municipalities and 13 in thirteen Panchayats) are planned. Private participation will be encouraged with initial fund from ULB and to be returned in instalments. Maintenance/running expenses will be borne by the private party.

4. Secondary collection:
   - Secondary Collection of solid waste: Secondary transport vehicles, mostly tractor /trailor container type, will be deployed at secondary collection centres. The peculiarity of these stations are that the primary solid waste will be directly transferred to vehicles carrying them to the main processing plant at Brahmapuram. 6 Tractors and 32 Trailor containers are estimated Private participation will be encouraged with initial fund from ULB and to be returned in installments. Maintenance/running expenses will be borne by the private party. Private participation will be encouraged with payments based on actual tonnage of solid waste transported at predetermined rates.
   - Waste from institutions/Markets/Hotels/Hostels /Lodges etc will be collected directly by ULB .Till such time they put up the solid waste processing units, waste will be collected at applicable rates fixed by ULB. These wastes will be directly transported to the main processing plant at Brahmapuram. The vehicles currently available with ULB will be used. Private participation will be encouraged with payments based on actual tonnage of solid waste transported at predetermined rates.

5. Slaughter House /Main Market Solid Waste. These will be collected and directly transported to main processing plant at Brahmapuram. Specially designed covered vehicles will be deployed to reduce foul smell. 4 such vehicles are planned.

   Till such time they put up the solid waste processing units, waste will be collected at applicable rates fixed by ULB.Private participation will be encouraged with payments based on actual tonnage of solid waste transported at predetermined rates.

6. Litter Bins. Litter Bins will be standardized and sponsors will be found tosupply the same with their advertisements. This will be installed by ULB and contents will be removed by ULB. Only small paper pieces/ paper wrappers are expected to be put in these. Other than Litter Bins, no other Bins/Containers are envisaged on the road sides.This will also make pedestrian path neat and clean. In other words, dumping of any kind of waste on the road side will not be allowed. IN FACT, IT WILL BE A PUNISHABLE OFFENCE.

7. Incineration Units. Incineration units: Hopstals/cluster of hospitals will be forced to install incinerators Incinerators have to be employed for treating bio-medical waste. Initial fund can be given by ULB,to be returned in instalments. About 10 such incinerators are planned for installation.

8. Main Solid Waste Processing Site at Brahmapuram:
   a. Weighing Mechanism with Utility. Weighing mechanism with utility building, security etc. is planned at Brahmapuram main sold waste processing site
   b. Sorting of Non-Biodegradable Waste**.** Sorting of Bio-degradable waste into components like plastic, glass, rubber porcelain, metals etc. by mechanical means is envisaged at Brahmapuram main sold waste processing site.
   c. Composting. Composting being slow process and require a lot of space is planned to be done only in small units of (about 5mt/day capacity) at Brahmapuram main sold waste processing site. 6 units are planned initially. The manure will be mainly used for the gardens planned in Brahmapuram campus.
   d. Bio-Methanation Plant. Bio-Methanation Plant using Slaughter house waste and market waste is planned at Brahmapuram main sold waste processing site. Power will be generated from this mainly to light up the locality.3 nos 20mt/day capacity bio-methanation plant cum power generation units are planned initially.
   e. Secure Land Filling Facility. Secure Land Filling Facility at Brahmapuram main solid waste processing site: About 4 to 5 Cubic Metres of Hazardous waste will have to be buried every year.Aprox. 10 cents of land will be required to be prepared every year going upto 20 years atleast. We are planning for 2 nos excavators also.
   f. Effluent Treatment Plant. Effluent Treatment plant, Monitoring cell with laboratory etc are planned at Brahmapuram main sold waste processing site.
   g. Drinking Water Facility. Drinking water facility at Brahmapuram main solid waste processing site is envisaged.
   h. Green Belt. Green Belt at Brahmapuram main solid waste processing site: The vacant areas will be converted into a beautiful picnic spot with Land scaping, wide roads, gardens with fragrant flowering plants like Jasmines, medicinal plants, vegetation (special bamboo etc), vegetable farms, integrated farming with diary, piggery etc, water park, Fish ponds, entertainment facilities, conference cum recreation halls, Library with reference books etc. All concerned stakeholders and experts will be consulted before finalizing the facilities at Brahmapuram. *It will be one of the best solid waste processing sites in the world.*

9. Enhancing the Role of ULB Staff. Accountability and responsibility with appropriate authority to ULB staff is also envisaged to improve their motivation and effectiveness to ensure cleanliness of the designated areas of each team. The team shall consist of the ULB staff as well as representatives of **Residents Association**.

   High incentives are recommended to the team members who score highest ratings in a thorough audit, conducted by external specialist auditors .They shall be honoured in a befitting way every year.

   Effective sweeping /scraping of roads as well as path ways and removal of debris is expected to be done daily. Main streets shall be swept in the night. Sweeping shall be followed by water sprinkling (during summer) to minimize dust.

   Spraying of larvicide, fumigation /fogging shall be as per strict schedule. ULB staff will be made conversant with user-friendly software system for the convenience of the stake holders and also to improve transparency. Four Mechanical sweeping Units & water sprayer units are also envisaged. Implementation of a software system is envisaged to improve the effectiveness of the system as well as better customer interaction.

10. Building waste for Land Filling /Road Construction. ULB will render help to transfer the above on special request .The collection and transportation rates will be decided by ULB. Private participation will be encouraged.4 Dumpers are estimated for this.

11. Waste of the Immediate Future: We reckon the danger of fast increasing waste of old computers /TV. Sets /Fridges/Mobile Phones/Kitchen utensils/ small automobile worn out parts and other gadgets .An appropriate technology will be considered to deal with such solid wastes in 2012.Cost estimation is difficult at this stage. An appropriate technology will be considered to deal with such solid wastes in 2015.Cost estimation is difficult at this stage.

5.4.9 Financial Strategy and Economic Viability

With Private Participation and community involvement we envisage no problem in the operation and maintenance of the assets created.

Performance Indicators. We recognize that the projected growth in population in the fast developing Kochi City and Suburbs will bring a lot of pressure on the Solid Waste Management. We also recognize that Solid Waste Management is one of the most critical sectors to be attended on war footing. At the same time, it is planned to achieve the following performance parameters.

Table 5.12: Performance Indicators

Components	Current	2011	2016	2021
Collection efficiency %	40	95	98	100
Segregation %	0	95	98	100
Door to door %	40	95	100	100
Vehicle capacity %	60	90	95	100
Processing of waste %	0	90	95	100
Disposal %	0	90	95	100

Resistance to Change. Resistance to change can mostly be overcome by Awareness cum Live Demonstration. The participation of all the school children will make the task easier for the future. A few “quick hits” will bring confidence in all stakeholders. In the long run, when they see the accrued benefits, an attitudinal shift will take place, which will make the waste management programme sustainable, and initiatives irreversible.

The Gains

- Involvement of all stakeholders including children;
- Comprehensive solid waste awareness cum live model demonstrations;
- Present condition and diagnostic analysis with live data samples;
- A clear vision for the Solid Waste Management;
- Remedial solutions proposed considering all the present short comings, with the involvement of stakeholders including experts in the field;
- Root cause for water stagnation/mosquito menace resolved;
- Benefits to Urban Poor directly and indirectly;
- Segregation at source with stakeholder involvement;

- Smooth collection and transportation system;
- Processing at domestic/institutional/community level encouraged;
- An ambitious main processing unit at Brahmapuram;
- A programme to make Brahmapuram waste processing area a picnic spot cum knowledge centre on environmental aspects;
- A scheme to motivate the ULB staff and make them more effective;
- A well-planned investment strategy with community/corporate/public participation;
- Strengthening revenues and recovery systems to make the plan sustainable;
- Measurable Performance parameters and IT system for up-to-date monitoring; and
- Vision to transform Kochi and Suburbs to one of the cleanest places in the world by the year 2010.

Conclusion. The main issue identified is that there is no proper system of collection, processing and management of solid waste. The problem is acute in the Corporation and Municipal areas with waste thrown into canals, drains and road side. Collection efficiency is only 40%. The proposal is to create a solid waste management taskforce, create awareness among the public by live demonstration of using the waste for biogas generation, encouraging segregation of solid waste involving public participation, acquisition of modern environment friendly vehicles to carry the waste and development of proper processing system at Brahmapuram.

The total project cost is **estimated** to be **Rs.152.40 crores** and the proposal is to get back the money by beneficiary contribution and through sponsorship programmes.

6. TRAFFIC AND TRANSPORTATION

6.1 Present Scenario

Kochi is one of the few cites of India blessed with connection to other parts by all major modes of transport like road, rail, air and water. NH 17, NH 47 and NH 49; 3 National Waterways, an International Airport, Cochin Port located on strategic International Route and broad guage lines linking Kochi to other States are the major intercity linkages.

The regional road linkages are supplemented by an extensive network of navigation routes through the lagoon system, serving the movement of passengers and cargo.

As part of the preparation of a report on the comprehensive study for the transport system in Greater Cochin area, RITES have done a survey in (2001). Its analysis reveals that:

- The buses contribute about 14% of the vehicular traffic and carry 73% of the Passenger traffic;
- The share of cars in terms of vehicular trips is about 38% carrying 15% of passenger trips;
- Two wheelers contribute 35% of vehicular traffic and 8% of passenger traffic; and
- Auto rickshaws constitute about 13% of vehicular traffic and 4% of passenger trips.

As part of the comprehensive study for the transport system M/s RITES had undertaken O-D survey, Volume count surveys, speed and delay surveys, parking survey; pedestrian volume survey, travel characteristics etc. and the study results are utilized in the preparation of this document. The relevant study results are included as tables in **Annexure.5**.

6.2 Traffic Flow and Travel Demand

Increasing urbanization over the years has resulted in the development of vast areas as urban extensions. Many roads were laid in an incremental manner to cater to the increased traffic demand. The City has developed in a disintegrated urban form spreading along major traffic corridors. Congestion on arterial roads is due to haphazard development, narrow streets, congested junction, unorganized parking etc. which creates hindrance to the smooth flow of traffic. Most of the bridges and major corridors are no longer able to cope up with even the present traffic demand. High travel time and congestions have created an adverse effect on the economic and environmental health of this city.

The running speed characteristics during peak and off-peak periods are presented in Table (**Ref. Annexure 5**). The running speeds are relatively low in the study area network with 72% have running speed around 20 kmph during peak hours and greater than 30 kmph during Off peak hours.

The major problems identified in road sector are listed below:

- Majority of traffic problems are concentrated along two east-west corridors of the city;
- The city is divided into two parts by the Railway line;
- Improper traffic junctions;
- Chronic parking problems in core areas, lack of parking space results in road side parking causing bottle necks and creating traffic block;
- The pedestrian crossing across major corridors in city centre is a serious problem;
- The absence of bus bays causes considerable reduction in road capacity;
- Main roads are obstructed by transformers and hoardings installed on road margins;
- High volume of traffic in major corridors of the city core which do not have the capacity to bear the present traffic volume and creates high congestion;
- Narrow bridges and inadequate number of railway over bridges; and
- Encroachment of road by foot path vendors and petty shops which result in consequent narrowing of the area available for movement of traffic

A classified traffic volume survey was carried out in selected screen line (9 locations) mid blocks (23 locations) and intersections (40 locations) as part of the transportation study for Kochi.

The peak hour traffic at mid block locations varies between 423 PCU at Market road to 3979 PCU at MG Road. The heaviest traffic is observed at MG road (4000 PCU s) and Shanmugham road (3700 PCUs) during peak hours (**Refer Annexure 5**).

The hourly variation of traffic at mid block locations is presented in (**Ref. Annexure 5**).

Composition of Traffic. The study of the share of different vehicles in the total volume of traffic has revealed that the share of cars varies between 25 to 32% along MG road and Central Business District (CBD) The share of two wheelers varies between 36 to 46% on MG road while the share of bus is about 11%. The share of auto-rishaws is about 14% while the share of bicycles is only 3%.

Intensity and Directional Distribution of Traffic at Screen Line Locations. The intensity of traffic at screen line locations is presented in table (**Annexure 5**). It is observed from the analysis that the average daily traffic varies from 21,347 PCUs to 60833 PCUs. The highest traffic is observed on the north ROB on the Banerji Road followed by the screen line point west of Kaloor on NH47. The traffic intensity is very high along the south ROB on SA road, which is of the order of 42,672 PCUs. Like wise the peak hour traffic varies from 1,847 PCUs at Venduruty bridge in the evening peak hour to 5,142 PCUs at north ROB in the morning peak. The directional distribution of traffic at screen line location is generally in the ratio of 60:40 (N-S:S-N).

Movement of Passenger and Vehicular Trips. The distribution of passenger and vehicular trips of movement at the outer cordon points are represented in table given below. The analysis reveals that about 44,000 vehicle trips and about 3.7 lakhs passenger trips are performed on an average day at the outer cordon Points of the study area.

Table 6.1: Passenger and Vehicular Trips at Outer Cordon Points

Sl. No	Movement Type	Passenger Trips	Vehicular Trips
1	Internal to External (%)	112,674 (36.67)	14,824 (33.68)
2	External to Internal (%)	120,401 (39.18)	17,672 (40.15)
3	External to External (%)	74,214 (24.15)	121,514 (26.17)
	Total	**307,289 (100.00)**	**44,010 (100.00)**

Source: RITES Primary Survey, 2000.

Passenger Trip Distribution by Mode. The analysis on Modal split of passenger movement on intercity routes (**Ref Table 6.2**) shows that buses constitute about 14% of vehicular traffic but carry about 73% of the passenger traffic. The share of car in terms of vehicular trips is about 38% carrying 15% passenger traffic, while two wheelers is 35% carrying 8% passenger traffic. Autos constitute about 13% of vehicular trip and 4% of passenger traffic.

Table 6.2: Distribution of Passenger and Vehicular Trips by Mode

Sl. No.	Mode	Type of Trips	Internal to External	External to Internal	External to External	Total
1	Car	Passenger (%)	15,279 (13.56)	20,647 (17.15)	11,543 (15.55)	47,469 (15.45)
		Vehicular (%)	5,392 (36.37)	7,217 (40.15	4,140 (40.15)	16,749 (38.06)
2	Two Wheeler	Passenger (%)	7,381 (6.55)	9,201 (7.64)	6,398 (8.62)	22,980 (7.48)
		Vehicular (%)	5,063 (34.15)	6,127 (34.67)	4,371 (37.36)	15,561 (35.35.36)
3	Bus	Passenger (%)	84,630 (75.11)	86,078 (71.49)	53,187 (71.67)	223,895 (72.86)
		Vehicular (%)	2,378 (16.04)	2,419 (13.69)	1,415 (12.29)	6,212 (14.11)
4	Auto	Passenger (%)	5,384 (4.78)	4,475 (3.72)	3,086 (4.16)	12,945 (4.21)
		Vehicular (%)	1,991 (13.44)	1,909 (10.80)	1,588 (13.79)	5,488 (12.47)
Total Trips		Passenger (%)	112,674 (100)	120,401 (100)	74,214 (100)	307,289 (100)
		Vehicular (%)	14,824 (100)	17,672 (100)	11,514 (100)	440,410 (100)

Source: Comprehensive study for GCDA area by RITES.

Road Network. The road network is constituted by a broken gridiron pattern. The main emphasis is on the north south axis with minor roads giving the east west connection. Undue concentration of services can be seen in certain areas of the city. But vast portion in the peripheral areas remain isolated. The lack of accessibility is contributed by poor quality of roads, narrow section of roadway crossing by railway line, canals and backwaters.

Right-of-way. 53 % of the total roads in Kochi city are of local street category and have a right of way less than 5m. 35 % of roads in the study area are of Collector road category and have a right of way ranging from 5 to 10m; 8% of the roads are of sub-arterial category and have 3 % ROW ranging from 10 to 20 m. Hardly one per cent of the roads (5.939 Km) of the roads in Kochi city

have right of way more than 40 meters. Distribution of right-of-way available for roads in Kochi city is given in **Table 6.3**.

Table 6.3: Distribution of Road Network in Kochi City According to Right-of-Way

Sl. No	Right of Way (m)	Road Length (km)	Percentage
1	< 5	325.604	53
2	5 – 10	214.887	35
3	10 – 20	49.117	8
4	20 – 30	18.418	3
5	>40	5.939	1
	Total	**613.965**	**100**

Source: NATPAC Report 2006, Master Plan study for CoC.

Carriageway Width. The data collected from the inventory survey were analyzed to study the distribution of the road network in Kochi city with respect to availability of carriageway width. It was found that 16.3% of the roads have less than 3m carriageway, while 56.6% having single lane carriageway of 3.5m, 13.2% have intermediate lane of 5.5m, 8.5% have two lanes, 0.70% have three lanes (10m) and 4.7% have carriageway more than four lanes. **(Ref. Annexure 5)** gives the distribution of road network of Kochi city according to availability of carriageway.

6.3 Surface type and condition of roads

The road network in the city was divided into different categories based on the type of surface. It is found that majority of the roads in the city (90%) were having bituminous surface. Of the remaining roads, 5% were having concrete surface, 3% WBM surface and 2% earthen surface. The condition of road is very important in deciding the riding quality of pavements. The distribution of road network according to surface type and condition are presented in **Annexure 5**). It can be observed that only 37 % of the roads were in good condition. In the case of cement concrete, fairly good proportion of the roads (92%) were found to be in good condition.

Availability of Footpath and Drainage. The availability of roadside appurtenances is necessary for the smooth flow of traffic including pedestrian traffic. It was observed from the road inventory surveys that only 6% of the road network in Kochi city has footpath on both sides of the road and 87.5% of the roads network has drainage facility. However, only 8% of these roads were having covered drainage. **Annexure 5** gives the distribution of road network in Kochi city according to availability of footpath and drainage.

Table 6.4: 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
	Total	**100**	**Total**	**100**

Source: NATPAC Report 2006, Master Plan study for CoC.

Traffic and Transport Safety. Most of the accidents occurring in the city involve pedestrians and

this can be attributed to poor pedestrian facilities. The number of road accidents registered in Kochi City has increased from 2,808 in 2002 to 30,191 in 2004. An analysis of accident statistics revealed that the number of persons injured due to road accidents has increased from 2,811 in 2002 to 30,224 in 2004. During the same period, the number of persons killed in road accidents has increased from 149 to 177. **Annexure 5** gives the details of accidents occurred during 2002-04 in Kochi City.

Vehicle Population. The number of vehicles in Ernakulam district has increased from 91,411 in 1989 – 1990 to 525,204 in 2004 – 05 showing an average annual growth rate of 13%. Two wheelers constituted the major shares of vehicle population in the district with more than 62 percent. **Annexure 5** gives the growth trend in vehicle population in Ernakulam district during the period between 1990 and 2000.

Table 6.5: Growth trend in vehicle population in Ernakulam

Sl No	Type of Vehicle	1989 - 1990	1994 - 1995	2002 - 2003	2003 - 2004	2004 - 2005
1	Goods Vehicle	12,059	15,315	36,628	39,874	43,922
2	Bus/ Mini Bus	2,076	5,176	9,753	10,931	12,247
3	Car/ Jeep/ Van	24,737	37,481	71,404	80,448	91,402
4	3 Wheelers	6,219	17,012	33,478	35,511	37,629
5	2 Wheelers	44,129	165,250	283,283	285,221	326,491
6	Others	2,221	1,547	12,413	12,937	13,513
Total		**91,441**	**241,781**	**446,959**	**464,922**	**525,204**

Source: Economic Review, Kerala State Planning Board

During the span of 15 years between 1990 and 2005, personalized vehicles such as scooter/ motor cycles 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 and good vehicles more than 3.6 times in 2005, compared to the vehicle population of 1990.

Composition of traffic at outer corden location is presented in figures given below. The share of car varies between 21-29%. But for two wheelers it varies between 14-28%. The share of goods vehicle is 14-44%. Buses account for 7-13% at daily traffic. Autos account for 6-11% while slow mode is negligible. For composition of Traffic at Outer Cordon Locations **(Annexure 5)**.

6.4 Public Transport Amenities

The major public transport modes in Kochi are City Buses, Auto rickshaws and Ferry boats operated mainly by private operators. The bus system in Kochi area is operated by bus operators association through individual operators. A total of about 650 buses are operated on about 160 routes originating/ terminating from 60 locations scattered all over the city. The seating capacity of buses is 48, but it is observed that the average passenger occupancy is 42.

The National Urban Transport Policy (NUTP) recommends " encourage and support investments in facilities that would keep people away from the use of personal vehicles rather than build facilities that would encourage greater use of personal motor vehicles" in order to promote sustainable development of the urban areas. The present Public Transport System may not be able to keep its present modal share under the current scenario unless policy changes in favour of

public transport are implemented and complimenting them with improved Public Transport System infrastructure. The NUTP document also further state that the Central Govt. would therefore, recommend the adoption of measures that restrain the use of motor vehicles through market mechanism such as higher fuel taxes, higher parking fee, reduced availability of parking spaces etc.

The Inland Water Transport System is comprised of ferries operating from 10 major terminals. The ferries operated by Pvt. Operators as well as KINCO; act as the principal link between the mainland and islands.

The route between Fort Kochi and Vypeen is the major route having about 12,000 passengers daily. Fort Kochi – Vypeen carries the maximum daily vehicle traffic of 1225. Water transport is also being used as a major transport for carrying goods.

Bus Transport. The seating capacity of buses is 48, but it is observed that the average passenger occupancy is 42. **Annexure 5** shows the guidelines issued by the Ministry of Urban Development, Govt. of India in 1998. This is designed for effective traffic management. Aware of this situation the National Policy of Urban Transport (NUPT) recommends "encourage and support investments in facilities that would keep people away from the use of personal vehicles rather than build facilities that would encourage greater use of personal motor vehicles" in order to promote sustainable development of the urban areas. The present Public Transport System may not be able to keep its present mode share under the current scenario unless practice policy changes in favour of public transport are implemented and complimenting them with improved Public Transport System infrastructure. The NUPT document also further state that the central Govt. would therefore, recommend the adoption of measures that restrain the use of motor vehicles, through market mechanism such as higher fuel taxes , higher parking fee, reduced availability of parking spaces etc.

Table 6.6: Desired Share of Public Transport

Sl.	City with Population in Millions	Desired Share of Public Transport (%)
1	0.5 – 1.0	25
2	Above 1.0 – 2.0	30 – 40
3.	2.0 – 3.0	50 – 60
4.	3.0 – 5.0	60 – 70
5.	5.0 plus	70 – 85

Source: Traffic and Transportation policies and strategies in urban areas in India's Ministry of Urban Development. GOI.

Suburban Railway. At present there is no suburban train service. Only long distance trains are plying. But sub urban rail system can be introduced by laying additional lines to the existing corridors. Sub urban train in north–south corridor, (Angamaly- Cherthala) and West–East Corridore (Ernakulam -Piravam road) can be introduced in the 1st phase which can be extended

further to Trissur in the north and Alleppey in the south, like wise it can be extended to Kottayam in the east. In this context we limit the coverage upto Kalamassery in the north, Kumbalam in the south and Tripunithura in the east, which is the limit of designated Kochi city and can be extended further in due course. The Railways Department may make sufficient investment considering the need for the proposal.

Mass Rapid Transport System (MRT). M/s RITES has identified a corridor starting from Alwaye in the north and Pettah in Tripunithura in the east via Ernakulam South, which is the most critical path demanding mass transport after a detailed and comprehensive study. A detailed project report has been prepared for this 25.253 km length corridor with an estimate amount of Rs.2239 crores by the Delhi Metro Rail Corporation. Expression of interest has been invited as a BOT project and is under scrutiny by GOK. As per the DPR viability gap of Rs.635 crores has been reported.

Fare Structure

- City Bus. For city buses minimum fare is Rs.3/- up to 5 km and 52 paise per Km for additional distance.
- Auto rikshaw. R.T.O. has fixed minimum fair of Rs.10/- for 1.5 km distance with subsequent increase by Rs.5/- for each additional KMs and waiting charge of Rs.1/- for 15 minutes
- Taxi charge. Minimum Rs.50/- for a distance of 5 km and Rs.6.5 per km for additional distance and waiting charge is Rs.6/ per hour
- Ferry. **Refer Annexure 5**.

Parking

Parking Characteristics. Parking survey was carried out at selected corridors as indicated in figure below. The registration number plate method was used to carry out the survey. The registration numbers of the parked vehicle were noted for every half-hour interval. The out puts obtained from the analysis are broadly classified into Parking Accumulation, Parking Duration and Parking Demand

Figure 6.1: Pedestrian and Parking Survey Locations

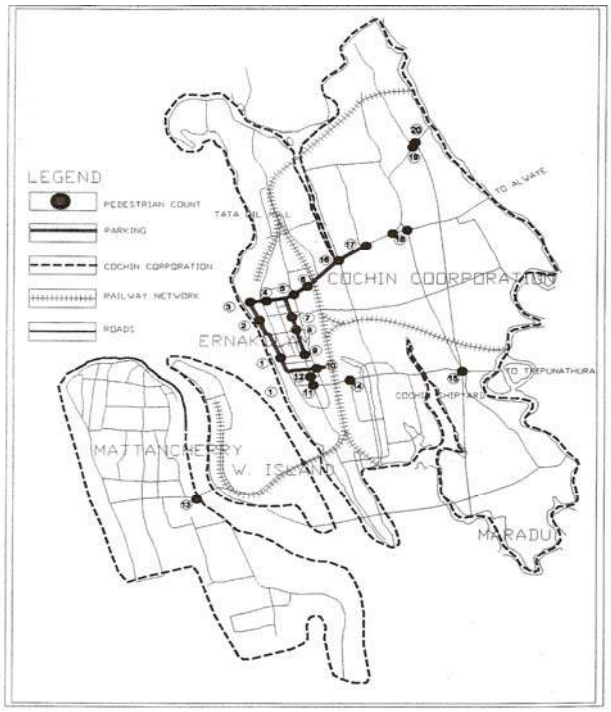


Table 6.7: Parking Demand

Sl, No	Location		Car	Auto	T.Whl.	LCV	Parking Demand (E.C.S.)
1	M.G. Road	Ravi Puram to Madhav Pharmacy	1,698	972	1,891	0	3,143
		Madhav Pharmacy to Ravi Puram	2,162	1,038	2,092	0	3,723
2	Banerjee Road	Kaloor to High Court	491	428	693	0	1,092
		High Court to kaloor	876	398	803	0	1,475
3	Edappaly Road	Kaloor to Jwahar Std.	339	164	489	0	625
		Jwahar Std to Kaloor	288	209	470	0	615
4	Broadway Road	Banerjee Road to Paico	93	43	65	12	182
		Paico to Banerjee Road	489	214	537	39	935
5	Shanmugham Road	High Court to Hospital	553	129	450	0	795
		Hospital to High Court	359	83	291	0	515
6	Market Road	Veg. Market to Hospital	484	340	428	53	1,064
		Hospital to Veg. Market	270	217	378	49	704
7	S.A. Road	Pallimuku to Janatha	266	147	270	0	481
		Janatha to Pallimuku	286	204	467	0	610
8	South Jn. Road	Ssouth Jn to Jos Jn.	378	377	200	0	805
		Jos Jn. to South Jn.	31	51	111	0	110
9	D.H. Road	Jos Jn.toB.T.H.	139	187	198	0	376
			113	84	123	0	238

Source: Comprehensive study for GCDA area by RITES.

Parking Survey

Traffic Attraction Zones. The parking survey analysis shows that high parking demand are around M.G.Road, Shanmugham Road, Banerji Road, Broadway, Market road etc. These areas are basically commercial centers; more the activity the parking demand will be high. Parking is directly depended on activity. If the activity increases the parking demand would increase proportionately.

Parking Accumulation and Duration. Peak parking demand, parking duration of vehicles has been analysed. The highest demand has been observed at M.G. Road (3723 ECS) followed by Banerji Road (1474 ECS). Parking demand is significant at Market road (1064 ECS) Broadway (935 ECS) South Junction (805 ECS) and Shanmugham Road (795 ECS) (**Ref. Annexure 5)**.

Short-term parking (<4 hours) is predominant at all corridors. The long-term parking is observed mainly along Shanmugham Road (8%) and S.A. Road (4%). The maximum parking space hours are observed at M.G. Road along Madhava Pharmacy to Ravipuram (4701) followed by Banerji Road along High court to Kaloor (1708). (**Refer Annexure 5**).

Per Capita Trip Rate

The total daily trips, as derived from the household survey, in the Greater Cochin area are about 14.56 lakhs. About 92 % of these are vehicular trips while 8 % are walk trips. The per capita trip rate is found to be 0.765, of this the component of vehicular trips is 0.704 and walk trips is 0.061. Of the total trips, about 19 % of the trips are intra-zonal while 81% are inter-zonal. Among the vehicular trips, the inter-zonal trips contribute about 14% and inter-zonal trips contribute about 78% of the total trips. Of the walk trips, intra-zonal trips contribute about 6%, while inter-zonal trips contribute about 2 % of the total trips.

Pedestrian Survey

The pedestrians are the most vulnerable road users in the city, where the footpath are absent except for M.G.Road and Banerji Road. There is large amount of pedestrian crossings near ferry stations and at major intersections. Analysis revealed that provision of pedestrian surveys at Menaka, Kacherippady, Town hall, Kaloor, Kadavanthra are warranted continuous footpaths of minimum 2 m. width are required along either side of arterial roads. Zebra crossings at major intersections are required to ensure safe pedestrian crossings.

6.5 Terminal Survey

Bus Terminal Survey. Surveys were conducted at 5 bus terminal from 6 A.M. to 10 P.M. regarding the parking accumulation, parking duration and passenger interviews

It is seen that uniformly in all terminals almost 90% of the buses have parking duration less than 30 minutes. The heaviest passenger volume is observed at Kaloor with 21406 passengers. About 15% of bus journey are below 5k.m. Trip length 13% between 5-10 km., 11% between 10-15 km., 27 % between 15 to 20 km. 25 % between 20-50 km. while only 9% proceed 50 km trip length. From the start point to originating terminal, about 50% of the trips are performed by bus,

42 % by walk, 4% by autos and 4% by other modes. From the terminating terminal to end point 29% of the trips are performed by bus, 65% of the trips by walk, 4% by autos, and 2% by other modes.

IWT Terminal Survey. The passenger inflow/outflow at important ferry terminals was surveyed to assess the characteristics of IWT transport. Important ferry terminals spread over the area were selected for the purpose. The route between Fort Kochi and Vypin is a major route with 11,688 daily passengers. The classified vehicle count was carried out and it is seen that Fort Kochi – Vypin route carries the maximum daily vehicle traffic of 1225. About 49% of the IWT trips are for work purpose and 16% for education. For faster and more efficient IWT service about 87% are willing to pay 125 % of the existing fare. From the origin to the IWT Terminals, 61% of the trips are performed by bus, 32% by walk and the balance by two wheelers and autos. About 39% of IWT trips are less than 0.5 k. m. trip length.

6.6 Institutional Arrangements

The facilitation and management of traffic and transportation in this area is at present done by a multiplicity of agencies/departments like Local Bodies, GCDA, GIDA, Roads and Bridges Corporation, PWD, NHAI, RTO, Police, KINCO, KSRTC, Railways, Road Fund Board, Inland Waterways Authority of India etc… No single agencies are solely accountable for providing transport services as well as transport infrastructure resulting in overlapping functions, functional and spatial fragmentation.

Key Issues and Challenges

- Inadequate lane width to carry the present / future traffic volumes;
- Insufficient East-West corridors and lack of ROB's;
- Absence of properly configured intersections and junction flyovers;
- Chronic parking problems in CBD area;
- Poor pedestrian infrastructure (absence of subway, footpath, pedestrian crossing etc);
- Absence of bus bays;
- Bus terminal situated in CBD which compels the Buses to ply through the congested corridors of CBD;
- Insufficient traffic management system;
- Absence of integrated terminals for different modes of transport (Road, Rail, Water, Air);
- Absence of truck/ transport terminal at present;
- Declining share of public transport;
- Poor road maintenance (As there is rain for nearly 6 months, roads are damaged very quickly which incur heavy cost on maintenance of the roads);
- Signals, metro –usability funds;
- Vehicle carrying capacity of the road is not growing proportionate with the growth of vehicles;
- Lack of organized Taxi / Auto Stand;
- Encroachment of Road / Footpath by street vendors / Bunk Shops;
- Lack of Public comfort Kiosks;
- Lack of Co ordination among departments; and

- Lack of utility ducts.

Kochi city is expecting enormous growth very shortly due to the coming up of International Transshipment terminal at Vallarpadam, the LNG terminal at Puthuvipu, the SBM (Single Buoy Mooring) of KRL at Vypin, the special economic zones at Vypin/ Vallarpadam, Kakkanad, the internet cities, cruise terminals etc. Kochi is the Gateway for all the international optical cable fibre net work. This will be an added advantage to Kochi to become an IT hub of India. All the above will fuel the development of many international business ventures in the city.

The current road network and public transport cannot handle the present travel demand. The proposed projects will add fuel to the existing burning problem if not tackled properly. There is no single agency accountable for the management monitoring and comprehensively facilitating the overall transportation mechanism. Formulation of a Unified Metropolitan Traffic and Transport Authority of Kochi is required to effectively co-ordinate all modes of transport operating in this area.

6.7 Vision

To attain an integrated transport system which leads to efficient, speedy, smooth, comfortable and safe traffic flow with high priority to public transport which is environment friendly and easily accessible to the challenged.

6.8 Strategies

6.8.1 Strategy for network improvement

Widening and Strengthening of carriage way of Road Structures. With due consideration to the growing traffic intensity, major roads, corridors, state highways and National Highways running through the city are to be extended and expanded. This shall involve construction of flyovers, bridges, subways/ foot over bridges, improvements to intersections etc. This shall also involve removal of encroachments on road margins, shifting of electrical poles, trees etc. and strengthening of road structures with pavements, footpaths and surface margins with a provision for storm water drains, utility ducts etc.

Construction of New Radial Roads, which are the Missing Links in the Transport Network. To connect the existing city area to the newly developing outskirts area, Ring roads and radial roads are proposed in the Master Plan. This will provide for the planned connectivity and proper road alignment to facilitate growth of peripheral areas.

6.8.2 Strategies for Planning, Reforms and Institutional Strengthening

Constitution of Greater Cochin Transport Authority (GCTA). The issue of institutional accountability can be addressed by formulating an apex authority “Greater Cochin Transport Authority”. It establishes coordination between the line departments in providing an efficient transport services. This acts as the single most authority that has administrative control of the transport sector.

Comprehensive Traffic and Transport Study for the entire CUA Region. Greater Cochin

Development Authority initiated the comprehensive study of traffic and transportation system for Greater Kochi area. This study was carried out by RITES and the study report was submitted in 2001. The study report proposed various road infrastructure development schemes to be taken up and one of the major improvement proposals pertained to the development of Light Rail Transit system between Aluva and Thrippunithura. But this report has to be updated considering mega projects like Container terminal project, IT projects etc to be launched at Cochin soon.

This strategy is aimed to come out with sustained solutions for the entire Kochi and its suburbs as a unit that has financial and environmental viability. This also includes the current institutional analysis, policy, and financial and service delivery issues

Traffic and Transportation Management using G.I.S. and GPS Technologies. Use of Global Positioning System (GPS), a satellite based positioning and navigation technology, will help track the position of the public transport vehicles from a central location. This data is very useful in assessing the performance of the services offered. The same data can be beamed back to the electronic information boards at bus stops that will display information on the location of the busses and the expected arrival time. Use of such service has additional benefits in tracking the traffic conditions on the roadways, unauthorised roadside parking, delays at intersections, passenger demand, as well as immediate notification to the control centre in case of accidents, all without any involvement of the driver or conductor. This strategy will also improve the share of public transport.

6.8.3 Strategy for Finance

Urban Transportation Development Fund. Infrastructure development for efficient functioning of transport system is a capital-intensive process and a substantial financial burden will have to be shouldered by the government. The state government or the local bodies do not have the required resources for financing such developments, thus delaying the projects indefinitely. The Central Government in the National Urban Transport Policy (NUTP) has recommended levy of direct taxes that would be credited to the account of the ‘Urban Transport Fund’ and used exclusively to meet the urban transportation needs. NUTP has further specified that such direct taxes could be in the form of a supplement to the petrol and diesel taxes, betterment charges on landowners or even in the form of employment tax on employers. Such provisions will also result in making private vehicular transport more expensive and result in a shift towards use of public transport systems. A similar approach is recommended for implementation in Kochi.

6.8.4 Improve the Share of Public Transport

Increasing the Fleet of Bus. As per the standards of GoI, a city should have at least 100 buses per lakh of population. It is also mentioned that by 2020, this should go up to 250 buses per lakh population. This is also supported by the prevailing over crowded buses specifically in peak hours. With the introduction of MRTS and Suburban railway system the need for buses can be reduced slightly. Hence a fleet of 100 buses per annum for the three consecutive years will meet the demand. In addition mini luxury buses can be introduced to ply trough the city centre linking the major residential areas of the city. This will reduce the use of personal vehicles & thereby reduce traffic congestion.

Dedicated Bus corridors, Bus bays and Terminals. 100 bus bays have been identified for provision of convenient stoppages for buses so that they do not cause inconvenience to the traffic

following through the major corridors. Further, dedicated bus corridors and construction of bus terminals at major hubs will ease the traffic flow, significantly increase the share of public transport and will also improve the comfort of the passengers through the development of 'hub and spoke' system of transport.

Introduction of MRTS. Regarding the mass transport system, DPR for Kochi metro project has been prepared by Delhi Metro Rail Corporation and the expression of interest as received is under scruitiny. The total project cost is Rs.2,239 crores for a length of 25.25 KM starting from Alwaye to Petta and Tripunithura. The project is proposed to be implemented on BOT basis and as per the project report it is understood that an amount of Rs.635 crores is required as viability gap fund.

6.8.5 Strategy for Better Transport Infrastructure

Streamlining, regularising the heavy cargo transport. As the work of major projects like Container Transhipment terminals have already started in addition to the existing port facilities, specific dedicated corridors along the important routes will be developed extensively for the cargo transport along the important routes where such cargo transport traffic is predominant. This traffic will be regularised in city core by introducing differential timings. Adequate number of Truck terminals will be provided to prohibit the on road parking of heavy cargo.

Junctions and Traffic Signal improvements. Cochin City has about 39 intersections, out of which only a few on CBD area are manned. All of these intersections shall be scientifically improved and provided with better LED controlled signal system.

Synchronized traffic control. There are more than 25 signalised intersections in the Cochin city area alone. Unless all these signals are linked with suitable area traffic management system, the overall delays may not come down. Optimisations of signals as an integrated network will be able to give better results pertain to the core area. Hence the Synchronized system with traffic sensors on the approaches, assisted by Video Cameras for incidence detection and management shall be installed.

Traffic Signs and Markings. The traffic in Cochin City being mixed in nature and carriageway being a non-standard format, the carriageways need extensive traffic signs and road markings to provide guidance for disciplined and safe driving. It is observed that on many important corridors traffic guidance in the form traffic signs and lane markings are not up to the standards. It is necessary to standardize the lane markings, edge markings, median markings, pedestrian crossings, parking zones etc, Locations for installing traffic delineators, and traffic are identified on all important travel corridors extending over a length of 320 Km and the same has to be implemented.

Parking Management. It is proposed to demarcate parking stalls and design the parking fee structure to improve parking turnover. A proper parking policy, which looks at users–pay principle, is imperative. Off street parking complexes (Elevated parking) for private vehicles at 39 important nodal points in the city are required to ease traffic congestion by releasing precious carriage way. Involvement of private partnership will be sought for such projects. Underground paid parking lots are proposed to be developed in public open areas in CBD. Besides there is urgent need to stream line the para-transit vehicles at major trip attraction centres by provision of suitably designed para-transit hubs. As many as 5 locations have been identified to implement

this scheme. Similarly there is a need for providing parking spaces for private bus operators. 16 such locations, on all major arterial roads are identified for this purpose.

Parallel Roads. There are situations when alternative roads have to be developed to reduce the traffic load on overburdened links. Finding space for such development is difficult in densely built up areas of the Urban Area. Only possibility is to open up new corridors by utilising the vacant land available at the peripheral areas of the city. Such a plan will have dual benefits of providing alternate routes and also help in non-encroachment of important lands.

Road widening. Given that the percentage area covered by roads in the city is less than 10 % of the total area, road-widening programme improves channel capacity by adding more area to the circulation channels. Cochin is one of the cities, which has been able to implement road-widening programme with the participation of nearby land owners, successfully, most of them surrendering their land free of cost for the formation of road. 16 major congested links have been identified for widening with some of them being already implemented.

The list of improvement works proposed under JNNURM is given in **Annexure 5**.

Conclusion. The growth in number of vehicles has far exceeded the growth and spread of the roads in the study area during the past 15 years. The total number of registered vehicles in the district is almost 5.75 times the number in 1990. Public transport, however, caters to the major share of trips (72%). This has rendered the roads congested leading to traffic blocks. Improper junctions, inadequate lane widths, narrow bridges, encroachment of roads and absence of integrated terminals, all lead to inefficient traffic flow. The expected growth of population in the light of major investments proposed is likely to worsen the situation. The strategy is to improve the road network by providing missing links, improve the junctions, integration of different modes of transport, full exploitation of the water transport facility, creation of an Urban Transport Development Fund, constitution of a Grater Cochin Transport Authority, rationalization of bus routes, provision of parking facilities (underground & vertical) & development of Truck Terminals outside the city. Suburban railway system with MEMU services can contribute towards decongesting the road network.

The total project cost under the Traffic and Transportation sector is **estimated** to be **Rs.4,252 crores** excluding the funds required for suburban rail service.

7. BASIC SERVICES TO THE URBAN POOR

7.1 Introduction

The policy of Govt. of Kerala towards urban poverty is defined in Kerala Municipalities Act 1994 which provides a strong framework for an integrated and city based approach including the establishment of UPA cells in ULB's to co ordinate all poverty alleviation programmes. The State Poverty Eradication Mission (SPEM)- Kudumbashree started in the year 1998 aims at eradicating absolute poverty within 10 years under the leadership of the Local Self Govts. The mission launched by the State Govt. with the active support of Govt. of India and NABARD has adopted a different Methodology in wiping out absolute poverty by organizing the poor into Community Based Organizations. (CBO's). The UPAD was initiating and implementing the poverty reduction programmes in Kochi Corporation and UPA Cells in Municipalities. From 1999 onwards the above two cells are merged with Kudumbashree. At State level the poverty alleviation activities of ULBs and Panchayaths are Co-ordinated and monitored by Kudumbashree.

As per the Section 284 of the Kerala Municipality Act 1994, 2% of the income of each ULB is to be spent for Urban Poverty Alleviation Programme. The ULBs are transferring such amount to the CDB annually, as its share for UPA budget. The other souces of income to the CDS for UPA activities, include the transfer from GoK under S.P.E.M.(Kudumbasree), centrally sponsored UPA programmes and institutional finance for Self Help Groups.

Exploring the multifarious possibilities of Kochi, every cross sections of people from the adjacent localities come over here because of multifold reasons, especially for employment in various organized/ unorganized sectors, trade, industries, for availing better standards of living in terms of services like better transportation, electricity, water supply, education, luxury, amusements…etc. Industrial and commercial development, the modernization of the port, triggered urban migration to Kochi and unplanned urban expansion has contributed to both growth in slums and urban poor population. Growth of Kochi is also marked with the growth of slums. Mattancherry the word itself means 'slum' which is considered as one of the major slum areas known not only in Kerala but widely familiar in India itself. The shift of economic activities from the western part of Kochi to the east also accelerated poverty and growth of slums in the western part. More than 280 slums are located in Kochi in which 70% of the slums and urban poor are located in West Kochi. The suburban areas cover 32% of urban poor.

7.2 Present Scenario

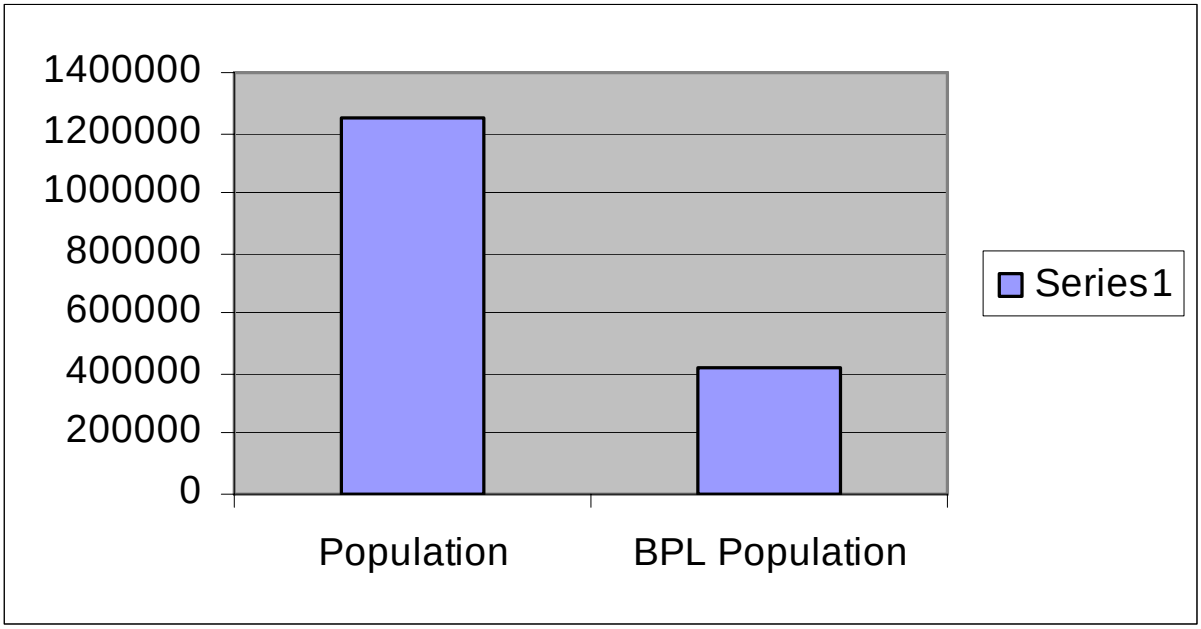
Kochi Corporation, surrounding Municipalities and Panchayats (CDP Area) constitute a total BPL population of 34 Percentage. The table given below illustrates the urban poor population of Kochi Corporation and surrounding Municipalities and Panchayats.

Table 7.1: Urban Poor Population - Kochi CDP Area

Sl. No.	LSG	Population 2006	BPL Population	%
1	Kochi Corporation	603,597	213,120	35
2	Kalamassery Muncipality	71,941	10,405	14
3	Thrippunithura	68,264	8,110	12
4	Kumbalam	32,232	13,901	43

Sl. No.	LSG	Population 2006	BPL Population	%
5	Kadamakkudy	18,005	10,000	56
6	Cheranelloor	32,919	9,160	28
7	Elamkunnappuzha	59,159	26,280	44
8	Thirvankulam	25,409	7,632	30
9	Kumbalangi	31,193	17,595	56
10	Chellanam	42,365	33,090	78
11	Eloor	41,620	9,000	22
12	Thrikkakara	78,718	18,205	23
13	Njarakkal	33,605	7,526	22
14	Mulavukadu	26,725	15,870	59
15	Maradu	56,455	16,560	29
16	Varapuzha	28,693	8,400	29
Total		**1,250,900**	**424,854**	**34**

Figure 7.1: Urban Poor Population



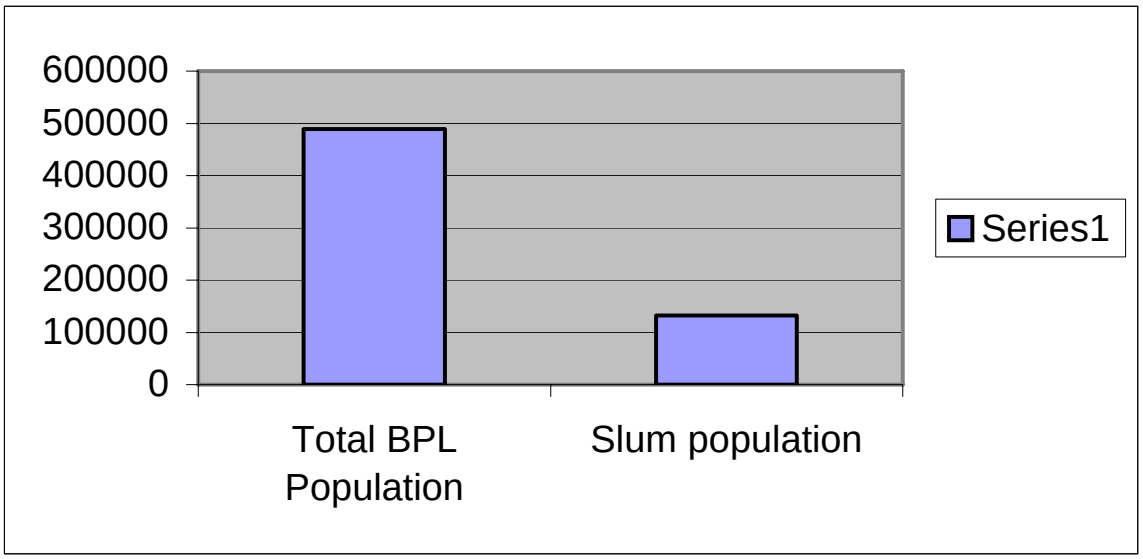
7.3 Slums in Urban agglomeration

Kochi with a population of about 603597 is the largest and most densely populated city in Kerala. About 132420 people equivalent to 32 percentage of BPL population now live in slum areas/colonies. In these areas poverty is high both in relative and in absolute terms.

Table 7.2: Shows the number of existing slums and location

Location	No. of Slums	Slum Population	Total BPL Population
Kochi	280	127,872	213,120
Urban out skirts	131	4,548	276,226
Total	**411**	**132,420**	**489,346**

Figure 7.2: BPL Population and Slum Population



7.4 Criteria for Identification of Poor Families

A Criteria for Identification of Poor Families in Urban Areas: The poor families are not identified on the basis of level of income. The Risk indicators to identify urban poor family are as follows:

- Less than 5 cents of Land / No Land;
- Dilapidated House / No house;
- No Sanitary Latrine;
- No access to safe drinking water within 150 meters;
- Women headed households;
- No regular employed person in the family;
- Socially Disadvantaged Groups SC/ST;
- Mentally retarded / Disabled / Chronically ill member in the family; and
- Families without colour TV.

B The Criteria for Identifying Poor Families in Rural Areas: The criteria for identification of poor families in rural areas are:

- No Land /Less than 10 cents of Land;
- No house/Dilapidated House;
- No Sanitary Latrine;
- No access to safe drinking water within 300 meters;
- Women headed house hold/ Presence of a widow, divorcee / abandoned lady / unwed mother;
- No regularly employed person in the family;
- Socially Disadvantaged Groups(SC/ST);
- Presence of Mentally or physically challenged person / Chronically ill member in the family; and

- Families with an illiterate adult member.

The identified poor in urban and rural areas are organized in to Nighbourhood Groups consisting of 20-40 families. At ward level these NHGs are federated to Area Development Societies and at LSG level all ADS are federated Community development society - a registered organization of the poor under Charitable Societies Act. All the poverty reduction programmes are implemented through CDS.

Figure 7.3: Kudumbashree CBI - Structure

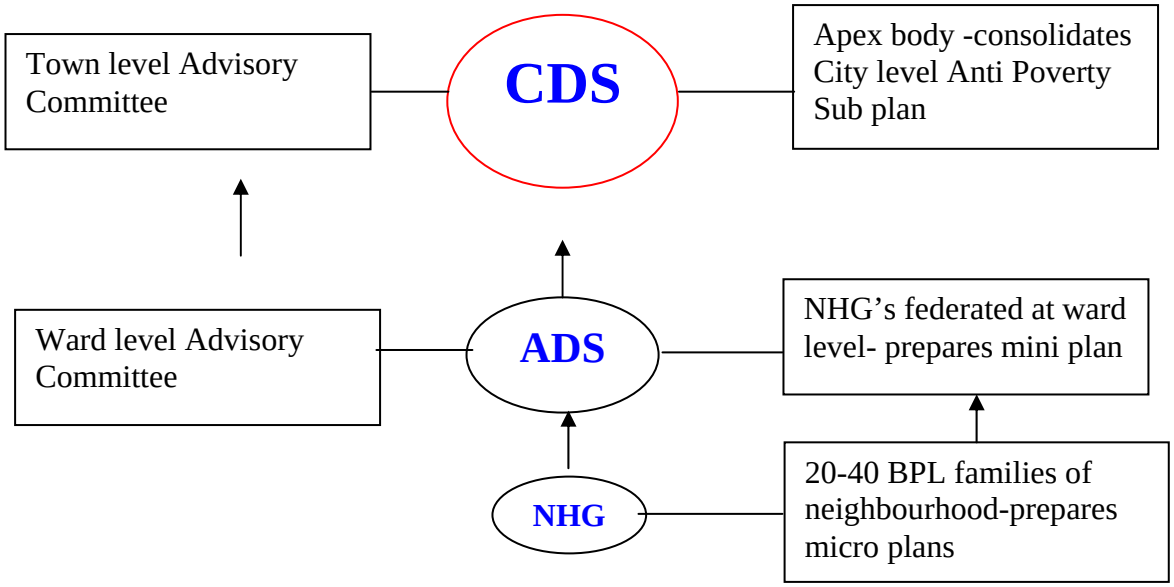


Table 7.3: Number of Existing NHGs, ADSs and CDSs

Name of ULB or Panchayat	BPL Families	No of NHGs	No.of ADSs	No of CDSs
Kochi	42,624	1,242	79	2
Urban out skirts	39,286	2,176	241	15
Total	**81,910**	**3,418**	**320**	**17**

7.5 Major Poverty Alleviation Interventions

It was only in the late eighties that an integrated approach was formulated. Considering the magnitude of the Poor, various Welfare and poverty alleviation programmes were carried out in order to improve their living conditions .The programmes implemented in rural and urban areas are shown in the table.

Table 7.4: Programmes Implemented

Sl. No.	Name of the Programmes	Central/ State/ULB/ External Aid	Implemented By
1	SJSRY	Central/ State	SPEM/CDS
2	SGSY	Central/ State	Rural development
3	NSDP	Central/ State	SPEM/CDS
4	CUPRP (Cochin Urban Poverty Reduction Project funded by DFID, U.K.)	External Aid	UPAD/ULB
5	VAMBAY	Central/ State/ULB	SPEM/CDS
6	ICDS	Central/ State	Social Welfare Dept:
7	PMRY	Central/ State	District Industries Centre
8	Various Welfare progrmmes	State	KSWDC,BCDC,SC/ST Dept & Corpn, S.W Dept:
9	Kerala Development Plan (Poverty Alleviation is one of the major sector)	State	LSGD
10	Poverty Alleviation Programmme for Mattancherry	Central/ State/ULB	CDS
11	Schemes under Kudumbashree	Central/State	LSG/CDS

The CUPR Project was aimed at securing better access for the poor of Kochi to improved services and livelihood opportunities by improving their capacity to identify needs and plans for improvement.It was a joint venture of COC and DFID. The project was implemented for the years 1998 to 2004 and the total outlay was Rs.70.76 crores.

Project Goal	Project Purpose
Sustained improvements in livelihoods in Kochi and Replication of the Model throughout the State	*Better access by the poor of Kochi to improved Livelihood opportunities and services.*

Components of the project.

- Infrastructure- Inslum and citywide;
- Health care;
- Economic development;
- Land tenure;
- Capacity building;
- Community development; and
- Monitoring and evaluation.

Major Achievements

- Rehabilitated 275 street children and 160 destitute with the support of NGOs;
- Legal Literacy and Legal awareness given to 35000 members with the support of NGOs;
- Support given to 260 destitute and mentally challenged persons through the PRS;
- Possession Certificate issued to 296 families, 300 tenants converted as title holders. Rehabilitated 275 street children and 160 destitute with the support of NGOs;
- City wide and inslum improvement programmes;
- Strengthened CBO structure; and
- Rebilitated 260 families by constructing multi dwelling units.

Poverty Alleviation for Mattancherry

A special project under SJSRY,first in India for the poverty Eradication of Mattancherry area started in 2004 with a central share of Rs.3.5 crores and state Share of 1.17 crores. The major achievements of the scheme include initiation of 77 DWCUA units, 726 USEP units, Skill training to 1056 members and renovation of 2 Govt.hospitals under UWEP.

Table 7.5: Socio-Economic Profile of Urban Poor

Employment	**70% in unorganized informal sector**
Sc/ST Population	5%
Rented Accommodation	14%
Destitute/Women	30%
With acute alcoholic/Drug Addicts	25%
Without the Capacity to take 2 square meals a day	32%
Without access to safe drinking water within 15 Mts.	82%
Without Having a sanitary Latrine	60%
With Children Below 5 Years	45%
Living in Huts/Substandard Houses	85%
With no regular employment/Only one member with regular employment	93%
Street Children	2076
With an Illiterate person	20%

7.6 Challenges & Key Issues

As a first stage in the analysis, general issues facing people in urban poor circumstances can be identified. The study confirmed the range of problems facing the down trodden.

- Insecurity of tenure and housing;
- Poor sanitary facility;
- Acute scarcity of Potable water;
- Poor standards of Health & Nutrition;
- Social Security-Threat faced by women headed families, most vulnerable, physically mentally challenged, bedridden, chronic ill patients and street children;
- Poor standards of Education and Literacy, which has a particular impact on women and children., especially Muslim Women face particular problem because of levels of illiteracy;
- Poor transportation facilities from remote slum settlements to the mainstream;

- Extremely limited employment and income earning opportunities; and
- Limited provision of Environmental services and infrastructure.

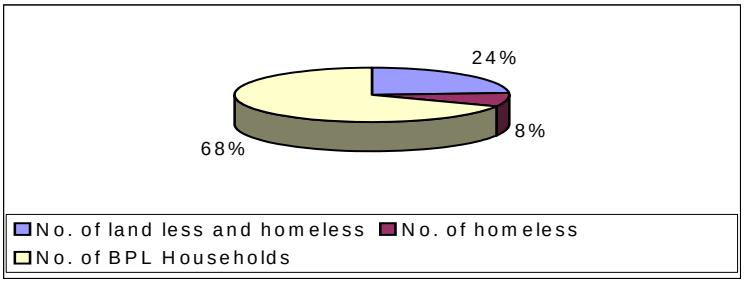
Vision. "A slum free city by the year of 2016".

A comprehensive and sustained strategy with the participation of all stakeholders designed for the full fledged development of the potentials of the Urban poor by utilizing the existing resources to tackle the multi fold problems related to infrastructure, environment and livelihood to equip them for future threats.

7.7 Land Tenure and Housing

Access to secure tenure and housing has been a perennial issue plaguing the urban poor.. The tenure problem of the urban poor in the city is complex in nature. Slums in Kochi are scattered all over the city and that makes it difficult to distinguish slum area from regular habitation. The exception is Mattanchery where one can see real slums. Over crowded and dilapidated buildings owned by private individuals and trusts are threats to the residents. In many cases the owners of these buildings have no other property and share the premises with slum dwellers. An analysis of the insecurity experienced by the poor clearly suggests the need to specifically target groups whose vulnerability is increased by the nature of their living arrangements. These have been identified as the homeless, landless, various types of tenants and encroachers on government and private land even on the verges of canals and roads.

Figure 7.4: No. of Land less and Home less house holders



About 90% of the housing shortage pertains to the weaker section, hence the affordable housing to the economically weaker sections and low-income category through a proper programme of allocation of land; extension of funding assistance and provision of support service is essential.

Vision. Ensure living security and shelter to urban poor in Kochi and urban agglomeration by 2016.

Table 7.6: Landless, Homeless and BPL Population

Name of ULB	No. of land less and homeless	No. of homeless	No. of BPL Households
Kochi	15,000	5,000	42,624
Other Municipalities and Panchayaths	7,000	7,500	39,286
Total	**22,000**	**12,500**	**81,910**

Table 7.7: Rental and Tenure Arrangements Amongst the Urban poor in Kochi

Section	Category	Population	Nature	Condition
Most Vulnerable	Home less	2,000	Sleeping on Street	No Security
	Transient	5,000	Renting space/bunks on nightly basis	
	Tenants	40,000	Weekly/monthly tenants 11 month lease/deposit Large Multi family Dwelling Absentee landlord with middle man Slum dweller owner	
Vulnerable	Encroaches	500 1,100 1,000 2,000 5,000 10,000 5,000 5,000 20,000 100 2,000	On GOI, Railway land GoK, PWD land Private trust land GoI Port Trust land KSEB land GCDA land GoK Dept. of Revenue Dept. of Irrigation CoC land GoK Evacuee Properties WAKF Board	Perceived Security
Likely to less vulnerable	Secure Occupants	5,000	Tenants by choice Absentee landlord	Legal Support
	Owners/ Quasi Owners	10-15,000 40,000	Owners without legal documents Owners making repayments Owners with legal documents	Functional Security Legal Security

Poverty Reduction Initiatives. As part of the poverty reduction initiatives of Kochi, several projects have been implemented. The Kochi Urban Poverty Reduction Project supported by the DFID during 1998-2004, NSDP and VAMBAY were major initiatives under the scheme. The details of the activities are presented below.

Table 7.8: Activities of DFID, NSDP and VAMBAY

Scheme	Activities
DFID	• Transferred title deed from WAKF Board to 202 families • Pattayam allotted to 900 families • Possession certificate issued to 296 families • 218 families were given shelter under 5 projects of multifamily dwelling units. • Five innovative cluster housing schemes, which seeks to overcome the stipulation of minimum land requirement under Govt. scheme. • Legal literacy and legal aid through NGO's
NSDP	• 2,497 houses constructed
VAMBAY	• 3,565 houses constructed

Details of Centrally Sponsored Programmes upto 20/08/2006

SJSRY

Year	Opening Balance	Receipts	Expenditure	Closing Balance
2003-2004	4,665,350	11,892,302	2,436,784	14,120,628
2004-2005	14,120,628	10,134,799	13,334,206	12,643,721
2005-2006	12,643,721	2,045,628	3,227,334	9,420,154

VAMBAY

Year	Opening Balance	Receipts	Expenditure	Closing Balance
2003-2004	2,399,850	85,390,820	56,845,660	33,710,660
2004-2005	33,710,660	10,972,585	16,053,245	16,053,245
2005-2006	16,053,245	14,627,027	13,085,000	17,595,272

NSDP

Year	Opening Balance	Receipts	Expenditure	Closing Balance
2004-2005		9,408,749	144,212	9,264,537
2005-2006	9,264,537		313,172	8,951,365

Figure 7.5: A Rehabilitation Project under DFID

Before Rehabilitation

After Rehabilitation

7.7.1 Key Issues

- Rapid increase of migrant population;
- Due to Scarcity and Soaring price of land urban poor are persuaded to stay in Puramboke lands or rental homes;
- Lack of tenure security;
- Lack of land management strategy for the city;
- Legal and administrative problems related to grant of pattayam;
- Lack of awareness in low cost technology and tenure issues;
- Dilapidated buildings in Mattancherry;
- Cost of construction and building materials are increasing;
- Administrative delay, shortage of skilled staff and lack of coordination; and
- Lack of land use data bank.

7.7.2 Strategies

- Issue photo identity cards to Puramboke dwellers to safe guard poor families from threat of eviction without alternative rehabilitation;
- Establishment of land management unit under the town planning department of Kochi;
- Identification and planned use of vacant land;
- Geographical Information system on land management;

- Public private partnership for land development;
- Conversion of slum dwellers as title holders;
- Land sharing and land readjustment;
- Provision of infrastructure to start income activities in the premises of shelter;
- Provision for loan with reasonable terms as well as additional loan for the construction of a house;
- Channelize self help groups and other financial institutions to arrange credit for housing;
- Promote housing co-operatives to acquire land, which will be subdivided after the project is completed;
- Construction of multifamily dwelling unit to most vulnerable homeless, landless people and occupants of dilapidated buildings;
- Cluster housing scheme for most vulnerable amongst the poor those who have inadequate land to access subsidies or loans;
- Relocation of slums located in hazardous and vulnerable areas;
- Co ordination with Government Departments and Trusts;
- Access to legal service related to land tenure;
- Scheme for providing loans for construction of houses with reasonable pay back facilities to EWS and LIG;
- Schemes for making available developed land for housing in the residential zones delineated by GCDA at reasonable cost by convergence with plan fund; and
- Land Bank – Plots of vacant land are acquired by the corporation and set apart for the purpose of housing to be under taken by the Co operative societies.

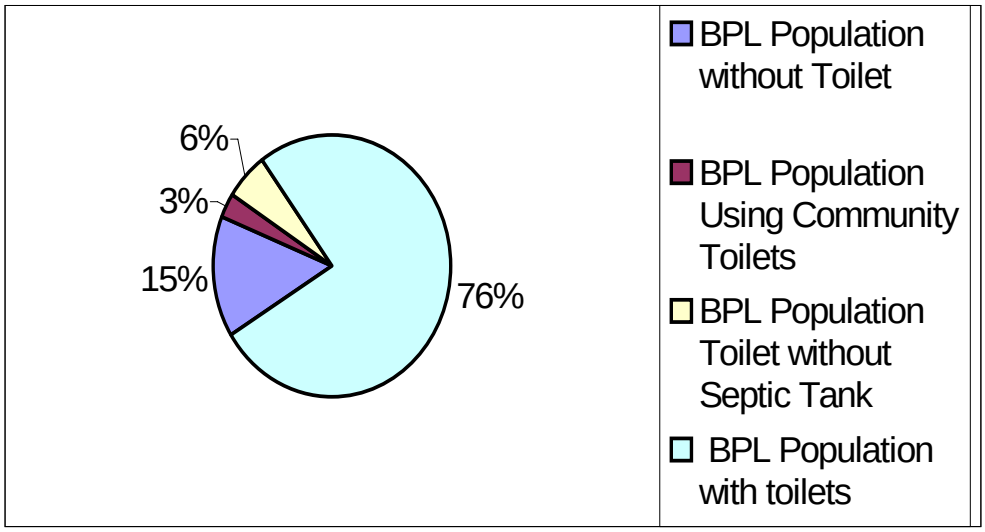
7.8 Sanitation

Lack of proper drainage, sewerage and toilets are major hazards in slum area. In Kochi Urban agglomeration 70 % of urban poor families are in coastal areas and they have no proper toilet facilities. This situation creates serious issues in rainy season. The following table shows number of BPL Population without toilets in Kochi and surrounding ULBs.

Table 7.9: Number of BPL Population without Toilets

LSG	BPL Population without Toilet	BPL Population Using Community Toilets	BPL Population Toilet without Septic Tank	Total BPL Population
Kochi Corporation	40,000	11,500	16,000	213,120
Municipalities and Panchayaths	56,210	8,000	22,750	276,226
Total	**96,210**	**19,500**	**38,750**	**489,346**

Figure 7.6: No. of BPL Population without Proper Toilet Facilities



In Kochi Corporation with the help of DFID and CUPR Project it was targeted to construct 10000 individual toilets to Urban Poor. This scheme was started at the ending phase of the Project and the target is not yet completed. Only 50% of the target is achieved so far. Besides 2000 toilets were constructed under NSDP.

7.8.1 Key Challenges.

- Lack of individual toilet facilities for slum dwellers and urban poor in Kochi and surroundings;
- Many of the existing toilets are lacking vent pipe covering;
- Inadequate public toilets and community toilet facilities;
- Poor maintenance of community toilets;
- Lack of awareness among the urban poor regarding proper use and maintenance of existing toilet facilities;
- Outlets of existing toilets are connected to open drainage and this creates health issues;
- Lack of space in slum households to construct individual toilets;
- Absence of sewerage system connected to slum areas; and
- Inadequate and unhygienic toilets in schools in the slum areas.

7.8.2 Strategies

- Construction of community toilets/Shared toilets for 10-15 families in slums where space is not available to construct individual toilets;
- Extension of sewerage networks to slum areas and connect toilet outlets to sewerage network;
- Develop mechanism for operation and maintenance of community/shared toilets;
- Construction of individual toilets to those BPL families having space for toilet construction;
- Improvement/reconstruction of existing community toilets and individual toilets;
- Awareness programs to slum dwellers for proper use and maintenance of toilets; and
- Provision for biogas plants adjacent to community toilets.

7.9 Potable Water

Water is one of the prime necessities of life Water shortage is a chronic problem irrespective of any area including Urban Agglomeration. The rapid development of the city in recent decades has placed an ever-increasing demand on the water supply system, the capacity of which is barely capable of meeting 50% of present total demand.

Vision. Sufficient water for all the inhabitants especially the slum dwellers by the year of 2016.

7.9.1 Key Issues

- The existing water connecting pipes are leaking and dilapidated;
- There exist slums without common taps;
- Potable water is used for other purpose;
- Problems related to the supply of water-irregularity;
- The hardship faced by women both mental and physical hazard while fetching water;
- Wastage of water from common taps; and
- The connecting pipelines drawn through drains.

7.9.2 Strategies

- Individual pipe connections to the slum dwellers;
- To promote Rain water Harvesting including storage and management;
- Develop strategy for the use of water from natural sources and to identify other sources of water for house hold purpose. (Bore wells, ponds, Backwater, Rain water etc.);
- Replacement of damaged pipes from drains and improves delivery pressures at public stand posts;
- The volume for the supply of water should be standardized; and
- Establishment of water usage Monitoring Committee-The Community Based Organisations can play a vital role in this regard

7.10 Health

The environmental conditions in the slums and other settlement areas of the urban poor are very poor and they lack proper health care facilities.. In Kochi Corporation and its surroundings, the slums and the other urban poor residential areas are prone to common diseases like typhoid, Cholera, dysentery, malnutrition, liver enlargement, gastroenteritis, tuberculosis, scabies and other skin diseases. Rapid urbanization results in the increase of health problems Majority of the poor in urban agglomeration depends on General Hospital, Ernakulam for all their serious ailments.

Table 7.10: Methods of Treatment

Mode	Estimated Population %
Allopathic	80%
Ayurveda	6%
Homoeopathic	14%

Figure 7.7: Modes of treatment

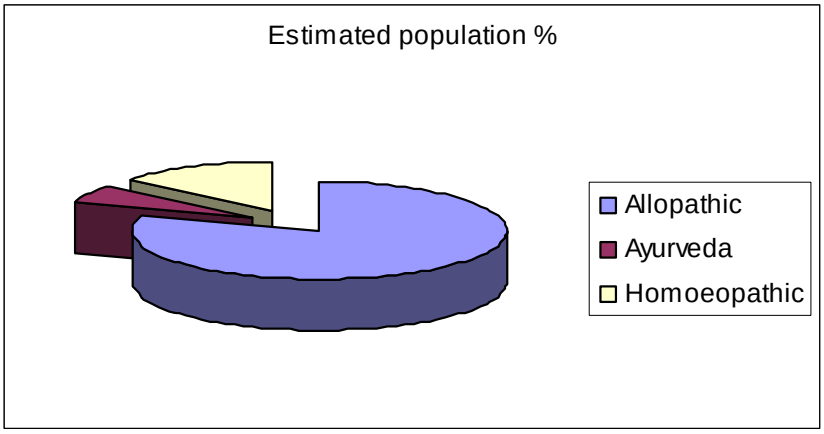


Table 7.11: Medical Institutions

Allopathic		**Ayurveda**		**Homeopathy**	
Hospitals	Dispensaries	Hospital	Dispensaries	Hospitals	Dispensaries
10	8	4	13	2	15

While considering the health status of the slums it is necessary to analyze the various existing health care facilities accessible to the urban poor in the area.

Compared to the urban poor population, existing health care institutions accessible to them are inadequate to meet their requirements. Studies show that health campaign Programmes are very limited in Kochi and its peri-urban areas, especially that of the urban poor. The usage of preventive vaccines is low due to ignorance. Economic instability is the major reason for malnutrition in children and women. Since a good percentage of the male among the urban poor, the sole bread winners of the family are under the wrath of such diseases it has resulted in the disintegration of these families and hence the society.

Table 7.12: No. of institutions in LBs

Name of ULBs and Panchayats	**No. of CHCs**	**No. o f MCW Centers**	**No.of Govt Hospitals (Allopathy)**	**No. of PHCs**
Kochi Corporation		13	7	
Kalamassery Muncipality		4		1
Thrippunithura			1	1
Elamkunnappuzha Panchayat	1			1
Njarakkal				
Mulavukadu		1		1
Kadamakkudy		4		1
Cheranellore		6		1
Eloor		5		1
Varappuzha		4		1
Thrikkakara	2	4		2
Thirvankulam		1		
Maradu		5		2

Name of ULBs and Panchayats	No. of CHCs	No. o f MCW Centers	No.of Govt Hospitals (Allopathy)	No. of PHCs
Kumbalam		6		1
Kumbalangi	1	6	2	1
Chellanam		7		2
Total	**4**	**66**	**10**	**16**

The ICDS feeding/pre school programmes for children make an important contribution to their nutritional status, reducing their risks of ill health and malnutrition increasing their learning ability and reducing the exposure of their households to treatment costs for ill health.

Table 7.13: Anganwadis

Name of ULB	No. of Anganwadies	Own Buildings
1. Kochi Corporation	280	20
2. Kumbalam	20	5
3. Kadamakudy	13	3
4. Cheranalloor	18	4
5. Elamkunnapuzha	8	0
6. Thiruvankulam	13	9
7. Kumbalangi	29	5
8. Mulavukadu	13	5
9. Njarackal	14	6
10. Chellanam	8	0
11. Eloor	20	14
12. Maradu	30	9
13. Varappuzha	20	1
14. Kalamassery	15	5
15. Thrikkakara	36	5
16. Thripunithura	31	8
Total	**568**	**99**

Through the CUPRP project, financial assistance was given to the victims of TB, Cancer, the Mentally challenged, and vulnerable families. The patients who need super specialty surgery and investigation were given support. Under Kudumbashree this project also trained 1200 Community health volunteers in collaboration with Amritha Institute of Medical science, and equipped them with medical kit.

Cochin Corporation started a “Blood Literacy Project” from 2002 onwards with the aim of issuing health cards to the urban population.

Sexually transmitted diseases like HIV and AIDS have emerged as an important public health problem and it is a developmental challenge. Ignorance about the diseases and its transmission and intervenal drug abuse and indiscriminate sexual behavior leads, these uneducated poor to contract these fatal diseases.

7.10.1 Key Issues.

- Poor infrastructure in existing Govt. Hospitals PHCs, CHCs, and MCW centers, cancer detection center, Kaloor, T.B Centre Karuvelippady;
- Lack of awareness about preventive medicines, nutrition, and other health care measures;
- Increase of alcohol/drug abuse, STD, AIDS etc.;
- Inadequate institutions and treatment for the mentally and physically challenged persons;
- Increase in life style diseases like diabetes, Blood pressure, cholesterol etc.;
- Use of contaminated drinking water;
- Improper drainage and absence of sewage system;
- Reluctance to use alternative treatment facilities like Ayurveda and Homeopathy; and
- Non Convergence of activities of various departments/bodies/ inadequate publicity to health care programmes.

7.10.2 Strategies

- Infrastructure development and adequate stock of medicines in all the existing Govt. Hospitals, PHCs, CHCs, MCW Centres, Cancer Detection Centre,Kaloor,T.B.Centere Karuvelipady, Anganwadies in the area and so on.
- Consistent health awareness programs through advertisements, print, and visual media in selected areas;
- Supply of free medicine for the chronically ill through health centers;
- Strengthen the CHV's with medical kits;
- Conduct monthly medical camps and immunization programs in slums;
- Issuing health cards to all the urban poor;
- Health assistance to victims of all chronic diseases among the urban poor;
- Start well equipped mobile clinics with ambulance service;
- Strengthening the distribution of supplementary nutrition through ICDS and community health centers also include children up to three years in the Anganwadies with a minimum fee. (Considering as day care centres);
- Convergence and Co-ordination of different community health care activities of different Govt. and Non-Govt. institutions;
- Bring all urban poor under medical insurance scheme with an affordable beneficiary contribution;
- Enhance voluntary counseling and testing centers (VCTC) in selected areas; and
- Promoting Ayurveda and Homeopathic systems of medicines.

7.11 Education

There are several educational institutions in the city that meet its educational needs. As per data available for the year 2001, there are 119 schools within the Corporation of Kochi. This includes lower and primary schools and high schools. Majority of these institutions are run by the private agencies. Just 21 of the 119 schools in the Kochi Corporation are run by the Government. There are 22 higher secondary (including Vocational) schools in the Kochi Corporation. 10 of them are in the Government sector and the remaining 12 are run by the private agencies.

Number of Government schools in Kochi Urban agglomeration by level of class.

Table 7.14: Govt. Schools

Name of ULB	High School	UP School	LP School
Kochi Corporation	4	6	11
Cheranalloor	0	0	2
Kumbalam	0	0	1
Kadamakkudy	1	0	0
Elamkunnapuzha	1	2	2
Thiruvankulam	1	0	0
Kumbalangi	0	1	1
Mulavukadu	0	0	1
Njarackal	0	1	1
Chellanam	1	0	0
Eloor	1	1	1
Maradu	1	0	2
Thrippunithura	1	6	1
Thrikkakara	0	2	0
Kalamassery	1	1	1
Varapuzha	0	1	0
Total	12	21	24

7.11.1 Key Issues

- Lack of building infrastructure in existing schools in slum areas;
- Increases of drop outs among urban poor;
- Due to financial constrain reluctance for higher education;
- Trend to close down existing schools in slum areas;
- No modern facilities in slum schools to compete with other schools like computer labs, Edusat, school library etc.;
- Lack of basic amenities like drinking water and proper toilet facilities in schools; and
- Lack of special/skilled training along with education.

7.11.2 Strategies

- Improve the building infrastructure of the existing schools in urban agglomeration;
- Provision of basic amenities in schools like drinking water, improved toilets etc girl-friendly;
- Provide facilities like computer lab, Edusat connection, School library etc. to slum schools;
- Promote higher education among the urban poor by engaging scholarships and grants;
- Strengthen continuing education centers to provide learning facility to urban poor adults;
- Strengthen the Balasabhas and Balapanchayath to promote extra curricular activities of urban poor children;
- Provide career guidance counseling in schools;
- Provide Education assistance to students belong to vulnerable families; and
- Encourage skill training along with regular education.

7.12 Social Security

Social security measures for the most vulnerable groups like street children, street adults, destitutes, unwed mothers, beggars, abandoned women, physically and mentally challenged are the important areas for concern. Many times the poor remain in the street without any secure place to stay or sleep. Aged people are facing the problem of isolation and many are victims of dementia, depression, and other chronic diseases. Owing to the port and wider employment opportunities Kochi city, attracts a range of poor migrants who end up and sometimes remain on the street, sleeping in bus stand, railway stations, and beach and in the market. These transient groups have little capacity to help themselves to break this cycle and often remain in the street indefinitely. There are 1000 - 2000 people living under these circumstances. Bench marking survey is being conducted under Kudumbashree to identify destitute families in Kochi and surrounding LSGs. Thiruvankulam and Elamkunnapuzha panchayaths are implementing Ashraya Project.

Table 7.15: Category of Children at Risk

Category	Male	Male	Female	Female	total	total
	No.	*%*	*No.*	*%*	*No.*	*%*
Children of sex workers	79	6.7	59	8.4	138	7.3
Migrant children	159	13.6	131	18.7	290	15.5
Street children	58	4.9	8	1.1	66	3.5
Hotel workers	207	17.6	1	0.1	208	11.1
children of slum colonies	671	57.2	503	71.7	1174	62.6
Total	**1174**	**100**	**702**	**100**	**1876**	**100**

Interventions. At present various programmes have been implemented by the Corporation and many of these activities are implemented by providing financial support to NGOs and CBOs working for the most vulnerable. It is commendable to note that Corporation of Kochi is unique in the setting up of a relief settlement for destitutes and vagrants. Presently 280 inmates are admitted in PRS. Corporation has also constructed night shelters for women, street girls, street boys, street adults and other 5 rehabilitation centers. Night shelter and shelter for street girls, women and adult are managed by NGOs with the financial support. Pension schemes are also implemented for the most vulnerable like widows, aged and single woman above the age of 50.

7.12.1 Key issues faced by the vulnerable groups

- Inadequate food and medicine;
- Inadequate shelter to destitutes and vagrant;
- Lack of access to basic amenities and services;
- Lack of infrastructure and other facilities in existing rehabilitation centers;
- Lack of night shelter for women;
- Lack of counseling and proper guidance; and
- Insecurity and threat from antisocial elements.

7.12.2 Strategies

- ASHRAYA (Destitute Identification Rehabilitation and Monitoring) project under Kudumbashree for destitutes in Kochi and surrounding local bodies;
- Need based rehabilitation programmes suitable to the needs of various vulnerable groups;
- Rehabilitation centers for mentally and physically challenged people;
- Education for street children and school dropouts;
- Shelter for street children, adults and destitute;
- Construction and maintenance of Old age homes and day care centers for the aged;
- Counseling centers;
- Convergence of programmes of various departments and NGOs;
- Community based rehabilitation centers and community kitchen;
- Recreational centers for children, aged and destitutes;
- Short stay homes;
- Home placement programmes;
- Housing programmes for widows and women headed families and handicapped;
- Social insurance schemes including unemployment wages, insurance, income support, old age pension, sickness and maternity benefit, injury and disability benefit and access to education;
- Awareness program against sex abuse;
- Relocation and construction of Palluruthy Relief Settlement;
- Alzheimer's care centers;
- Formation of Juvenile home; and
- Organizing livelihood and income generation programs for vulnerable urban poor.

7.13 Urban Poor and Livelihood

All urban poor families depend on city's economic activities for livelihood. Most of them work in unorganized informal sectors like fishing, akry collection, construction work, cloth selling or work as vegetable vendors, coolies, carpenters etc. Seasonal unemployment, irregular employment and low payment are major hazards. The informal activities mainly concentrate around major road network in the city such as road margins, foot paths, space in small market areas etc. spread all over the corporation and surrounding municipalities and Panchayaths. The major areas of informal activities in Kochi city are Shanmukhm Road, Broadway, M. G Road etc.

7.13.1 Key Issues

- Those Urban Poor families engaged in fishing occupation face the problem of seasonal unemployment. More over they face threats to potential earnings due to changing technology and depletion of fish stocks in rivers and seas;
- Non- availability of fish landing centers at suitable locations;
- Non availability of commercial spaces for marketing products of micro-enterprise units is a major constrain for urban poor entrepreneurs;
- Majority of Urban poor engaged in unskilled or semi skilled low paid work;
- Lack of marketing, quality checking facility to the products of urban poor entrepreneurs; and
- Absence of database to co-ordinate the job opportunities available to urban poor.

7.13.2 Strategies

- Construction of low cost workspace in different slum pockets and other market areas;
- Fix an affordable user charge for the work space;
- Develop a data base on job opportunities suitable for urban poor with Keralashree-a Virtual employment exchange initiated under Kudumbashree in different employment generating sectors like sea port, Vellarpadom Container Terminal, Kochi Special;
- Economic Zone, Info Park etc including Public/Private Sectors;.
- Set up a quality checking system for the products of urban poor entrepreneurs;
- Advanced EDP Training to eligible entrepreneurs; and
- Establishment of a marketing/resource/advisory centers. Major functions of the centers would be following:
  - Provide marketing opportunities to the products urban poor enterprises;
  - Counseling to those entrepreneurs facing different constraints;
  - Standardization of prizes of products of urban poor;
  - Form a guild of urban poor who engaged in similar work and make networks with larger business groups in the field to obtain subcontracts;
  - Diversification of traditional work carried out by urban poor like fishing;
  - Organize multi purpose job clubs of skilled and semiskilled workers among the urban Poor including women;
  - Promote new areas of income generation to urban poor like urban agriculture, fish farms, domestic animal farms, horticulture etc within urban and peri-urban areas; and
  - Development of fish landing facilities.

7.14 Environmental Improvements

The Urban Poverty Study Undertaken in late 1995 indicated that deficiencies in the city wide services such as Flood Control and Protection, In slum Transportation, Street lighting, are keenly felt by the urban poor, particularly the most Vulnerable Groups, who are least able to adopt ‘coping strategies to reduce the adverse effects of inadequate provision of these services.

7.14.1 Key Challenges

- Flooding during Monsoon causes silting up of drainage channel and the restriction natural flow caused by accumulated rubbish in channels;
- The poorest people have no means of escape from the consequences of flooding and it presents a significant threat to health particularly for children;
- There are 37 slums in the city that are severely affected by flooding;
- Dilapidated Drains and Canals; and
- Lack of protection walls and culverts in order to ensure natural flow.

7.14.2 Strategies

- Raising and protecting canal banks;
- Construction of retaining walls wherever required;
- Placing land fill in critical low lying areas;

- Inserting culverts in key locations;
- Major canal maintenance including de silting;
- Purchase of slum friendly adequate equipments for de silting;
- Renovation of existing Drains; and
- Awareness to the public on O&M.

7.14.3 Roads and Transportation

Better access of the poor to the public transport is of great significance related to their poverty. Inaccessibility leads to lack of opportunity, growth and development. One of the problems identified, related to this sector, is that the residential areas of slum dwellers are inaccessible to public transportation facilities. Dilapidated and poor roads, sub roads and bye lanes make their life pathetic.

7.14.4 Key Challenges

- Existing dilapidated roads, sub roads, bye lanes etc.;
- Low lying roads (flood affected);
- Poor and unhygienic pedestrian lanes;
- Inaccessibility of urban poor to the work place and mainstream of the city;
- Shortage of water transportation facilities; and
- Lack of public transport facilities extending to slums.

7.14.5 Strategies

- A demand led approach for the improvement of access to public transport;
- Realizing the geographical conditions and climate, choose appropriate technologies to build roads. (Nature of areas – riverside, coastal, low-lying);
- Develop usable inland water transport facilities;
- Ensuring the mobility of slum dwellers, Project should intervene promotion of mini bus services (Local area network), extension of existing bus routs to inner slum areas and purchase of new vehicles for public transport;
- Construction of all weather roads to the pedestrians; and
- Ensure people's participation in operation and maintenance of public transport.

7.14.6 Electricity and Streetlights

There are urban poor families with no household electricity connection. KSEB is providing free connections to below poverty line families but many of the BPL families do not use this benefit due to financial constraints to finish wiring work. There is coverage of streetlights in Kochi city but the peri-urban areas need special attention.

7.14.7 Key Challenges

- Most of the Slum Households have no electricity connections;
- Lack of adequate streetlights in peri urban areas;
- Existing streetlight are not working properly;

- Financial constraints of urban poor to avail individual electricity connections; and
- Frequent voltage fluctuations in slum settlements.

7.14.8 Strategies

- Promotion of solar, and bio gas technologies to produce energy;
- Coverage of streetlights to all localities and scattered areas of urban poor including peri-urban areas;
- Ensuring complete coverage of household electric connections to the urban poor;
- Promotion of streetlights using solar energy techniques; and
- Ensure electric connections in all civic amenities in slum like community hall centers, reading rooms, public health centers, community toilets etc.

7.14.9 Civic Amenities

The high density of population with limited space in slums makes the environment congested. The co- ordination and harmony of the people are an essential component for the smooth functioning of the society. Improved social awareness is a pre-requisite. The Social behaviour of every individual can develop through the improvement of environment and surroundings.

When analyzing a slum situation it is generally considered as the place of many social ills, all types of heterorganic amoral and asocial evils. A positive change is effective when there are accelerated improvements in the environmental conditions.

7.14.10 Strategies

- Development of existing community hall centers, community toilets, libraries, reading rooms, and other recreational centers;
- Construct parks in appropriate vacant lands in and around slum settlement;
- Construction of new community hall centers/reading rooms;
- Development of new and existing plays grounds;
- Day care centers for Babies;
- Improve the condition and infra-structure of schools in slums;
- Construction of new community toilets and improvement of existing ones;
- Construction of Working Women Hostels; and
- As a part of environment improvements, promote social forestry attempts and strategies.

7.14.11 Solid Waste Management

The urban poor do not generate large quantities of solid waste and tend to recycle any thing of value. The remaining waste is either allowed to accumulate near their dwellings, or is thrown in any convenient drain or canal. However, there are significant hazards to slum communities in these practices. Decomposing of organic materials releases toxic gases and foul smell, plastic and other inorganic materials block the drainage channels and cause frequent health issues and flooding in rainy season. The slaughterhouses in slums dump their waste to the nearby canals flowing to river. This practice creates blocks in the flow of canal water and pollutes the environment and also creates a mosquito friendly atmosphere in the areas.

Initiatives. In Corporation and surroundings Clean Kerala Units are started to collect solid waste from households and hotels in the city through Kudumbashree units. At present there are 21 units functioning. These units are doing collection and dump this waste to common bins. In Corporation and surroundings there are very few units of biogas plants and vermi compost units. But there is no provision for segregation/ treatment.

7.14.12 Key Issues

- City wide waste collection service does not reach most of the slums and urban poor residential areas;
- Absence of efficient and effective primary waste collection in Kochi and Surroundings;
- Lack of awareness among the urban poor regarding proper solid waste disposal;
- Open drainage, canals and vacant land become waste dumping places;
- Inadequacy of waste bins in slums;
- No provision for daily removal of waste from existing bins creates environmental pollution;
- Urban poor have limited land premises to segregate or dispose waste; and
- Reluctance of slum dwellers and urban poor residence to pay a nominal collection Charges or service charge.

7.14.13 Strategies

- Provision of simple waste bins at convenient locations within the slums;
- Collection of waste by small ubiquitous collection vehicle capable of carrying up to 2.2 Cubic meters of waste and can traverse footpath not more than two meters wide;
- Door to door waste collection service to slum and urban poor residents;
- Generate employment opportunities to urban poor in collection of waste;
- Create awareness to urban poor regarding solid waste management through popular media;
- After segregated collection regular removal waste to secondary collection points outside slums;
- Affordable collection charges can be introduced to urban poor;
- Promote Provision for disposal of bio wastes in building plans;
- Promote vermi composting in house holds;
- Provision for biogas plants within the slums and it will generate employment opportunity to urban poor; and
- lums and it will generate employment opportunity to urban poor.

7.15 Financial Plan

In order to decide the allocation of funds to the different local bodies for the projects identified for them the data collected through a workshop conducted for this purpose was utilized. Representatives of CBOs, Municipal councilors, Grama Panchayat and Block Panchayat Presidents along with their members and Project officers of Kudumbasree participated in this. Their aspirations were consolidated and based on the BPL population of each LB and their need the allocations were arrived at. The table below shows distribution of finance envisaged during the period of CDP.

Table 7.16: BSUP – Financial Plan (2006-2012) Rs. In Crores – ULB Wise

Component	CoK	Thripu Mun	Kala Mun	Kumba lam Pt.	Kumbg Pt.	Chell Pt.	Elam Pt.	Njara Pt.	Varap Pt.	Chera n Pt.	Ellor Pt	Thrika Pt	Marad u Pt	Thiruv a Pt	Mulav u Pt	Kada Pt.	Total
Development of Comprehensive Data Base	1.50	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	3.00
Institutional Strengthening and Capacity Building	3.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	6.00
Environmental improvement of slums	29.70	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.90	1.00	0.90	0.50	0.60	0.50	39.60
Electricity and street light	9.50	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	18.00
Civic Aminities	85.00	8.00	8.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	166.00
Land Tenure and Housing	187.60	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	307.60
Social Security	35	5.05	5.05	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	62.00
Livelihood	20	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	35.00
Health	99.50	13.15	13.15	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	158.30
Education	25.00	10.00	10.00	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	64.50
Operation & Maintenance Cost	12.25	1.50	1.50	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	25.00
	508.05	49.00	49.00	21.35	21.35	21.35	21.35	21.35	21.35	21.35	21.75	21.85	21.75	21.35	21.45	21.35	885.00

Conclusion. 34% of the total population in the CDP area falls in the BPL category. There are more than 280 slums of which 70% are in West Kochi. The key issues faced by the urban poor are insecurity of tenure, poor sanitary facility, scarcity of potable water, unsafe housing, poor standards of health, nutrition, education, social security threats, limited income and lack of social & environmental services.

Strategy includes creation of data base about the urban poor, their needs and potentials, provision of housing, ensuring security of tenure, institutional strengthening for continuous involvement in the urban poor needs and provision of social and physical infrastructure for their development.

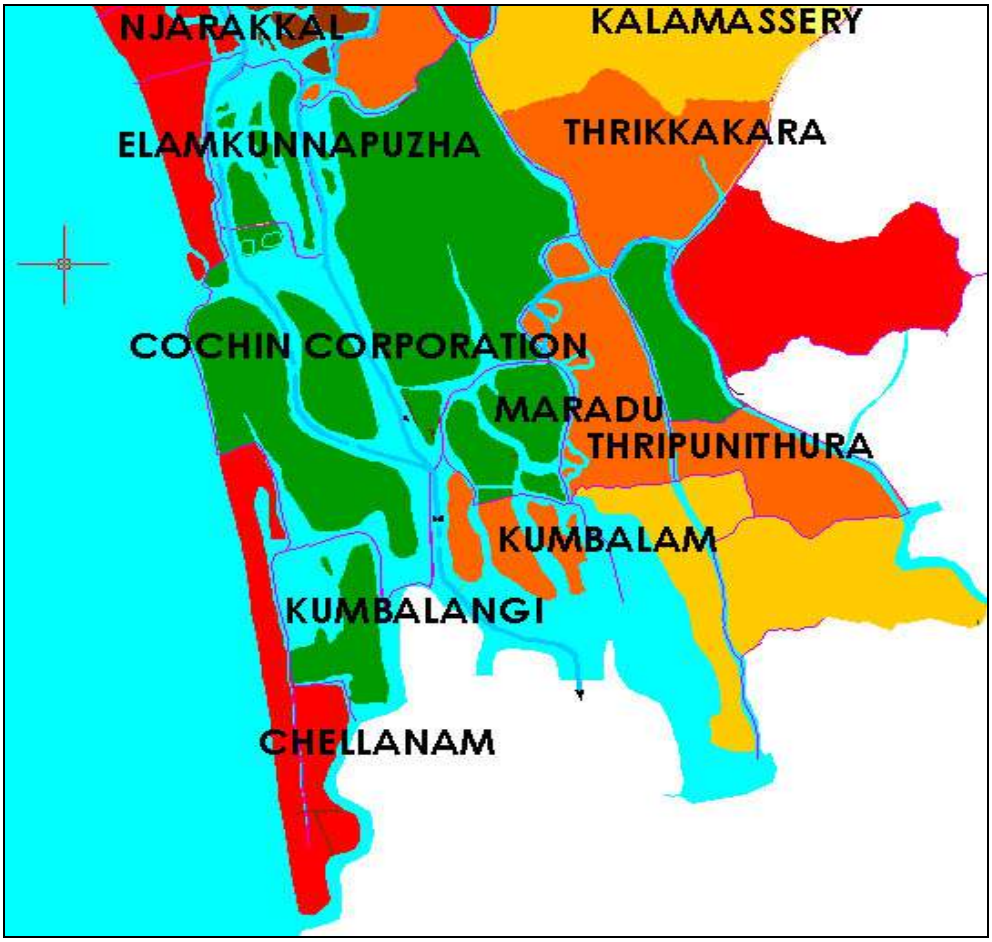
The project cost is **estimated** to be **Rs.885 crores**.

8. HERITAGE & TOURISM

8.1 Introduction

Kochi City has always been special for its Heritage and Pluralistic Culture through its history, which is primarily based on trade shipping activity. Being an Island City, Kochi has unique environmental features and a cultural heritage, which is intertwined with the environment. The city's ever-growing demand and potential for growth opportunities constantly interact and depend on its valuable natural and cultural heritage. The CDP looks at the effective symbiosis of Conservation and Development aiming at the protection of our rich natural and cultural heritage.

Figure 8.1: Area Covered under the Heritage Project

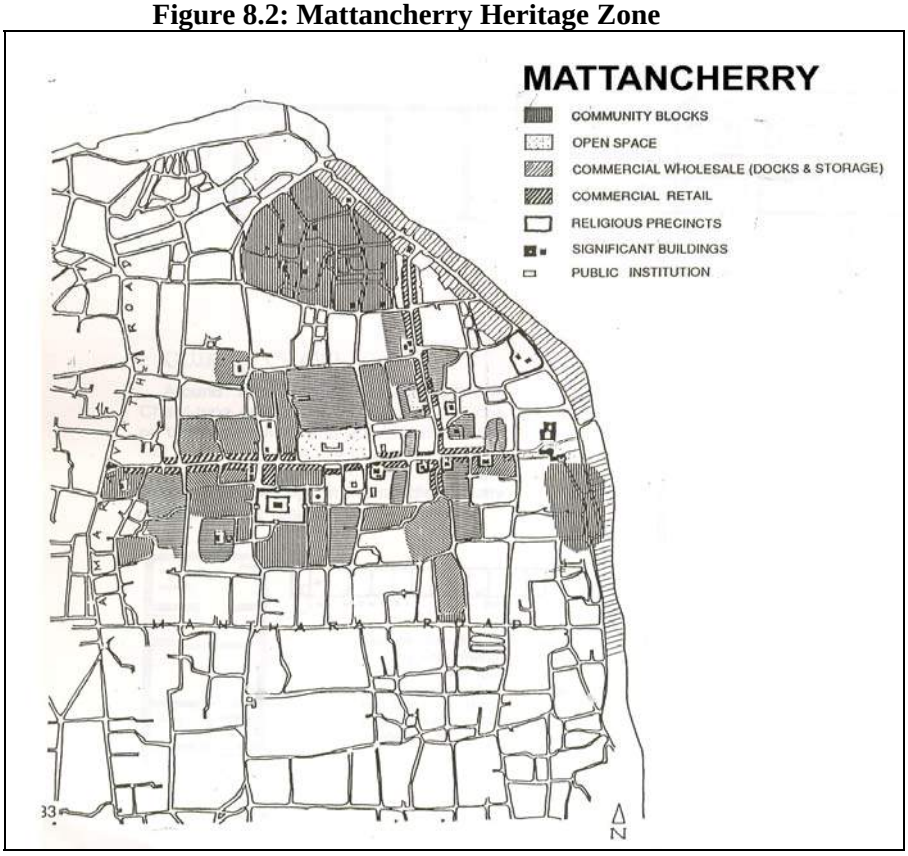


8.1.1 Major Heritage Zones in Kochi & Development Issues

Fort Kochi, Mattancherry, Fort Vypeen Integrated Heritage Zone. The History of the City of Kochi starts with the natural phenomenon in 1341 AD when the great flood in Periyar washed away a sizable piece of land creating the sea mouth and natural harbour of Kochi. During 1440 AD Kochi City grew around Mattancherry settlement as a city of 5 miles of circumference and Chinese and Arabs used to trade with the natives of the town. Kochi was ruled by the Kochi Rajas in the period from 12th Centaury onwards.

In 16th Centaury AD Portuguese came to Kochi and subsequently built their Fort and thus the formation of Fort Kochi. The trade activities flourished after the decline of Kodungallur port and Jews, Konkinis and many other ethnic groups moved to Kochi and settled here. In 17th Century AD, the Dutch and subsequently British in 18th Century invaded Kochi. The Fort Kochi, Mattancherry and Fort Vypeen placed right at the sea mouth has experienced immense trade related activities and has developed a rich pluralistic culture and tradition unique to this heritage zone. This is reflected in the heritage of this area, which exhibits great monuments, structures and settlements of outstanding heritage value. Fort Kochi & Mattancherry can proudly claim the uniqueness in the entire heritage zone which is not seen anywhere in the region, and this makes it a major attraction for the tourists as well.

Figure 8.2: Mattancherry Heritage Zone



Issues Related to Heritage. The development issues related to heritage are also unique to this heritage zone. As the City of Kochi grew around Ernakulam as a major town, this area had been left behind by developments and investments. However, due to the growing demand of the tourism industry has made this heritage zone alive again. The areas and settlements in Mattancherry and Fort Kochi are facing a serious threat of urban degeneration. Sanitation and health has become one of the major issues. Pulling down and unauthorized modifying of valuable heritage structures and public spaces is also a major issue in this zone. Unsympathetic and alien developments destroying the harmony in heritage zones due to lack of proper development guidelines is experienced in this field. Public spaces of intense use such as streets and markets choke with traffic jams resulting in unfriendly public areas. Too much dependence on tourism has resulted in displacement of original citizens and this adds to urban degeneration.

Willingdon Island Heritage Zone. During the period of the British Rule, in early 20th century, Dredging of Port and formation of Willingdon Island was executed under the design and direction of Sir Robert Bristow. Subsequently Kochi emerged as the major port in the entire region. Willingdon Island grew as the port and seat of power for British rule. The entire port town was designed by Sir Robert Bristow and left an outstanding heritage settlement built during the British period. The Heritage structures including that of the Port Trust, Palacial Bungalows, Commercial godowns and Public spaces of the Southern Naval command area etc. become part of this heritage zone.

Issues Related to Heritage. This beautiful island of outstanding heritage value poses some unique issues in the field of heritage. Kochi Port Trust and Indian Navy mostly own the Island, which leave little regulations being effective in these areas. Unsympathetic and alien developments destroying the harmony in heritage zone and water edge skyline due to lack of power development guidelines is experienced in this area. The beautiful water edges and public spaces associated to this island do not share it with the citizen of Kochi except in few cases.

Ernakulam Central Area Heritage Zone. In 19th Century during the British Rule, Kochi rulers shifted to Ernakulam. As a result, market and associated settlements flourished. The Ernakulam Heritage Zone is in fact the heart of today's City of Kochi. Most work places, Administrative and institutional centers and market places are located here. Moreover the City's widely used parks and public open spaces are located defining the landward edge of this zone, which connects the city to its natural heritage of backwaters. Institutions such as the Kochi University on foreshore road, Maharaja's College, Law College, St. Theresa's college and St. Albert's College etc. Many cultural and religious institutions with some of the oldest temples churches, mosques and synagogues also become part of this heritage zone. Old commercial streets with buildings abutting roadsides are also seen in this area, especially in Broadway. Re development of the area on conservative principles will increase the productivity. Historical heritage structures, which represent many cultural and ethnic groups who have come and settled here during its history, are spread all over. City level institutions such as the Corporation of Kochi, GIDA etc culminate at the northern part along with the High Court complex of the state. More to mention, the city's breathing spaces such as the Subhash Park, the walkway at Marine Drive and the Durbar Hall ground etc are the most used and celebrated public spaces of the city.

Issues Related to Heritage. The development issues related to heritage are mostly to do with the rapid urbanization and demand posed by the ever-growing needs of the city. This has resulted in unsympathetic and alien developments destroying the harmony in heritage zone due to lack of proper development guidelines. Pulling down and unauthorized modifying of valuable heritage structures and public spaces is also a major issue in this zone. Public spaces of intense use such as streets and markets choke with traffic jams resulting unfriendly public areas. Lack of adequate Infrastructure and Sanitation has become one of the major issues in areas like Ernakulam Market.

Canal & Backwater Network Heritage Zone. Canal Network is part of our regional traditional heritage planning. These canal systems can be commonly experienced throughout in Kerala in the low-lying coastal areas. They, once upon a time, used to be the drainage system, transportation corridor & irrigation system of traditional development. The entire development in the low-lying coastal areas has been dependent on such canal systems integrated by backwaters, lagoons and

Estuary and was instrumental for trade and commercial activities. The Canals Network in Kochi is very much intertwined with rivers and backwaters. Most of the traditional areas and heritage zones are connected by such canal system. Most public spaces, settlements and institutions are also grown along them.

Issues Related to Heritage. The canal Network is both a natural as well as cultural heritage of our city. It has played an important role in the history of Kochi. The issues related to the Canal Network are basically the major issues of Kochi City itself. Sanitation, mosquito breeding, drainage etc. are the major issues of the City and all related very much to the Canal Network. Accessibility to the canal is another issue of equity. Encroachment is another issue related to the canal & Backwater precincts.

Mangalavanam Natural Heritage. Known for its small bird sanctuary, Mangalavanam mangroves is situated in the Ernakulam District of Kerala State. This small mangrove area comprising of a shallow tidal lake in the center with its edges covered with thick manger vegetation and the lake here are connected to backwaters by a canal. Mangalavanam gained importance because of the mangrove vegetation, and also due to the congregation of commonly breeding birds. Apart from these, it is considered a 'green lung' of Ernakulam City, which is polluted by many industries and motor vehicles.

Issues Related to Heritage. Major issues related to this Natural Heritage are associated with the issues related to canals and backwaters. The quantity of water flowing into Mangalavanam is extremely harmful for the species habitat in this zone. Lack of Urban Development guidelines in the area surrounding this heritage zone is a serious threat to the future of this small forest in Kochi.

8.1.2 Kochi Estuary Natural Heritage Zone

Kochi Estuary is an important Natural Ecological Feature in the entire Vembanad Lake Region. The Vembanad Lake Region, which extends about 70 Kms to the South of the Kochi Sea mouth and 35 Kms to the North, flushes out 7 major rivers through Kochi Estuary. A major transactional point for most of the marine species and habitat for many of them, Kochi Estuary becomes a major zone of great environmental significance. This zone also becomes Kochi City's most important place with the location of Port and proposed Container Transshipment, Navy etc.

Issues Related to Heritage. The major issues related to this zone are the absence of planning for the Natural Heritage and marine habitat of this estuary. The water edge development guidelines lack environmental sensitivity. Methods to effective reduction of pollution during the port activity are also not ensured. Environmental guidelines for accretion and landfills are also absent.

8.1.3 Thripunithura Heritage Zone

This living fossil of Royal glory has an important place in the history of Kerala. It was the capital of the Kingdom of Kochi from 1755 onwards.

The main area covers the following major heritage features like the Fort area, Hill Palace, Temples, Palaces, Malikas, Churches, Christian settlement, Tamil Brahmin settlement and Konkini settlement.

The temple forms the focal point of the city. The growth of the city started from around the temple. The main spine, the heart of the Fort, passes through the temple in the east-west direction starting from the east arch and ending at the west arch. The main spine runs from the west Irumpanam iron bridge to the east Statue junction through the temple. The east is guarded by arch. The spine forms the main element of the city. The fort is surrounded by water on 3 sides. The west arch has an iron bridge in front over the river. The east-west axis road is the Kings way. The city has come up in such a way that the commercial units are all around the temple.

8.1.4 Sub-Zones

Edappally – Temple and Palace

Thrikkakkara – Temple

Kumbalanghi, Kumbalam, Maradu, Chellanam – Historic Precincts

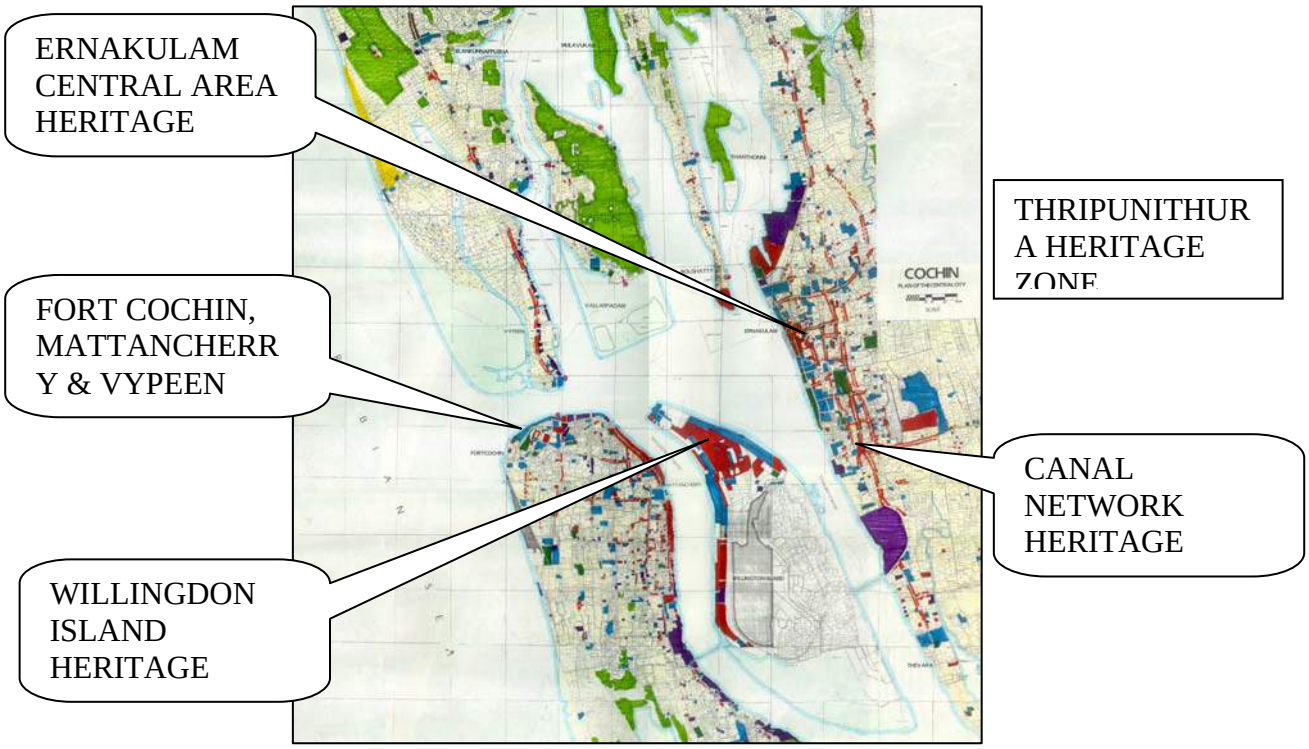
8.1.5 Plan Proposals

Declaration of Heritage Zones in Kochi. The CDP hereby proposes the following zones in Kochi as protected Heritage Zones; the boundaries of which will be delineated and detailed listing, documentation and preparation of urban development guidelines, to integrate Conservation and Development.

Table 8.1: Heritage Zones in Kochi

Kochi Heritage Zone 1 (CHN1)	Fort Kochi, Mattancherry, Fort Vypeen integrated Heritage Zone
Kochi Heritage Zone 2 (CHN2)	Willingdon Island Heritage Zone
Kochi Heritage Zone 3 (CHN3)	Ernakulam Central Area Heritage Zone
Kochi Heritage Zone 4 (CHN4)	Canal Network Heritage Zone
Kochi Heritage Zone 5 (CHN5)	Kochi Estuary Natural Heritage Zone
Kochi Heritage Zone 6 (CHN6)	Mangalavanam Natural Heritage Zone
Thripunithura Heritage Zone	Fort area, Hill Palace, Temples, Palaces, Malikas, Churches and settlements
Sub-zones	Edappally, Thrikkakkara, Kumbalanghi, Kumbalam, Maradu, Chellanam

Figure 8.3: Different Heritage Zones



8.1.6 Listing and Documentation

The detailed list of buildings structures and precincts of historic / architectural / aesthetic cultural/ environmental significance shall be prepared. On site listing and documentation of outstanding heritage in the city and inviting or organizing public hearing for suggestions, additions, observations and objections etc. shall become part of the listing & documentation work. A value based identification process is proposed for Heritage Listing.

It is important to have categorization and grading to the list being prepared. The following categories shall be followed and they may be revised time to time as per the new requirements.

- Heritage Areas and Settlements;
- Heritage Structures and Complexes;
- Cultural and Heritage Institutions;
- Arts and Crafts;
- Linguistic / Cultural / Livelihood /Ethnic /Religious Heritage Institutions and Communities;
- Precincts or features of outstanding environmental significance or natural beauty; and
- Natural Ecological Precincts or Features.

Invitation for enlistment for consideration of incentive for conservation for both heritage and cultural structures / spaces / institutions shall be part of the scope of documentation and listing works. The listing procedures shall aim at prioritizing action areas.

8.1.7 Urban Development Guidelines and Controls for Heritage Zones and Precincts

The following shall become the thrust areas and objectives for preparation of guidelines and controls for the Heritage Zone.

- Restriction on development, redevelopment, repairs etc. in the listed areas to protect natural / cultural heritage;
- Special regulations on high value areas of environmental significance and also for its immediate surrounding region;
- Guidelines to ensure protection, preservation, maintenance and conservation of heritage buildings and precincts;
- Guidelines to ensure equity & development rights;
- Guidelines and controls to ensure architectural harmony and maintaining the skyline;
- Regulations on infrastructure to ensure effective traffic / water / waste / energy management;
- Regulations to avoid environmentally hazardous development in natural areas and sensitive zones;
- Alter / modify/ relax other development rights for the protection of heritage;
- To grant transferable development rights for the protection of heritage;
- Incentives for the use reuse of heritage structures and funding for their maintenance in case of public buildings;
- Incentives for promotion of art, craft, culture, language etc.;
- Regulations on public space design and treatment;
- Regulations and Controls for Canal and Backwater Edge Development;
- Regulations and Controls for regulating pollution levels due to port activity;
- Regulations to ensure protection of natural elements such as trees, birds life, marine species in heritage zones;
- Regulations for effective traffic management in intensely used old parts of the heritage zone; and
- Regulation and controls on urban art such as signage, advertisement billboards, street furniture, urban artifacts etc.

8.1.8 Policy Guidelines for Heritage Zones

The City Development Plan proposes the following 5 principles as the cornerstones of Kochi Heritage Zone Notification and Enforcement of Guidelines and Controls.

- Integrating Conservation and Development to accommodate Changes demanded by the growing urban development activities in the city;
- Protection of Natural Heritage of outstanding environmental significance and natural beauty;
- Protection of coastal areas and tidal zones and disaster mitigation planning towards possible natural hazards;
- Ensuring safety, equity and adequate infrastructure in planning; and
- Tap Reuse, Renewal and Revitalization possibilities of heritage zones facing urban degeneration.

Conclusion. The great flood in Periyar in 1341 A.D. pushed open the sea mouth creating the natural harbour in Kochi. This induced development of trade in Mattancherry, Fort Kochi, where Chinese, Arabs, Dutch, Portuguese & English carried out business. Jews, Konkinis and many other ethnic groups settled here. A rich pluralistic culture unique to this heritage zone is visible here. Willington Island, Ernakulam Central Area, Canals and backwater of the area, Mangalavanam all are part of the rich heritage. Degeneration of old heritage areas, improper modifications to them, lack of guidelines for conservation, water edges under private ownerships, ill managed canal system etc are the main problems faced. Preparation of a Heritage Master Plan, awareness creation programmes, formulating guidelines for renewal, management programmes for preserving cultural heritage, legal provisions and projecting heritage for economic benefit form the components of strategy.

Mission projects, mid term projects and long term projects are identified and estimated at a total cost of **Rs.76.10 crores**.

8.2 Tourism

8.2.1 Introduction

Tourism is one of the fastest growing sectors in the world economy. In recent past Tourism has emerged as a major industry in almost all countries, with a sustained growth rate exceeding 5 percent per annum over the last twenty years. Tourism industry offers an opportunity for earning foreign exchange at a low social cost. It stimulates the rate of growth of the overall economy because of its immense growth potential. In addition, under certain situations it also functions as an important industry, promoting diversification of the industrial structure as well as augmenting regional development of backward areas. In many under developed countries, it is an important sector that provides employment, propagates cultural and ethnic values and ensures sustainable economic development. Domestic tourism strengthens national integration while international tourism promotes the international relationship and social interactions.

Figure 8.4: Chinese Fishing Net (Kochi)

Kerala is today the most sought after and most favoured tourism destinations in India. It is sought after for its breath taking natural splendours, the luxurious greenery, bewitching backwaters and innovative tourism products. National Geographic Traveller' calls it 'one of the ten paradises of the world'. 'The New York Times' calls it 'where the smart traveler goes'. And 'the Times of India' calls it 'The Winning State'. This is the personality that Kerala has in front

of the world community. God's own country, is just a slogan of the Department of Tourism or the Government of Kerala, but Kerala is truly the 'God's own country'.

Foreign tourist arrivals to Kerala are showing an increasing trend for the last few years. In 2004, it recorded 17.28% growth over the year 2003. During 2004 the foreign exchange earning from tourism in the state was Rs.1266.77 Crore, which shows an increase of 28.82% compared to 2003. The total revenue generated from tourism to the State in the year 2004 is worked out as Rs.6829 Crore. According to WTTC report, "Travel and tourism" in Kerala is expected to grow at the rate of 11.4% per annum in real terms between 2004 and 2003.

In Kerala, Kochi has a distinct place for its geographical diversity, sparkling backwaters, magnificent beaches and delightful fairs and festivals. Kochi City, the head quarters of Ernakulam district, is the hub of tourist activities in the district and it has a lot of potential to be further developed as a major tourist destination. The backwaters of Kochi are now one of the most popular tourist attractions in the world. Being the commercial and industrial capital of this southernmost state of India, Kochi is home for a variety of modern and traditional activities. Kochi is popularly known as 'Queen of the Arabian Sea' by virtue of its location and the existence of a major harbour. Being a lovely natural harbor, Kochi enjoys a special place in the history of Kerala. It is ideally located for trade and commerce. The foreign tourists arriving in Kerala prefer to spend more time in Kochi, followed by Thiruvananthapuram and Kovalam. Kochi is preferred by tourists mainly from West and East European countries.

Figure 8.5: Tourist Arrival in Kochi (Trends)

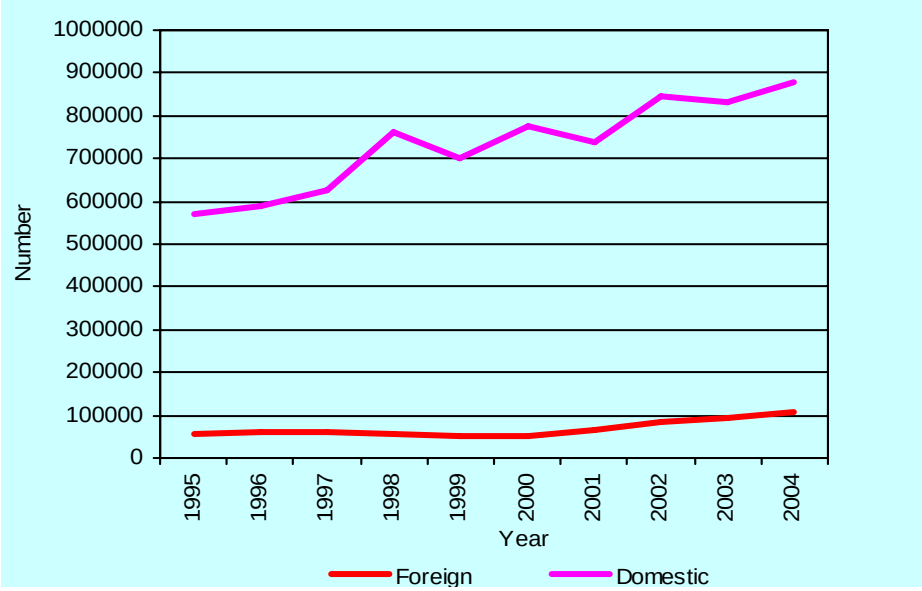
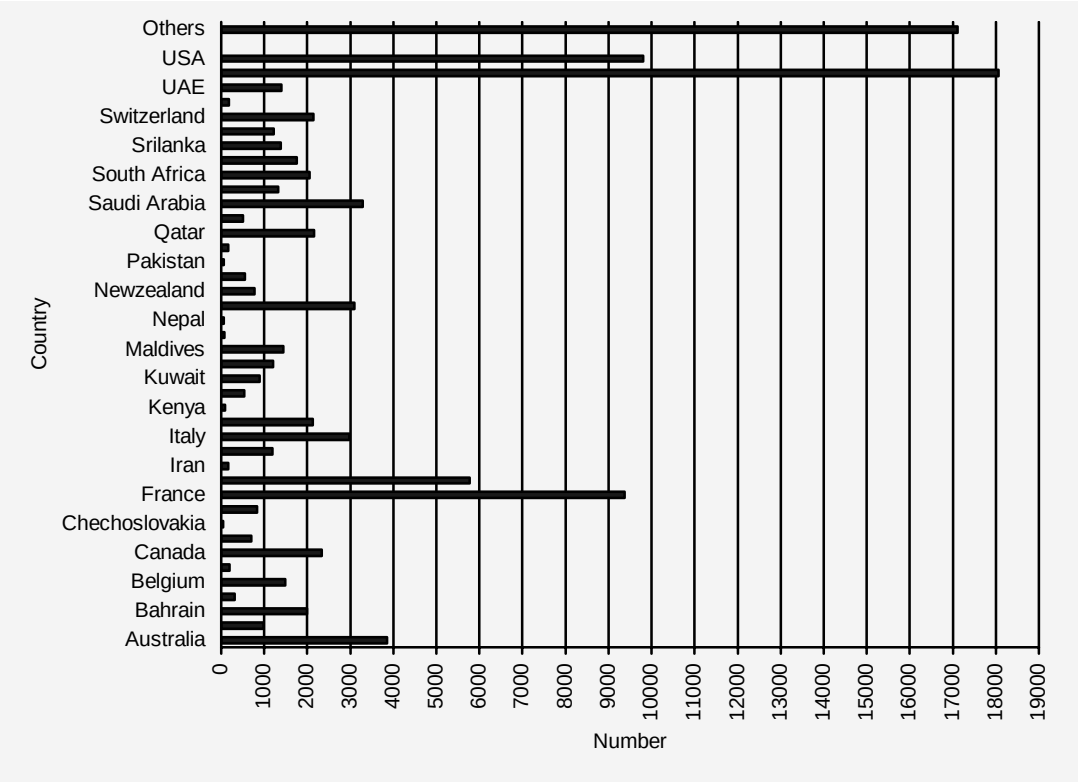


Figure 8.6: Nationality Wise Arrival of Foreign Tourists in Kochi - 2005



The City Development Plan is prepared with a vision to make the Kochi Urban Region as Asia's best meeting destination, India's first world class sea-side destination, South India's favorite art and Culture City, South India's favorite Creative City and India's favorite Heritage City.

To achieve this vision, the region needs to succeed in five key areas that are Quality, Safety, Cultural Investment, Transport and Marketing. The strategic framework of Tourism in Kochi region is based on four principles to ensure Tourism Development that are Tourism Industries should be profitable, visitors should have a positive experience, local people should benefit from tourism and regions environment should be protected.

8.2.2 Tourism: Problems and Potentials of Kochi Region

Problems:

General. Even though the number of tourists is showing an increasing trend the percentage share of foreign tourist arrivals is decreasing. The period of stay of tourist in Kochi is decreasing as the other locations in the neighboring districts are getting popularized. Lack of information and publicity about that tourist centres other than Fort Kochi ant Mattancherry.

Transportation. Transportation linkages connecting various tourism spots are weak. Transportation facilities from terminals to tourist centres are insufficient. Absence of signages, facilitation centres and complaint points at terminals tourist centres and travel circuit. Inadequate off-street parking spaces at tourists centres. Disuse of inland waterways.

Inherent attractions. Underutilization of the extensive networks of rivers lakes and canals. Destruction of heritage elements. Lack of performing arts centres recreational activities such as golf course etc.

Tourism facilities. Absence of moderate hotels with good services near tourist centres. Absence of eating places serving hygienic local food. Lack of wayside amenity centres and comfort stations along travel circuits. Absence of enough conducted tours connecting various tourist sites. Lack of qualified guides. Lacks of boats and coaches.

Image. The image of backwater city is not properly maintained. Uncontrolled water front developed without considering the landscape and environment. Lack of marketing facilities for the products from souvenir industries and traditional cottage industries. Health care sector – especially Ayurveda – is not properly exploited. Non availability of good quality potable water at tourist centers. Poor drainage and sanitation system. Inefficient solid waste management system. Growing trend of slums.

Potentials. Presence of backwater. Presence of historical monuments. Availability of road/rail/water transportation facilities. Presence of international airport. High literate inhabitants. Personal security and safety.

8.2.3 Findings and Suggestions

Transportation. Development of travel circuits for better accessibility and linkages. Improvement of road, rail and water transport services. Signages in travel circuits. Facilitation centres/complaint points at terminal and other selected points along travel circuits. Identification of boat jetty locations to promote back water tourism.

Inherent Attractions. Preservation and conservation of heritage monuments. Architectural control in heritage areas to guide built form. Performing arts centres at major tourist centres. Heritage fair to highlight ancient culture of Kerala. Museums and emporia of regional crafts. Using of local culture, music, architecture, dance, crafts and food through careful planning. Proper management and regulations of the multifarious coastal development and activities. Regional level recreational elements such as botanical gardens, golf course, club houses with indoor recreational facilities etc to prolong the stay of tourist. Theme parks activity centres. Waterway based recreational activities protection of wild life sanctuaries.

Tourism facilities. Accommodation facilities with good services near tourist spots. Wayside facilities like kiosks, rest spots, parking places, petrol pumps, tourist huts, souvenir shops, comfort stations the along travel circuits at sustainable locations. Facilities for shopping, eating, walking, site seeing etc near tourist spots. Foreign exchange facilities, Travel agencies, tour operators, tourist transport operators. Improved flow of information about tourist attractions – pamphlets, literature guides, application of modern IT, high quality documentaries, festival calendar, video tapes, maps etc. Trained guides and interpreters. Public relation cells at tourist centres. Attractive package tours.

Image. The unique identity of the coastal line should be protected through strict controls for physical development in water front areas. Renovation and reactivation of canals and water ways. Protection of heritage areas and environs. Protection of traditional structures and conversion for tourist accommodation. Encouragement of souvenir industries. Display of traditional life, artifacts, musical instruments, textiles, dresses, ornaments etc. Ayurvedic health care centres with good quality and services at suitable locations. Identity and sanctity of tourist sports. Improved water supply and drainage system. Control of litter and treatment of sewage. Preservation of open spaces. Awareness campaign for host population to have better care and courteous attention to tourist - 'adhithi devo bhava' in real sense. Control over the growth of slums and squatter settlements.

Projects. In order to convert Kochi Urban Region into a major tourism destination for people from all aver the world and also from within the country keeping in mind the above mentioned strengths and weaknesses of the place in the City Development Plan the following major projects and smaller projects are recommended.

Conclusion. Kerala is one of the most favoured tourism destinations in India. In Kerala, Kochi has a distinct place for its geographical diversity, sparkling backwaters, magnificent beaches and delightful fairs and festivals. Lack of publicity leading to reduction in number of tourists, lack of linkages among tourism spots, under utilization of canals, lack of performing art centers and recreational activities and absence of tourism facilities are the problems identified by this sector. The strategy for action include creation of signages and tourists information facilities in all transport terminals, creation of facilities for tourists - domestic and foreign, proper marketing of the strengths and provision of different options of travel circuit planning.

The total cost of all the projects in this sector is **estimated** to be to **Rs.284.75crores**.

Conscious efforts to conserve this valuable heritage and to encourage tourism through these projects are sure to give a new face to the city. Also, the opportunity to enjoy and learn this beautiful heritage city will be extended to tourist's world over.

9. ENVIRONMENT

9.1 Vision and Objectives

Vision. *To make this gifted land an abode friendly to nature and salubrious to inhabitants through activities with community participation.*

Objective. *Educate and empower urban communities on the guardianship of environmental resource and make them an integral part of decision-making process in urban development.*

9.2 Background and History of Urbanization

9.2.1 Geology and Physiography

The Kochi City and the surrounding urbanizing area comprising of 330 Sq. km with varying shades of urbanization which fall within the geographical co-ordinates 90 49’ to 100 14’N and 760 10’ E to 760 31’E, are relevant in the present context.

The climate of the region, like the rest of costal Kerala is warm with gentle prevailing winds and daily temperatures varying in the range 23 - 34^{o}C. Humidity ranges from 65% and 95% with diurnal and seasonal variations and the average annual rainfall is 2900 mm. There are two distinct periods of higher than average rainfall from June to August and October to November.

The Kochi Corporation, two municipalities and thirteen panchayaths fall in the present CDP. It is located on the southwestern coastal strip of India. Kochi is inseparably linked with the wetlands of Vembanad estuary.

The Vembanad Lake and the surrounding geological formation are the fruit of all the major rivers of central Kerala, namely Chalakkudy puzha, Periyar, Muvattupuzha River, Meenachilar, Manimalayar, Pampa River and Achancoil River and lesser rivers like Keecheri, Karuvannur and Puzhackal. The silt and sand washed down by these rivers from the Eastern highlands originally sculptured the landscape of the coastal belt on either side of Kochi. Also the hinterland of Kochi comprising of Ernakulam, Idukki, Kottayam and Pathanamthitta districts is watered and in a sense nurtured by these rivers. The oceanic wave action and the unimpeded discharge of sediment load before the debut of civilization resulted in the formation of a long sand bar from Arattupuzha to Kodungalloor along with a large network of deltaic islets and lowlands in between braided streams. There are reasons enough to conclude that the seashore began along the western fringe of the midlands well before the emergence of the Vembanad Lake. In Kuttanad region, thick layers of calcareous shells of extinct marine organisms are seen betraying a marine past of this region. Today the low lands and the catchments of the seven rivers aforesaid are economically the most important region of Kerala. And this part of the state, over the past one hundred years or so, has undergone sweeping anthropogenic transformations.

Kochi, unlike other urban centers of India, is a region interspersed with tidal water bodies and all developmental initiatives have to be streamlined giving due respect to the geological and ecological fingerprints of the region.

Vembanad wetland system is the largest of its kind on the west coast. Nearly half of the population of Kerala depends directly or indirectly on this wetland or its drainage basins. The wetland system with its drainage basins cover an area of about 16,200 km2, which is about 40% of the area of Kerala. It is expected that about 30% of the population of Kerala will gravitate to the periphery of Kochi City in the years to come given the magnitude and dimension of projects on the anvil in the region. Already there are 411 slums in the urban region where people are tied to squalor and penury.

A major portion of Periyar water is diverted to Tamilnadu from Mullaperiyar Dam. Another major human intervention on the Periyar is the Idukki dam, which diverts water to the Muvattupuzha River after power generation. It appears that the greatest river of Kerala has been slighted and degraded by inter-basin and inter-state water transfers. The transfer of the Periyar river water to Muvattupuzha basin has unleashed a phalanx of environmental and industrial problems.

The most industrialized zone of Periyar lies between Angamaly and Kochi, with over 50 large and medium scale industries. The Edayar branch of Periyar, which caters to the needs of these industries, is estimated to have a lean season flow of 80-100 m3/sec while the monsoon flow is around 150-250 m3/sec (KSSP Report, 2002). The lower stretch of the river becomes slack at the onset of the dry season and salinity intrusion occurs in tune with the tidal pendulum. The industries of Edayar-Eloor area are estimated to consume about 189 million litre water per day and discharge 75 percent of this as wastewater along with a variety of pollutants (KSSP, 2002). The incursion of salinity upstream during the lean months has crippled many economic activities on several occasions. Drinking water shortages became a problem in Greater Kochi region.

Figure 9.1: The Project Area

Barrages were laid across the river to contain migration of salinity and the trapped water bodies upstream became heavily polluted with acidic industrial effluents and fish kills became regular. The inter-governmental panel for climate change (IPCC) has predicted in 1990 a 31cm rise in sea level (Lower scenario) induced by green house warming by the year 2100. In that case the sea would move several meters inland, permanently flooding a large part of the highly urbanized coastal fringe of the city. The city, in any case will have to inch eastwards in the decades to follow.

9.2.3 Kochi Watershed

Kochi, for all practical purposes, is the gift of the water bodies it is braided with. Protection conservation and sustainable environmental practices are the essential part of a desirable integrated urban management approach.

Kochi is a coastal settlement interspersed with backwater system and fringed on the eastern side by laterite capped low hills from which a number of streams originate and drain into the backwater system. The western part of the study area is a flat coastal zone, which forms a part of the coastal plains of Kerala, and the eastern low hills are part of the midland region.

The western flat land comprises of 52 drainage units covering an area of 115 km2 and islands in the backwater system with a total area of 56.4 km2. The backwater extending to an area of 72.6 km2 also comes within this zone. The eastern low hills, covering an area of 291 km2, comprises of 21 stream basins or micro catchments, each with independent watershed area (Benjamin, 1998). These 21 major streams originating from the eastern low hills run mostly west in between the low hills and drain into the tidal canals with a linkage to the back water system. The drainage basins of these streams have laterite or lateritic soil with occasional rock outcrops. The tidal water canals of Chithrappuzha, Karingachirapuzha and Edappallythodu receive the waters from the east.

9.2.4 Kochi And The Back Water Lagoon System

The estuary on the western parts of the city, stretching in the North South direction, has suffered large-scale siltation in the heydays of the Periyar. This has resulted in the formation of a number of mud bank islets, which are heavily populated. Overpopulation and industrial activities further north have degraded the quality of this sensitive marginal marine environment.

9.3 Growth of Kochi as an Important Urban Center and its Impact on the Tidal Canals - a Historical Perspective

Kochi originally developed as a converging point of water transport. Kochi had water transport connections with Alappuzha, Quilon, Kottayam, Changanassery, Ambalappuzha, Neelamperoor, Pulikeezhu, Mannar, Athirampuzha, Paippad and Neerettupuaram in the south and Arattukara Canal and the Edathuruthy canal constructed in 19th century made water transport possible between Kochi and Trissur. Mattancherry and Fort Kochi and the rest of the region were by far rural. In 1905, Ernakulam got connected to the rest of the country by railroads. Thereafter, the process of urbanization picked up momentum. The debut of Kochi as a major port on the west coast, triggered urbanization and industrialization in the modern lines, thus radically transforming the physiographic personality of this region. Road and rail traffic facilities pushed canal transport systems to a humble backseat and urbanization inched its way further east. Demography changed and traditional farming and fishing petered to near extinction. The land use pattern underwent a dramatic change. Armed with an all weather harbor, cheep electricity from Pallivasal, railroad connection to Indian mainland across the ghats and the availability of enough fresh water Kochi-Aluva belt turned all too ready to become a significant industrial nerve center. Pressure on land increased and in the same measure utility of the canals plummeted. Canals and wetlands were a casualty when greed for dry lands increased.

9.3.1 Development of urban Kochi

When road and rail traffic facilities improved, the center of gravity of the city shifted to the eastern mainland. Fortunately, the city is still gravitating further east with a nose for more fresh air. The tidal canals, which once served the purpose of modern roads, cannot be left to decline and decay as water is growing more precious and dear in Kochi and elsewhere.

9.3.2 Impact of Urbanization on Environment

The domestic sewage from Kochi and its satellite towns ends up in the tidal canals and the estuary. Kochi City alone generates 255 million L/day of urban sewage that directly enters the estuary. In Kochi, the sewage treatment plant covers only 1 % of the population (KSPCB, 1982). It is estimated that nearly 260 million liters of trade effluents reach the Periyar estuary from the industrial belt daily. This discharge is fraught with heavy metals, nutrients and insecticides.

9.3.3 Population Growth of Kochi and Urbanization

In Kerala the rural-urban divide is not that sharp as far as basic amenities are concerned and hence there is not an appreciable flux of humanity into the city. In 1875, the population of Ernakulam town was 20,000. From 1875 to 1901, the population growth was very less. From the turn of 20th century an explosive growth of population was observed. This tendency persisted up to 1961 when the population reached 2,50,000 (Benjamin, 1998). Census of 2001 shows that the total population of Kochi Corporation is 5, 96,473, and the population of Greater Kochi Region, is around two million. A remarkable shoot up in population is expected in the years to come as the city is spreading itself thin to the east, transgressing the city limits. A floating population of around 4,00,000 commutes to the city from the suburbs (CUSAT and Oak Ridge National Laboratory Study, 2002).

The city consists of islands and parts of the mainland linked by water transport and bridges. Kochi is dissected by numerous canals and backwaters. Managing the quality and quantity of the waters in these tidal canals is of utmost importance in so far as the quality of life is concerned. Insufficient drainage facilities and pressures of urbanization nag the city. Diffuse urban liquid and solid wastes naturally find their way to the nearest watercourses. The main threats from municipal sewage waste are anoxia and eutrophication. At present, the sanitary waste disposal system is limited to a small portion, with only one treatment plant at Elamkulam. The outlets of the septic tank and wash systems are directly connected to the public drains and, as a result, a wide spectrum of degradable and biodegradable pollutants is entering the drains and ultimately the water bodies. For most residents, the canals are the easiest option to get rid of their refuse. Urban run off is the single great source of water pollution and is an ecological problem threatening the long-term health of estuarine ecosystems and local economy.

Table 9.1: Kochi City – Common Aspects

Name	Kochi City (CDP area)
Area	330.2 Sq.kms.
Population	11.38 Lakhs
Literacy Rate	92 percent
Population density	3448 / Sq.km.

When many of the arterial roads of the city emerged into prominence, many age-old canals and wetlands were a casualty. M.G Road, the flashy showpiece of the city, was once a fairly long wetland, so was modern Banerji road as well. The costly strip of land west of Shanmugham road was the shallow edge of the estuary. The evolution of Kochi alluvial bars followed a regular pattern. Immediately west of the rolling hills, alternate rows of swales and sand bars with a north-south orientation existed before the onset of urbanization. Even today, a shadow of these regions' former self is discernible. Such a pattern had avoided flooding problems effectively as natural run off had a place to go. The situation was further confounded when railroads were laid giving rise to artificial ridgelines dividing natural watersheds. Numerous culverts en route choked or bottlenecked all the existing canals, partly impeding inland navigation and reducing flood-discharging capacity. The land utilization pattern of Kochi City is indicated below:

Table 9.2: Existing Land Utilization in Kochi Corporation Area

Gross Land Area	9488 Hect.
Water sheets	1,878 Hect. (19.8 %)
Agricultural land	788 Hect (8.45 %)
Developed land	6,822 Hect. (71.75 %)

Considering the vast area under water bodies, the development planning of Kochi has to be done giving due weightage to its extensive water bodies.

9.4 Status of Environmental Quality

(Status related to municipalities and panchayaths are given separately.)

The environmental quality of an area depends up on the ambient air quality and water quality which influence the quality of life of the inhabitants. The Central Pollution Control Board had undertaken a detailed study of the air quality in various cities in Kerala. (Furnished as **Annexure 6**). The study has shown that Kochi exhibits a comparatively low level of ambient air quality with respect to the presence of SO2, No 2, & SPM.

The noise levels of the samples collected from different location in the CDP area and Physico-Chemical characteristics of soil are given in **Annexure 6**.

9.4.1 Water Quality

Surface water. Periyar and Muvattupuzha rivers support the urban drinking and industrial water supply. Both the rivers have undergone substantial hydraulic modifications with impact on natural purification. The discharge of industrial and urban effluents makes the waters unacceptable in most of the stretches down stream the points of discharge. Absence of centralized sewage treatment facility forces builders to resort to onsite sewage disposal. There are no stipulated standards for onsite sewage disposal. Builders install septic tanks, which are unscientifically designed and maintained. Water samples collected from most of the urban wells and majority of suburban wells are unfit for drinking purpose due to biological contamination and organic loading.

Of late the land use alternation has become intense at the waterfront of the city and suburbs by reclaiming the estuary and wetlands, and in the eastern hillocks, slopes and wetlands. These areas fall under the panchayaths where building rules are virtually nonexistent. These hilly suburbs and slopes yielded high quality well water, which was extensively tapped for drinking purposes. It is estimated that 99% of the houses had own wells, which served as a perennial source of drinking water. Extensive reclamation of the wetlands (paddy fields) and leveling of the hillocks led to depletion of well water. Discharge of poorly treated sewage from septic tanks has contaminated the well water beyond repair.

The periurban region has been the venue of institutional development. These include industry parks, IT parks, health care facilities and institutions of higher education. These institutions where a considerable number of workers flock also lack black and grey water treatment facilities. This has led to increasing contamination of minor water sources like Kadamrayar and Chithrapuzha.

The topography of the city is in such a way that there are alternate sand bars with a swale in the

middle. If the greed for land eats into the natural drains, the city will have to drown in its own liquid wastes since natural gradient is not conducive to a swift and efficient discharge of the runoff.

The urban modification of tidal canals can potentially have adverse environmental impact, which in particular circumstances may include:

- Loss of wetland habitats and other sensitive aquatic systems, including the reduction in the sustainable values of estuaries as highly productive nursery areas necessary for fisheries;
- Inadequate hydraulic functioning, which may reduce water quality through poor flushing, cause sedimentation or affect structural integrity;
- Impact caused by storm water and urban runoff, including erosion and sedimentation away from the site;
- Impacts associated with imported fill;
- Problems caused by disturbing acid sulfate soils;
- Pollution by wastes from vessels;
- Ongoing impacts from maintenance including maintenance dredging; and
- Loss of wetland plants alters the chemistry of water. Wetland plants have the ability to release oxygen through the roots and could possibly increase the solubility of metals and arsenic.

Most of the estuarine banks have already been urbanized and as a result the shores and the network of tidal canals have forfeited their original morphology. The pre-urban tidal canals were swales and braided rivulets in which interaction with the bottom sediment was unimpeded. The construction of bathtub canals substantially decreased the inter-tidal zone in the canals and sewage waste load denatured the quality of water. This is the general pattern of all the urban tidal canals of the world. There rare significant water management issues and areas of concern related to flow control measures in drainage basins in the inter tidal zone.

The following observations indicate the alarming state of environmental deterioration:

- Concentration of fecal Coliform bacteria commonly exceeded recommended standards for contact recreation
- Concentrations of total phosphorus is generally high in urban streams leading to nuisance plant growth
- Toxic compounds found in stream bed were also found in fish tissue
- Deteriorated water quality and sediment as well as habitat disturbances contribute to degraded biological communities in urban streams.

Want of sufficient DO is the most crippling constraint in all of the tidal canals. At present, there is not any strategy whatsoever to check the discharge of oxygen demanding wastes into the water bodies of consequence. Industrial effluents play a very minor role in this connection. Urban liquid and solid wastes are primarily responsible for oxygen depletion in the canals. Again many of the canals have lost their dynamism that would otherwise have facilitated the re-aeration of the stagnant stretches. All the canals are at sea level and natural flow is sluggish or non- existent in

non-rainy days. Tidal oscillation alone infuses some life into the system. But intervention by bunds, loss of depth by siltation and bottlenecks created in the channel by civil structures and dumping of solid waste isolate the canals into stagnant wet patches.

Table below shows the number of slums, the slum population and the total BPL population in Kochi.

Table 9.3: Sources of Water Contamination

Location	No. of Slums	Slum population	Total BPL Population
Kochi	280	127,872	213,120
Urban out skirts	131	4,548	276,226
Total	**411**	**132,420**	**489,346**

The number and population are on the increase. Due to unhygienic conditions the slums are more prone to incidence of diseases. Most of the slums are located near water bodies. The people who live near the water bodies discharge waste and sullage in to the water bodies or open drains. A number of slums are located on the edge of the water bodies.

Analytical results of ground water samples collected from the different parts of the study area are given in **Annexure 6**. It shows that the ground water is highly contaminated by the presence of Coliforms through out the study area.

9.5 Solid Waste Management

The target region of this CDP with produces about 650 tons of municipal solid waste per day. The region does not have a scientific management system for solid waste. Some isolated small-scale efforts have been made. Otherwise the solid waste is dumped (illegally) on roadside or in vacant plots and estuarine fringes. This unscientific practice leads to air and water contamination. Segregation can lead to reduction in treatable waste; This aspect has been dealt with in detail in another chapter of this report.

9.5.1 Health

With high humidity, air and water contamination air and water borne diseases are more common. Occurrence of contagious diseases in Kochi from 1995 to2001 is presented in **Annexure 6**.

Disease statistics available from health care institutions are only partial and cannot establish the trend, which is needed to set health care goals.

- The industrial suburbs are reported to be the hotspots of environmental pollution, but the reports are not corroborated by reliable data;
- Kochi is listed as one of the cities unsafe to tourists with regard to water borne diseases;
- Typhoid, leptospirosis and cholera are reported at times; and
- High ambient humidity and poor maintenance of schools make children a sensitive group to diseases caused by poor indoor air quality.

Adequate supply of safe drinking water is the prime requirement for human survival. Quality of infrastructure attracts industries and tourists. With its picturesque countryside and very comfortable climate, Kochi is an emerging tourist destination. Poor quality of the environment can off set all the advantages generated by better infrastructure, if we fail to project the visible and aesthetic aspects of the region.

Kochi has the rare distinction of being the hub of industrial activities in the state. Due to the contributions of industries and transport Kochi has become hotspot for environmental pollution. The scarce supply of fresh water has been contaminated by urban and industrial discharges. The Common Hazardous Waste Disposal Facility coming up at Kochi will receive all the hazardous waste generated in the state. In short Kochi will be turning in to a dump yard of human as well as industrial wastes. Type and quantity of waste generated in the industries in the region is given in **Annexure 6**. The impact of all these will be felt on the natural resources of the region. It becomes the onus of the local authorities and the resident communities to take proactive measures to curtail and contain activities that are detrimental to the environment and will reduce the sustainability of the region.

9.6 Disaster risks in Kochi

The geographical location and the developments have made Kochi one of the most disaster prone areas in the country. The risks involved are,

- Geological;
- Water and Climate related;
- Chemical and Industry related;
- Biological; and
- Accident related.

9.6.1 Vulnerability

Kochi is considered to be in the seismic hazard zone (zone – 3) and prone to earthquakes. Amplification of seismic energy due to landfills and liquefaction of sub surface rocks are some of the major areas of concern. Kochi is located on a thick sedimentary pile consisting of alternating layers of sand and clay. Any seismic event can disturb these sediments. Moderate earthquakes are possibilities both on land and off shore sources. Earthquakes experienced at distant sources in Kerala can also damage the sedimentary piles leading to collapse of structures.

The terrain of Kochi with in the coastal wetland zone is highly fragile. In discriminate reclamation is permanently damaging the eco system. Cyclones and local severe storms have occurred in Kochi at 5 to 6 times during the last 100 years. **Coastal erosion** and storm surges are constant phenomena in Kochi. **Flooding** is another calamity occurring every year during Monsoon disrupting the activities of the region. The recent **Tsunami** affected the coastal areas of Kochi resulting in losses life and belongings. The location of the major **chemical industries and petroleum installations pose serious threats of disaster** related to this. The biological threats include mosquito **vector diseases**.

Proper hazard management programme relating to all the vulnerable conditions is essential in city development. Detailed study on this is going on as part of Master Plan for Kochi City which is under preparation.

9.7 Summary of Environmental Activities by Various Agencies

Parisththibhavan (Center for Environment Established in 2002). Activities were limited due to lack of funding. Meanwhile different agencies interested in infrastructure facilities conducted independent studies on the status of environment mainly as part of mandatory Environmental Impact Assessment. The studies conducted by various agencies have brought out the following facts. Kochi Corporation entrusted Kerala Sastra Sahithya Parishad to compile a report on the status of environment. The report was submitted in 2002. Kerala Government entrusted Greater Kochi Development Authority to study the water sources of Greater Kochi area. GCDA in collaboration with Kochi University of Science and Technology submitted a detailed report supported by year round data. The three-part report deals with the water shed and water quality in various canals.

9.7.1 Outcome of the Studies

- Unplanned growth of the city and suburbs has led to bad land and waste management practices. The local water resources are contaminated by human activities, especially unscientific layout of buildings, inadequate sewage treatment and nutrient discharge in to the water bodies.
- Community participation is minimal in environmental conservation
- Natural wetlands, which were supporting the local ecosystem, are retained only marginally.
- Local authorities (ULB) have no statutory control over many of the environmentally sensitive activities undertaken by private and governmental agencies. ULB has no a mechanism to assess the activities and make their learned decisions.

9.8 Gap Areas

The foregoing discussion brings out the weakness of the ULB in countering environmental degradation. These may be summarized as follows:

- Lack of environmental awareness among the public and decision makers
- Lack of community participation in the conservation of environmental resources
- Lack of technical capability to formulate and implement best management practices to minimize environmental degradation
- Lack of reliable information on land use, water quality, air quality and environmental diseases.
- Absence of a mechanism to monitor and predict trend in environmental quality

9.9 Objectives (related to Environment Sector) of the CDP

An Environmental Management Centre (EMC) will be established with the definite objectives:

- To promote environmental stewardship
- To induce community participation in decision-making.
- To establish an Environmental Management Centre that, among other things, will:

a. Impart environmental awareness in the community targeting children, adults, businessmen, elected representatives and administrators. Its activities will include observation and dissemination of scientific information on land use, water resources, human activities which have bearing on the quality of life and ecology;
b. Formulate guidelines for the operation of EMC;
c. Assess the baseline status of the environment, and predict trends;
d. Review environmental impact assessment reports referred to ULB and formulate submissions on the same;
e. Raise funds needed for its activities through projects; and
f. Ensure community participation in decision making by providing reliable information.

9.10 Methodology

The methodology ensures that the local community is a participant at all stages of developmental and conservational decision making. All the projects will lead to income generation in the weaker sections of the community, mainly at the non-technical level. This will benefit people below poverty level. The programs will generate a feeling of resource stewardship.

Schools. Local educational institutions right from the primary level and local NGO's are to be induced into the environmental education programmes. Green clubs will be instituted at local levels and in campuses. Students, teachers and the public will have an active role. Such clubs will be trained to observe and report the current environmental quality of the local resources and such grass root reports will eventually be brought to the notice of local administration.

Young generation is more susceptible to accepting challenges and changes. More resources will be spared to get educational institutions and students to actively participate in the programs

Institutions of higher education. There is one Science and Technology University and five engineering colleges in the jurisdiction of the ULB. There are two medical colleges and a number of nursing and paramedical institutions. These institutions of higher education will be invited to spare their expertise for the design of appropriate engineering projects, monitoring of health and environment, assessment of technologies, and to provide expert advise to the ULB.

NGOs. NGOs with specific objectives in the areas of concern for ULB will be invited to assist in awareness, and grass root technology development. This approach will ensure community participation in projects through the involvement of Residents Associations, and SHG.

9.11 Environmental Stewardship: Specific Tasks

As part of community participation tasks will be assigned to community groups and agencies. They will be looking after public trust properties as virtual guardians.

Land Use. There has been extensive encroachment and illegal occupation and conversion of land and water space. This was facilitated by the absence of a boundary demarcation system and lack of public guardianship. It is proposed to prepare a GIS based resource map with community participation.

Solid Waste. Individuals, households, trading centers, and institutions generate municipal solid waste. Only 15 % of the MSW produced is putreceable demanding immediate disposal. The practice of mixing bio degradable and non-biodegradable solid waste results in an unwieldy and fussy cocktail of solid waste. The people are to be trained to segregate the waste they generate for smooth and efficient disposal of MSW. Again the classic environmental panacea of reduction reuse and recycle strategy has to permeate the masses. All NGOs operating in the region can be inducted into this daunting mission bringing about a quantum shift in the waste generation and disposal philosophy of the city.

Kochi City generates 400 tonnes of solid waste every day. About 60% of the waste generated is collected by Kochi Corporation and dumped at selected dumpsites at Wellington Island, Cheranalloor and Brahmapuram and the rest is dumped on roadsides drains and canals. But the collection network miserably lacks the solid support of community.

Water and wastewater. Water supply is public concern, whereas the same public is unaware of the role of wastewater in contaminating water resources. Unscientific onsite sewage disposal by residential units and institutions are largely responsible for spoiling local groundwater and nearby tidal canals. Awareness drive and implementation of Best Management Practices will be done under the auspices of voluntary agencies.

Water resources. ULB recognizes that availability of fresh water is going to control sustainability of all activities. The local fresh water resources, conventional as well as non-conventional, are to be identified and protected. In the none-too-distant future water pumped in from the rivers will be out stripped by the burgeoning demand.

CDP proposes to give special attention to conventional community water resources viz., open cut wells and ponds. These will be restored and maintained as alternate sources. Emergency disinfection procedures will be part of the awareness program.

Large-scale reclamation of inland wetland and tidal creeks affect the availability and quality of well water. It is proposed to develop wetland parks in newly developing areas, especially on the eastern side. This will help sustain the yield of wells, open space and recreational facilities.

Parks and open spaces. Per capita green areas and open spaces are a direct indicator of the environmental quality of the city. They will add to the aesthetic appeal of the urban environment. Vacant spaces owned by the state and currently not put to rational use can be transmuted to verdant cooling slots in the city. It is strongly suggested that the roads going to come up in the urban areas ought to have professionally planned green shoulders. Even on the existing roads, wherever spaces constraints do not imperiously stand in the way, such green strips can be incorporated.

Comfort stations for moving/floating population. Most of the people are thickly used to relieving themselves in the open quite oblivious of the environmental fallouts thereof. People confined by a nagging civic sense find it hard follow the way of the masses. And the city is not endowed with adequate facilities to meet the call of nature. No civilized society can permit or tolerate such a

sate of affaires. And the existing facilities, as a general rule, are in a bad shape owing to design and management flaws, resulting in air and water pollution. ULB proposes to build scientific toilets at transit points and urban centers.

Improvement of crematoria. The crematoria in the Kochi Corporation area and in other areas requires more attention. The existing crematoria will be modified with electrical furnace and beautifully laid out gardens. These will be maintained with community participation.

Coastal line protection. The coastal line from Chellanam to Munambam is very sensitive to erosion. Conventional protection measures have proved to be ineffective in many stretches. Shoreline protection with geo-textiles and vegetation is proposed. This will be implemented with community participation. Coastal communities on community ownership basis will do maintenance.

Conservation of mangroves. The mangrove patches of Kochi estuarine fringes are in danger due to dredging, filling and waste dumping. These mangrove fringes support aquatic and amphibian species, which are of high economic value. Special attention is paid to conserve and protect the mangroves through community intervention.

Health. People cannot be better than their environment. A healthy environment supports a healthy people and vice versa. In the project area incidence of air and water borne diseases is an alarming indication of the state of the environment. Industrial hubs and congested urban areas like West Kochi call for particular attention on that score. Poor living conditions and social pressures of West Kochi are symptomatic of the vicious circle of poverty, population and pollution (P3) that this region is in the grip of. The tidal canals in this region do not any more carry out the natural functions expected of them because of the solid and liquid wastes ending up in these canals. If the tidal ministrations are allowed to sweep past the canals, they will remain clean and lively all through the year. The trend in the prevalence of environment related diseases could be identified only through scientific surveillances. Voluntary groups will be set up, trained and deployed to prepare disease statistics in industrial and residential areas. Yearly report of communicable diseases shows that the hidden cost in this sector is very high. International travel information providers list Kochi as a high-risk area with regard to water borne diseases. This sector deserves special attention

Some of the photographs showing problems of environment are presented in **Figure 9.2**.

Figure 9.2: Manually Collecting Drinking Water

Polluted Drinking Water Sources

Conclusion. Major hurdles in achieving the vision i.e., 'to make the area an abode friendly to nature and salubrious to the inhabitants' are undesirable waste management practices, both solid and liquid leading to contamination of air, water and land. Kochi is the gift of the water bodies and the protection, conservation and sustainable environmental practices, the concentration of fecal coliform bacteria, excess level of phosphorous and toxic compounds found in the water bodies necessitate urgent measures to be taken to protect our water resources. Geographical location of Kochi and the developments in Kochi have made Kochi one of the most disaster prone areas. Lack of environmental awareness, lack of community participation, lack of reliable data base on land use , water quality and air quality are the major lacunae in assessing the environmental quality trends. The strategy therefore includes creation of awareness among the people beginning with schools, community participation, and developmental decision-making, environmental stewardship (assigning specific tasks for protection water bodies, special environmental features etc.) Conservation of mangroves, coastal protection, setting up of crematoria, comfort stations and establishing and maintaining an environmental management center. The total **estimated** cost comes to **Rs.291 crores**.

10. URBAN RENEWAL AND SOCIAL AMENITIES

10.1 Social Amenities

Education. Kochi city is well developed in terms of education facilities with a range of pre-primary, primary, secondary and higher secondary schools, technical education institutions and professional colleges run by Govt., private and semi-Govt. agencies. The number of schools and colleges in the area are sufficient as per UDPFI guidelines. However certain institutions lack facilities such as playgrounds as per standards due to the limitation in land availability.

Health. The medical facilities include hospitals, dispensaries, P.H Centers, specialist hospitals, referral hospitals etc., Kochi has Ayurvedic, allopathic and Homeopathic hospitals spread over different parts.

The availability of medical facilities in the City & suburbs is found to be sufficient. More specialty hospitals are coming up in different parts outside the city under private sector. Health centers, Primary health centers and Maternal and child health centers are also available in panchayat areas. However there is need to augment the facilities available in the Govt. run hospitals. Cost component for this is included in Urban Poverty Alleviation.

Open Space and Recreational Facilities. This includes parks, open spaces, play grounds, stadia and maidans. The extent of open space with in the city is extremely low compared to any other urban area. But this deficiency is not directly felt because of the water bodies available in the area. Residential level parks and tot lots are available only in planned residential areas. There is need to develop such facility in different residential settlements. There is an international stadium and four other stadia in Cochin. There is need to provide proper roofing for the international stadium and to improve the amenities in the other stadia. Development of play fields with proper gallery is also necessary in Govt. high schools. A district level Stadium and Sports Hostel is required to be developed in the District Headquarters.

Community Halls. Large scale convention centers and halls are being developed in the private sector. But for the urban poor there is need to have public or local body owned community halls scattered in different parts of the CDP area.

Old Age Home. Old age homes, destitute homes and orphanages have to be developed as part of the local body service facility. Amenities like Bio-gas plant have to be set up in such establishments to reduce the recurring expenditure on the part of the local body/Govt. A separate fund has to be set up as part of local body for provision of medical facilities and specialized needs of such institutions. Special provision for giving vocational training to the orphans and regular counseling facility should be imparted cost component is included.

10.2 Urban Core Area Renewal

The urban core areas in the CBD are characterized by narrow roads with commercial buildings on either side almost abutting the road in Cochin City. There are two CBD’s, one in Ernakulam and

the other in Mattancherry. Mattancherry is a specialized urban core with heritage value which needs to be preserved. In Ernakulam the market area is situated in the heart of the city and the roads leading to the market are flanked by commercial buildings dealing with wholesale trade. Recently the agricultural component of the whole sale market has been shifted to an outer area at Maradu with the assistance of EEC. The whole sale building material market is still functioning with in the core area which causes traffic bottlenecks all over the city. There is need to shift the whole sale building material market away from the city center so that the existing market area can be renovated to function efficiently as a central retail market. Special area development schemes have to be notified to take up this work with beneficiary participation.

In the surrounding Panchayats and Municipalities also the markets situated in the core area need to be renovated. They need to be improved and the quality of the environment can be improved by taking up area development schemes. The cost for this is tentatively worked out and indicated. In the Cochin City centre the old CBD are is characterized by buildings, which are dilapidated. The land values are prohibitive and it will be economically beneficial if the whole area comprising of such old structures is reorganized .It is proposed to construct multi-storey buildings relocating the existing activities, which are location specific. This will render large open spaces around such buildings and improve the environmental quality. Ernakulam North Town area is considered for such development.

Conclusion. The core areas of the city and the old parts of the suburbs are characterized by narrow roads flanked by old and dilapidated buildings. Location of certain activities like wholesale trading in the heart of the city attracts trucks and other goods vehicles to these narrow roads resulting in congestion. Decentralization of such activities to the peripheral areas and renewal of the urban core areas by reconstitution of plots is proposed.

There are deficiencies in the delivery of services by the public sector as a consequence of lack of facilities in the Govt. Hospitals, Govt. Schools and public recreational areas. The urban poor are the most affected as they rely fully on these services. The project proposes to augment the facilities in these institutions and create infrastructure wherever necessary.

Total **estimated cost** of the projects under this is **Rs.259.5crore**.

11. MUNICIPAL FINANCES

This chapter focuses mainly on the finance of the Kochi Corporation and other local bodies included in the CDP area.

11.1 Structure of the City Finance

The review of the finances involves analysis of the income and expenditure of the local bodies to ascertain the trends on the major sources and uses of funds. In addition to this key financial indicators dealing with property tax, entertainment tax etc., are also being assessed.

The transactions of Kochi Corporation are carried out under revenue sources and expenditure. The revenue sources include taxes, non-taxes such as rents, fees, fines etc., and grants. Details of the revenue from different sources for a financial year are indicated separately. The taxes include property tax, profession tax, entertainment tax etc. It is envisaged for revision of property tax, which will strengthen the financial position of the Local Bodies.

11.2 Sources of Fund

- Own source revenue which includes taxes, duties, cess and surcharge, fees from licenses and permissions, income from municipal properties, and income from other miscellaneous items;
- Share of the taxes levied by the Government and transferred to the Local Bodies;
- Grants to the Local Bodies from the Government for the implementation of schemes, projects and plans formulated by them, under non-plan scheme;
- Grants realized to the municipal corporation by the Government for implementation of schemes, projects and plans assigned or entrusted to the municipal corporation under the KM Act 1994; and K.P.R Act 1994; and
- Money raised through donations and contributions from the public and non-governmental agencies.

The KM Act 1994 and the K.P.R Act 1994 mandates the publication, not later than first week of June, of an annual financial statement of the municipal corporation of the preceding year showing a classified abstract of receipts and payments of the municipal corporation under Revenue, Capital and Debt heads, a demand, collection and balance statement and a statement of the general financial position of the institutions.

Overview of Finance Sources. Actual sources of the revenues for the Local Bodies for the last 5 years is analyzed and furnished below.

Figure 11.1: Sources of Revenue

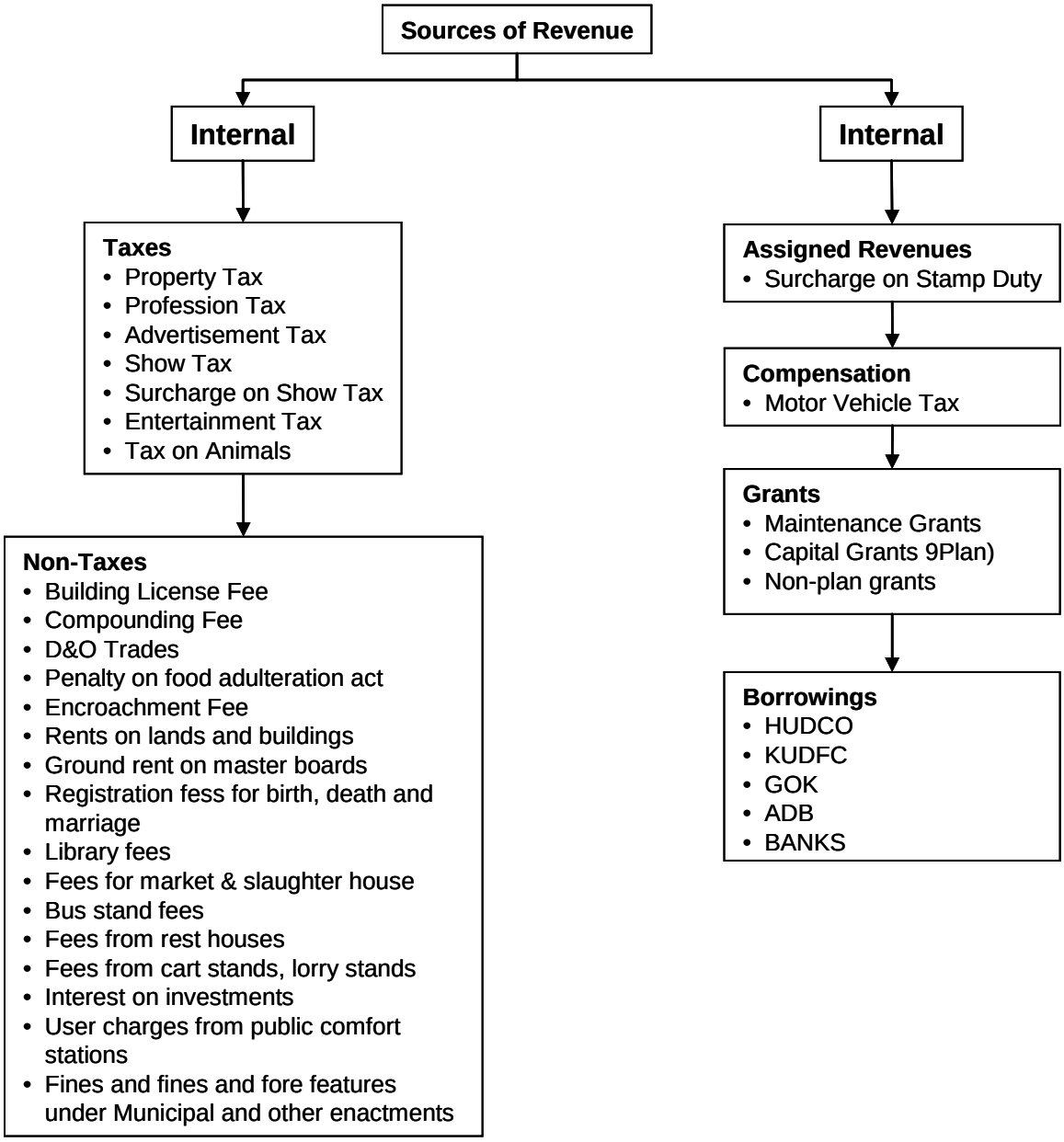
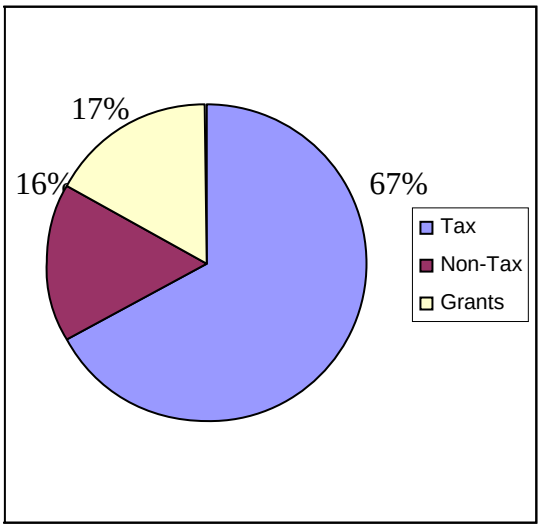


Table 11.1: Details of Income Source of Local Bodies

Sl. No.	Revenue Source
A	**Taxes**
01.	Property Tax
02.	Profession Tax
03.	Entertainment Tax
04.	Additional entertainment Tax
05.	Advertisement Tax
06.	Show Tax
07.	Surcharge from Show Tax
B	**Non taxes-rents, fees, fines etc**
01.	Rent on land and bldgs
02.	Rent on Govt. bldgs
03.	Markets

Sl. No.	Revenue Source
04.	Bus stand fees
05.	Ferry service
06.	Town Hall
07.	Slaughter House
08.	Library fees
09.	Interest on investments
10.	Fees from cart stands
11.	Fess from registration
12.	Fines
13.	Transfer of properties
14.	Public comfort stations
15.	Road cutting
16.	D & O Trades
17.	Building application fees
18.	Construction of factories
19.	Machinery erection
20.	Fees collected under PPR Act
21.	Fees collected under Cinema Regulation Act
22.	Fees collected under PF Act
23.	Fees imposed on hospitals & tutorial colleges
C	**Grants**
01.	Vehicle tax compensation
02.	General purpose grant
03.	Plan grant
04.	Non- plan grant

Figure 11.2: Income sources of Local Bodies



11.2.1 Revenue Receipts

The Revenue Receipts of the municipal corporation can be classified into 3 types of revenue source:

- Own source income;
- Revenue from assigned and shared taxes; and
- Grants-in-aid from the Government.

Own source income refers to those revenue items, which the Local Bodies are responsible for in terms of their assessment and collection. Assigned and shared taxes are taxes collected by Government but the revenue is assigned to or shared with the municipal corporations. Grants-in-aid from the Government come in the form of plan, maintenance of assets, specific purpose grants.

Table 11.2: Revenue Receipts and Expenditure KMC (In Lakhs)

Year	Receipts	Expenditure
1998-99	3183.90	2119.20
1999-00	3778.20	3849.40
2000-01	3849.40	2975.70
2001-02	4232.00	2241.00
2002-03	5124.70	2657.90
2003-2004	6745.80	6463.70
2004-2005	6907.40	5925.70
2005-2006	7075.10	6197.30

11.2.2 Government Grants

Plan Grants. As per the decentralized planning policy of the Govt. of Kerala approximately 35% of state plan allocation is transferred to local bodies annually for their development works. The annual plans are scrutinized and approved by the District Planning Committee in the case of municipalities and Panchayats and by the State Planning Board in case of Municipal Corporations. The plan allocations for the past 3 financial years are given below.

Table 11.3: Grant-in- aid (Plan) K.M.C

Year	Amount in Lakhs
2003-04	2,340.80
2004-05	1,169.50
2005-06	1,512.70

Source: Budget documents KMC 2006 – 07.

11.2.3 Non- Plan Grants

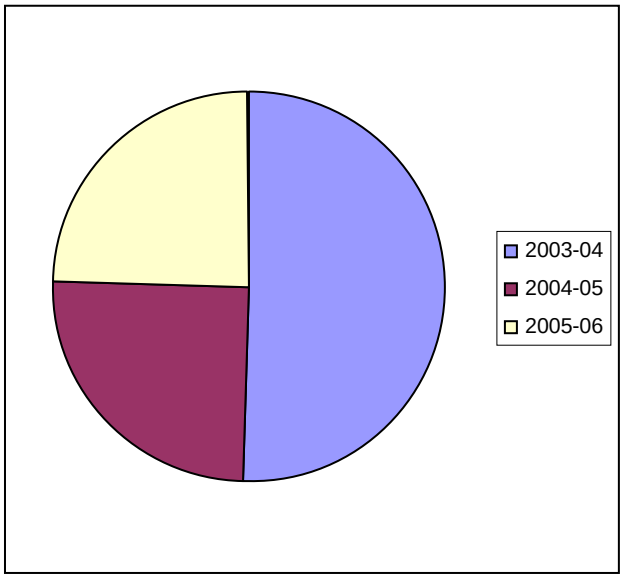
Based on the 73rd & 74th CAA the Govt. of Kerala has decided that all services providing institutions of the Govt. should be brought under the local bodies. Among them are schools, Hospitals of all systems of Medicine, Krishibhavan, Veterinary hospitals and Social Welfare institutions. All social pensions are also being distributed by the local bodies. The allocations in the state budget for the above services are transferred to the respective local bodies annually. The Non-plan grants received by the Kochi Municipal corporation during the past 3 years are given below:

Table 11.4: Grant-in- aid (Non-plan) KMC

Year	Amount in Lakhs
2003-04	3,918.70
2004-05	1,925.40
2005-06	1,904.60

Source: Budget documents KMC 2006 – 07.

Figure 11.3: Grant-in-Aid



11.2.4 Capital Account (Non-Plan)

The non-plan grants received from the Govt. of Kerala are utilized for the maintenance of services of the transferred Govt. service Departments and for the payment of all social pensions including unemployment wages. Receipts and Expenditure under this item for the past 3 years are given below:

Table 11.5: Receipts and Expenditure under Non- plan grants KMC

Year	Receipts in Lakhs	Expenditure in Lakhs
2003-04	3,918.70	1,842.50
2004-05	1,925.40	1,472.00
2005-06	1,904.60	1,637.70

Source: Budget documents KMC 2006 – 07

10.2.5 Capital Account (Plan)

Approximately 35 % of the annual plan allocation of Govt. of Kerala is being transferred to the rural and urban local bodies of the State, annually in installments. This fund is utilized for projects formulated by the local bodies and approved by the State Planning Board, on the recommendation of the District Planning Committee. Most of them are asset-creating projects. Separate targets are fixed for S.C. and S.T.s in the plan, for their socio-economic development. The receipts and expenditure under this account for the past 3 years are given below:

Table 11.6: Receipt and Expenditure – Plan Fund KMC

Year	Receipts in Lakhs	Expenditure in Lakhs
2003-04	2,340.80	2,340.80
2004-05	1,169.40	785.30
2005-06	1,904.60	1,512.70

Source: Budget documents KMC 2006 – 07

Their projects are implemented with the financial participation of the city and the beneficiaries. For the annual financial year (2006-07) the plan allocation for Kochi Municipal Corporation is Rs.1,908.20 lakhs. An amount of Rs.13 Lakhs is fixed as contribution from the beneficiaries, who are entitled for individual finance support for self-employment and housing. The KMC also earmarked 13 lakhs for the same purpose. Out of the above plan allocation an amount of Rs.27.50 lakhs is exclusively earmarked for the development projects for S/C. and S/T. community. The Govt. of Kerala has restricted the local body from any diversion of this fund for any other projects.

11.2.6 Financial Position

The financial position of the city indicates needs for improvement. The revenue income needs to be enhanced and the expenditure needs to be reduced to have at least 30% CB. This 30% savings can be added to the capital account spent for city development. This aspect is being discussed in the reforms agenda. The financial position of the KMC for the past 3 years is given below.

Table 11.7: Financial Position of Kochi Municipal Corporation (Rs In lakhs)

Year	OB	Receipts	Total	Expenditure	C.B
2003-04	225.30	13005.30	13230.60	10647.10	2583.50
2004-05	2583.5	10002.40	12585.9	8183.00	4402.90
2005-06	4402.90	10492.40	14895.30	9347.70	5547.60

Source: Budget documents KMC 2006 – 07.

11.2.7 Brief Analysis of Financial Position of other local bodies

It is evident that the Revenue expenditure has increased. Due to increase in Salaries, Wages, Electricity charges, Telephone and Postal charges, maintenance of street lighting system and also fuel charges. The income in the Revenue account however shows increase.

Table 11.8: Financial Position of Local Bodies

Financial Position of the two Municipalities included in the Project							*Rs.(Lakhs)*
Sl. No.	**Name of Local Body**	**Year**	**OB**	**Receipts**	**Total**	**Expenditure**	**CB**
1	Thripunithura	2003-04		661.00	661.00	572.60	88.40
		2004-05	88.4	673.90	762.3	449.30	313.00
		2005-06	313.00	877.20	1190.20	780.30	409.90
2	Kalamassery	2003-04		285.10	285.10	204.40	80.70
		2004-05	80.70	516.20	596.90	218.40	378.50
		2005-06	378.50	527.90	906.40	260.10	646.30

Table 11.9: Receipts and Expenditure of Plan Grants of two Municipalities

Sl. No.	Name of Local Body	Year	Receipts	Expenditure
1	Thripunithura	2003-04	247.20	228.10
		2004-05	194.10	98.50
		2005-06	245.70	127.30
2	Kalamassery	2003-04	269.50	261.10
		2004-05	246.80	156.80
		2005-06	252.70	43.10

Table 11.10: Receipts and Expenditure of Plan Grants of 13 Panchayats

Sl. No.	Name of Local Body	Year	Receipts	Expenditure
1	Elamkunnapuzha	2003-04	83.40	46.60
		2004-05	166.50	160.00
		2005-06	93.40	89.40
2	Njarakkal	2003-04	22.90	21.10
		2004-05	23.50	20.40
		2005-06	26.10	22.10
3	Mulavukadu	2003-04	96	100.00
		2004-05	108.8	84.50
		2005-06	128.4	1,16330
4	Kadamakudy	2003-04	19.40	17.20
		2004-05	21.80	23.40
		2005-06	25.60	22.10
5	Cheranalloor	2003-04	53.4	39.80
		2004-05	24.6	42.20
		2005-06	35.5	51.90
6	Eloor	2003-04	177.9	179.80
		2004-05	186.3	212.10
		2005-06	198.8	281.10
7	Varappuzha	2003-04	26.5	26.40
		2004-05	33.4	26.70
		2005-06	44.3	38.50
8	Thrikkakkara	2003-04	137.4	116.10
		2004-05	116.4	78.10
		2005-06	150	100.80
9	Thiruvankulam	2003-04	154.5	212.20
		2004-05	152.2	86.80
		2005-06	140.4	96.20
10	Maradu	2003-04	158.4	18.10
		2004-05	203.7	24.30
		2005-06	260.6	27.60
11	Kumbalam	2003-04	25.6	20.20
		2004-05	30.3	21.60
		2005-06	40.5	30.20
12	Chellanam	2003-04	32.7	30.10
		2004-05	52.4	34.40
		2005-06	82.8	40.20
13	Kumbalangi	2003-04	44	38.10
		2004-05	138.2	113.60
		2005-06	159.3	142.20

Year	Receipts
2003-04	655.7
2004-05	483.30
2005-06	548.80

Source: Reports from the respective Municipal and Panchayat Secretaries

11.2.8 Strengthening Financial Position and Asset Management

In order to meet the planned long-term financial strategy and to strengthen the management systems to meet the same, the local bodies in the CDP area propose to undertake a few capacity – building measures. These measures would primarily rely on issues related to:

- Basic accounting principles (with a focus on shifting to accrual-based accounting);
- Overall expenditure control;
- Preparation of balance sheets and the importance of assessing the financial condition of the Corporation;
- Importance of timeliness in preparation of management information;
- Budgetary Control;
- Importance of internal control and auditing;
- Fixed asset management and maintenance;
- Debt management and refinancing;
- Capital markets and their potential for local governments;
- Private sector participation in urban service delivery; and
- Taxation principles and maximization: equity and efficiency.

Conclusion. The analysis of the income and expenditure of the local bodies for the past 3 years under Revenue, (Taxes, rents, fees, fines etc. and grants) and expenditure (Salaries, wages, electricity charges, fuel charges, street lighting etc.) reveal that the expenditure is increasing considerably. Plan grants are utilized mainly for asset creating projects formulated by local bodies and approved by the State Planning Board / District Planning Committee. The non-plan grants are utilized for the maintenance of services of transferred Govt. Departments and for the payment of social pensions. In order to meet the long term financial strategy the revenue income of the Corporation needs to be substantially improved in comparison with the expenditure to have a cash balance of at least 30%. The measures to bring about this includes,

Overall expenditure control, Private sector participation in projects & service delivery, Debt management and Maximization of equity and efficiency.

12. URBAN REFORMS AND E-GOVERNANCE

12.1 Introduction

The scenario of urban governance and the initiatives have been discussed in Chapter 2. Further, it is state that subsequent to the 74th constitutional Amendment Act (CAA), 1992 the government of Kerala (GoK) embarked on a policy of decentralization of powers to local governments. The Kerala Municipalities Act, 1994, was drafted based on decentralization principles laid down in the 74th CAA. In September 1995, GoK transferred powers and functions to local governments; along with institutions, offices and functionaries. Key features of the decentralization initiative comprised of:

- Transferring health related institutions (except medical colleges and regional specialty hospitals) to local governments;
- Transferring all Government schools to Urban Local Bodies (ULBs);
- Planning and implementing centrally sponsored poverty alleviation schemes through ULBs;
- Planning social welfare schemes, implementing Integrated Child Development scheme (ICDS), affecting payment of various social security pensions, and creating centers for care of the disabled ULB responsibilities; and
- Planning and providing urban basic services, including water supply, sanitation, storm water drainage and urban roads (excluding those provided/ maintained by the State Public Work Department). (While the KM Act, 1994, and amendments therein requires the MC to maintain and arrange water and sewerage services, KWA continues to provide the said services in Kochi).

GoK chose to operationalize the decentralization process through participatory local – level planning initiated through the Peoples's Plan Campaign or the Kerala Development Program. The Annual Plan of the Municipal Corporation (MC) comprises of development projects planned at the grassroot level and approved by the Council – financing of all approved projects through ULB own funds and plan grants under State and Central schemes.

Financial devolution formed the backbone of decentralization and comprised of:

- Providing approximately 30–40 % of the total plan size of the State as untied devolutions to local governments for developmental works – of the total allocation to a local self government institution (LSGI), 30% is allocated for SC/ST development and 70% is allocated for general purposes (comprising 10% in productive sectors, 10% for slum infrastructure, not more than 50% on infrastructure and 30% for service sector);
- Stipulating that no part of the devolved funds should be based for staff salaries and establishment expenditure; and
- Releasing funds in fourteen installments during a fiscal year; any shortfalls in fund usage would result in allocation lapsing. Another important is the feature is regarding planning and implementing projects prepared by local self governments – 30-40% of the plan size of the State's budget was set apart for local self governments with 15% of the said amount earmarked for ULBs.

12.2 Legal Framework

A number of institutions are involved in governing a city. They include various departments of the State Govt., the local bodies and other institutions constituted by the State Govt. Local bodies and other institutions are created through Act of the legislature and Govt. notifications. The institutions established by law are shown below.

Table 12.1: Kochi City Governance Institutions

Agency	Legislation
Kochi Municipal Corporation	Kerala Municipality Act.1994
Municipalities-2	Kerala Municipality Act.1994
Grama Panchayts – 13	Kerala Panchayat Raj Act.1994
Greater Cochin Development Authority	Travancore Town Planning Act.1932
Goshree Islands Development Authority	

The departments of the Govt. of Kerala are part of State's governance framework.

Apart from the above, the following departments/ organizations involved in the development of Kochi City, are:

- Kerala State Pollution Control Board;
- Kerala State Road Transport Corporation;
- Kerala State Electricity Board;
- Kerala Water Authority;
- Fisheries Department;
- Tourism Department;
- Agriculture Department;
- Forest Department;
- Ground Water, Mining and Geology Departments;
- The Cochin Port Trust;
- Municipal Administration Department;
- Town and Country Planning Department;
- Kerala State Housing Board;
- Kerala State Health Services Department;
- Kerala State Education Department;
- Kerala State Social Welfare Department;
- Kerala State Information Technology Department;
- Information Kerala Mission;
- Kerala State Poverty Alleviation Mission;
- Kerala State Insfrastructural Development Corporation;
- Kerala State Roads and Bridges Corporation;
- Kerala Urban Development Finance Corporation;
- Housing and Urban Development Corporation of India;
- Kerala State Public Works Department;

- Kerala State Irrigation Department;
- Inland Water Ways & Navigation Corporation;
- Kerala State Water Transport Corporation;
- Kerala State Infrastructural Development Corporation;
- Local bodies adjoining the designated Kochi;
- Southern Naval Command;
- Customs and Central Excise;
- Central PWD;
- Central Water Commission;
- Research Institute of the Central Govt.;
- Inland Water Ways Authority;
- Marine Products Export Development;
- Central Institution of Fisheries Technology;
- Center for Earth Science Studies; and
- Kochi Refineries Ltd.

12.3 Functional Domain

The functional domain of local bodies in the State is derived from the respective legislation. In the State the Kerala Municipality Act 1994 and the Kerala Panchayat Raj Act 1994 are the main legislations by which the local bodies are functioning. Both the above Acts give the descriptions of the "Powers, functions and responsibilities of the each kind of local bodies." A list of mandatory functions and general functions are provided in the respective Acts. The above two enactments were passed by the Kerala Legislature Subsequent to the 74th Constitution Amendment, the functions of the urban and rural local bodies are almost similar.

Mandatory Functions

- Regulating building construction;
- Protection of public land from encroachment;
- Conservation of traditional drinking water sources;
- Preservation of ponds and other water tanks;
- Maintenance of waterways and canals under the control of Municipality;
- Collection and dispersal of solid waste and regulation of disposal of liquid waste;
- Storm water drainage;
- Maintenance of environmental hygiene;
- Management of public markets;
- Vector control;
- Regulation of slaughtering of animals and sale of meat, fish and other easily perishable food stuffs etc.;
- Control of eating houses;
- Prevention of food adulteration;
- Maintenance of roads and other public properties;
- Street lighting and its maintenance;

- Adopt immunization measures;
- Effective implementation of National and State level strategies and programmes for prevention and control of diseases;
- Establishment and maintenance of burial and burning grounds;
- Issue of licenses to dangerous and offensive trades and industries;
- Registration of birth and deaths;
- Providing bathing and washing ghats;
- Arranging ferries;
- Providing parking places for vehicles;
- Construction of waiting sheds for travelers;
- Providing toilet facilities and bathing ghats at public places;
- Regulating the conduct of fairs and festivals;
- Issue of license to domestic dogs and destroy stray dogs;
- Providing basic facilities in slum areas;
- Amenities including footpath and road crossing facilities for pedestrians; and
- Preparation of detailed town planning and action plan for implementation in a phased manner.

General Functions

- Collection and updating of essential statistics;
- Organizing voluntary workers and make them participate in collective activities;
- Organize campaign for thrift;
- Awareness building against social evils like drinking, consumption of narcotics, dowry and abuse of women and children;
- Ensuring maximum people's participation in all stages of development;
- Organize relief activities during natural calamities;
- Inculcating environmental awareness and motivating local action for its up gradation;
- Development of Co-operative sector;
- Promoting communal harmony;
- Mobilizing local resources in cash or in kind including free surrender of land for developmental purpose;
- Propagating legal awareness among the weaker section;
- Campaign against offenses;
- Organizing neighborhood groups and self-help groups with focus on the poor; and
- Awareness building on civil duties.

In addition to the above, the State and Central Government can also entrust other functions to the Corporation whenever required.

12.4 Institutional Framework

The Kerala Municipality Act and the Kerala Panchayat Raj Act provides for the foundation of separate standing committees for efficient administration of each local body.

Table 12.2: Details of Standing Committees

Sl. No.	Municipal Corporation	Municipality	Grama panchayats
01.	Taxation, Finance and Accounts	Taxation, Finance and Accounts	Taxation, Finance and Accounts
02.	Developments	Developments	Developments
03.	Welfare	Welfare	Welfare
04.	Health and Education	Health and Education	Health and Education
05.	Public Works	Public Works	Public Works
06	Town Planning & Heritage	Town Planning	
07.	Tax Appeal	Tax Appeal	

In Municipal Corporation a steering committee is functioning, with the Mayor as Chairman, the Deputy Mayor and the Chairpersons of all standing committees as members.

The Cochin Corporation area is divided into 7 zones for administrative convenience and better service delivery.

Revenue Department

- The Revenue Officer and the Dy. Secretary, heads the Revenue Department;
- The Revenue Department collects the bulk of all taxes, charges and fees collected by the Corporation;
- The largest section in the Department is that of the Property Tax;
- In addition to the Property Tax Section, the Revenue Department has smaller sections for Licensing; shop Rent, Advertisement Tax etc.;
- Responsibility for the revenue operations of different zones of the corporation has been vested with the Deputy Secretary (who is in charge of three Zones) and the Revenue Officer (who is in charge of four Zones); and
- The Revenue Superintendents assisted buy a dedicated team of Bill Collectors and U.D.C.s lead the revenue collection effort from the Zonal Offices.

Engineering Department

- The head of the Engineering Department is designated as Corporation Engineer;
- This section is responsible for construction and maintenance of roads and bridges and associated works such as storm water drains and culverts etc. This Section also carries out surveys and planning activities and makes technical and engineering drawings;
- The Engineering Department also undertakes the task of construction of public toilets, maintenance of school buildings and construction and maintenance of government buildings, parks etc; and
- At Zonal Offices, an officer in the rank of Assistant Executive Engineer heads the Engineering Department. The main functions at Zonal level are the maintenance of roads, regulations of encroachments and inspection of buildings.

Health Department

The Corporation Health Officer heads the Health Department. It is the largest Department of the Corporation in terms of staff strength, with the bulk of employees being utilized in conservancy duties.

The executive functions of the Health Department are as follows:

- Cleaning of roads;
- Garbage of collection;
- Disposal of dead animals;
- Control of stray animals;
- Anti larval and anti malaria measures;
- Preventive vaccination
- Control of epidemic and infectious diseases;
- Bio-waste management; and
- Registration of births & deaths.

Its regulatory functions are:

- Enforcement of the Prevention of Food Adulteration (PFA) Act;
- Inspection of eating establishments;
- The Corporation operates 13 maternity and child welfare centers;
- At the Circle Office level a Health Inspector heads the Department. Three junior Health Inspectors and around 20 – 30 sanitation workers in each zone assist the inspector; and
- Issuing of D&O trade licenses.

Accounts Department

At present the Department comprises of four executive sections and one administrative unit. These are the Treasury, Establishment/ Salary, Pension and Provident Fund (sometimes called "Contingency") sections and the General Administration or Head Office unit.

The key functionaries of the accounts department are the Accounts Officer, Asst: Accounts Officers, Senior Accountants and Accountants. The functions of the different sections of the Accounts Department are as follows:

- The **Accounts** Section is responsible for making all the payments of the Corporation. It also maintains records of Kochi Municipal Corporation's accounts and bank transactions such as loans, overdrafts etc… Within the accounts Section, each accountant and clerk has been allotted specific roles;
- The Establishment of Salary Section calculates the salary of Kochi Municipal Corporation employees based on attendance, leave records, loans taken etc… and prepares their salary statements. The bills are then sent to the Accounts section, which then passes the bills for payments to the employees of individual departments for further distributions; and.
- The accounts section also prepares the monthly and annual accounts.

Traditionally, the groundwork for preparing the budget has been done by the Accounts Officer in consultation with the Secretary to the Council of Kochi Municipal Corporation, who acts as an interface between the administrative and elected bodies of Kochi Municipal Corporation.

12.5 Key Issues in Governance

The governance of the city is burdened by multiplicity of agencies. Lack of inter departmental coordination is a serious hurdle in development. The agencies have their own priorities, procedures, lines of accountability and financing patterns, which often may not be in conformity with those of the local bodies. The critical issues that emerge from the existence of multiple agencies include:

- Spatial and functional fragmentation;
- Overlapping functions;
- Lack of accountability;
- High service delivery gaps; and
- Increasing urban poverty.

The Govt. of Kerala needs to address these problems.

12.6 The Reforms Agenda

Reforms are to be carried out mainly in two areas. The administrative reforms and the tax reforms. Reforms and charges are critical elements in development process of city.

Administrative Reforms. There is no adequate platform to provide the required information to the citizens on all services. Lack of awareness and information is affecting the citizens' access to grievances re-dressal.

There is a need to address these institutional and other challenges to provide good governance to the city. Unless the hurdles are removed, economic developments are tampered and efficient service delivery becomes difficult. This will have adverse impact on the community-particularly the poor. Therefore there is a need to restructure the governance framework, remove the roadblocks and streamline the line of accountability. The governance reforms become more critical as Kochi is becoming more and more competitive and investment destination. The institutional strategies required includes:

- Spatial integration of Cochin Corporation, the nearby Municipalities and Panchayats for better planning and service delivery;
- Establishing clear lines of accountability of all service delivery agencies;
- Constituting separate service delivery agencies in different sectors like water supply, sewerage, sanitation, solid waste management, transport etc.;
- Performance based memorandum of understanding between the city administration and various service delivery agents focusing on targets and outcome;
- Evolving inclusive E-Governance mechanism;
- Institutional integration;
- Establishing Co-ordination mechanisms to overcome spatial and functional fragmentation;
- Outsourcing of services;
- Rationalization of Municipal Man Power;
- Simplification of regulations and systems;
- Training to functionaries; and
- Basic accounting principles (It focus on shifting to accrual – based double entry system of accounting).

The above innovations will be implemented in a phased manner.

Tax Reforms. The city need not introduce any new taxes, as it has a very good and well-framed tax base. But the assessment and realization machinery are to be geared up to the maximum available potential.

The main source of income for the city is Property tax, Profession tax, Entertainment tax, D & O license fee, Rent etc., the present system of assessment and realization of property tax is vogue. There are ample chances for under assessment and evasion. No concrete criteria are envisaged for the assessment in the act and rules. Specific criteria for the assessment of property tax on the basis of Plinth area, type of construction and locations are to be formulated by the Govt. of Kerala. A new method of self-assessment by the owners on the basis of plinth area, type and location is prepared to be introduced from the next financial year. The annual rent per Sq.m. for each type of building in different locations are to be fixed from time to time. The owner needs to have an awareness of his property tax on the basis of plinth area before he starts to construct a building. If such a reform is implemented and the entire structures are re-numbered using modern G.I.S data, the property tax demand is expected to increase by more than 300%. There was a practice in Kerala to revise the property tax in all local bodies every 5 years. But no revision of property tax has been done during the last 13 years. This has created heavy shortfall in the income of local bodies. The revision of the property tax is to be done in a scientific manner.

The Cochin Corporation has an average property tax demand of 2,350 lakhs annually. If the proposed tax revision is done properly and scientifically additional revenue will be available to the city, which can be utilized for sustainable city development activities. There will be no more revenue deficit also in the city accounts.

Professional tax rates are fixed by the Govt. of Kerala through a notification. The tax from employees of Govt. and other institutions are collected half yearly through their heads of institutions and there fore there is not much evasion in that. But in case of traders, professionals, legal practitioners, consultants and similar category the assessments are not made in full. The tax evasion in this category is assessed to be above 20%. By enlisting the entire persons in this category and bringing them in the tax frame the city can have additional revenue to the tune of 100 lakhs. The revenue officials can manage this if they are provided with required facilities. They need to visit door-by-door and enlist all persons without omission. This can be continued with D & O License listing activity. The data can be computerized once, the primary data are collected.

Another area where the city lacks in tapping the full potential is the collection of D & O License fees. There is approximately 25% evasion in this area. The entire traders and commercial institutions liable to take License need to be listed visiting door-by-door by the Health staff. They can institute criminal prosecutions against defaulters. If this is done properly and faithfully the city will get additional income.

Along with the above said changes in assessment the collection machinery are also to be geared up to have 100% collection annually.

The present average collection rate of property tax and profession tax is around 75%. In the case of property tax the collection of tax from govt. departments, and Govt. owned autonomous

bodies, the collection rate is very low. The case is similar in respect of collection of rent of buildings owned by the City Corporation and leased out to private and Govt. agencies. Strict measures will be taken up.

Tax reform innovations proposed to be undertaken include:

- Computerization of all demand and collection registers;
- Area, location and type based property tax revision using GIS platform, introducing self-assessment system;
- Levy of user charges to ensure full O & M cost recovery in a phased manner within next 7 years; and
- Improvement of collection machinery.

12.6.1 Other Reforms

Other reforms proposed to be implemented include:

- Strengthening Urban Poverty Alleviations machinery with community participation;
- Utility mapping GIS platform;
- Formation of MIS;
- Developing Public-private partnership in service delivery;
- Promoting BOT projects;
- Public disclosure system;
- Establishment of performance monitoring unit;
- E- Governance initiatives; and
- Simplification of planning regulations.

Pro-Poor

- Preparation of Municipal Actions Plan for poverty reduction by ULBs;
- New citizen friendly street vendor policy; and
- Provision of basic services to urban poor as detailed in chapter BSUP.

The above reforms will be implemented in a phased manner. The administrative Efficiency and the accountability will be substantially increased to provide high-level service delivery to the citizens. The additional income derived due to the reforms will be utilized for development programmes under JNNURM. The State level reforms are to be looked into and implemented by the Govt. of Kerala.

Conclusion. The Kerala Municipalities Act 1994 and Kerala Panchayat Raj Act was drafted in tune with the principles laid down in the 74th CAA and in September 1995 GoK transferred the powers and functions to the local Govt.s along with institutions offices and functionaries. The decentralization process is carried out through participatory local level planning based on Kerala development programme. In addition to the mandatory functions entrusted with the urban and rural local bodies, they are taking up the optional functions also in a phased manner. In order to equip the urban and rural local bodies to carry out the functions & responsibilities vested with the local bodies capacity building is necessary. There are 16 local bodies involved in the CDP area. Fixing of accountability is essential to bridge the service delivery gaps. Spatial integration of the local bodies for better planning and service delivery, institutional integration, performance based

MoU between city administration and service delivery agents and evolving E-governance mechanism are the main administrative reforms. Tax reforms necessitate computerization of all registers, innovative approaches like levy of user charges, betterment charges, simplified method of tax assessment and improvement of collection machinery. Reforms agenda includes promoting BOT projects, establishing performance monitoring system, encouraging public – private partnership projects, mapping on GIS platform and strengthening Urban Poverty Alleviation Machinery with community participation.

13. MOBILIZATION OF FINANCE

13.1 Financial Analysis

Detailed account of and an analysis of the financial position of Municipal Corporation of Kochi and all other local bodies under the CDP were carried out in the chapter ' Municipal Finances'. The sources of revenue of the local bodies are,

- Own source revenue which includes taxes, duties, cess and surcharge, fees from licenses and permissions, income from municipal properties, and income from other miscellaneous items;
- Share of the taxes levied by the Government and transferred to the Local Bodies;
- Grants to the Local Bodies from the Government for the implementation of schemes, projects and plans formulated by them, under non-plan scheme;
- Grants realized to the local bodies by the Government for implementation of schemes, projects and plans assigned or entrusted to the local bodies under the KM Act 1994; and K.P.R Act 1994; and
- Money raised through donations and contributions from the public and non-governmental agencies.

The Total receipts and expenditure of all the local bodies that come under the CDP for the past three financial years are given below.

Table 13.1: Receipts and Expenditure of Local Bodies

Name of Local Body	2003-04		2004-05		2005-06	
	Receipts	*Exp.*	*Receipts*	*Exp.*	*Receipts*	*Exp*
Corporation of Kochi	13,230.60	10,647.10	12,585.90	8,183.00	14,895.30	9,347.70
Thripunithura Municipality	661.00	572.60	762.30	449.30	1,190.20	780.30
Kalamassery Minicipality	285.10	204.40	596.90	218.40	906.40	260.10
Elamkunnapuzha Panchayat	83.40	46.60	166.50	160.00	93.40	89.40
Njarakkal Panchayat	22.90	21.10	23.50	20.40	26.10	22.10
Mulavukadu Panchayat	96.00	100.00	108.80	84.50	128.40	116.30
Kadamakkudy Panchayat	19.40	17.20	21.80	23.40	25.60	22.10
Cheranalloor Panchayat	53.40	39.80	24.60	42.20	35.50	51.90
Eloor Panchayat	177.90	179.80	186.30	212.10	198.80	281.10
Varappuzha Panchayat	26.50	26.40	33.40	26.70	44.30	38.50
Thrikkakkara Panchayat	137.40	116.10	116.40	78.10	150.00	100.80
Thiruvankulam Panchayat	154.50	212.20	152.20	86.80	140.40	96.20
Maradu Panchayat	158.40	18.10	203.70	24.30	260.60	27.60
Kumbalam Panchayat	25.60	20.20	30.30	21.60	40.50	30.20
Chellanam Panchayat	32.70	30.10	52.40	34.40	82.80	40.20
Kumbalangi Panchayat	44.00	38.10	138.20	113.60	159.30	142.20
Total	**15,208.8**	**12,289.8**	**15,203.2**	**9,778.8**	**18,377.6**	**11,446.7**

The revenue structure is dominated by tax, which constitutes 67% of the total revenue. Non-tax revenue comes to 16% and the grants constitute 17% of the total revenue. The own stream of revenue of all the local bodies are dominated by property tax, which is assessed, collected and retained by the respective LBs.

The per capita total receipt of KMC in 2005-06 was Rs.2467, while per capita receipt from revenue was Rs.1172. Per capita tax revenue stood at Rs.1653.

For the annual financial year (2006-07) the plan allocation for Kochi Municipal Corporation is Rs.1,908.20 lakhs. An amount of Rs.13 Lakhs is fixed as contribution from the beneficiaries, who are entitled for individual finance support for self-employment and housing. The KMC also earmarked 13 lakhs for the same purpose. Out of the above plan allocation an amount of Rs.27.50 lakhs is exclusively earmarked for the development projects for S/C. and S/T. community

There is scope for increase in the revenues by scientifically revising the tax structure. There is need for assessing the debt service capacity of the local bodies. The analysis has revealed that there is scope for finding matching funds for the projects envisaged. It is also evident that the expenditure can be curtailed by strict financial discipline. The trend analysis shows that there is need to balance income and expenditure to generate surplus funds.

13.2 Funds Needed for Projects under CDP

Year wise expenditure needed to implement the projects envisaged in the CDP are consolidated in the table below.

Table 13.2: Proposed Year Wise Expenditure

Investment Sector	Year							Total
Water Supply	05-06	06-07	07-08	08-09	09-10	10-11	11-12	
Water Supply	0.00	1.63	84.01	210.12	216.89	332.06	327.59	1172.30
Desalination	0.00	6.50	23.50	0.00	0.00	0.00	0.00	30.00
Special Water supply Eloor & Kalamaserry	0.00	1.00	2.00	2.00	5.00	1.20	0.00	11.20
Rain Water Harvesting	0.00	0.84	2.36	0.00	0.00	0.00	0.00	3.20
Sewerage	0.00	18.25	223.25	562.80	1102.75	315.00	406.95	2629.00
Solid Waste Management	0.00	40.41	45.57	27.79	14.71	11.96	11.96	152.40
Traffic & Transportation	0.00	692.00	1,041.00	1093.00	847.00	519.00	60.00	4252.00
Basic Service to the Urban Poor	0.00	206.15	184.93	183.73	142.13	92.13	75.93	885.00
Heritage	0.00	11.42	11.42	15.22	19.01	11.42	7.61	76.10
Environmental Protection	0.00	7.05	64.80	64.01	63.90	48.70	42.45	291.00
Tourism	0.00	42.20	51.20	66.60	67.00	36.20	21.55	284.75
Urban Renewal & Social Amenities	0.00	31.10	64.20	65.20	51.00	40.00	8.00	259.50
Drainage	0.00	142.85	183.40	208.15	166.60	128.50	72.50	902.00
Spatial Growth & Land utilization	0.00	11.50	10.00	4.50	3.50	0.50	0.00	30.00

Investment Sector	Year							Total
O & M – Institutional strengthening	0.00	2.00	0.60	0.60	0.60	0.60	0.60	5.00
Total	**0.00**	**1214.90**	**1992.24**	**2503.81**	**2700.09**	**1537.27**	**1035.14**	**10983.45**

Many of these projects have a spatial spread over parts/full of all the local bodies included in the CDP and for the implementation of works in an LB, the completion of works in many others will be a precondition (e.g. water supply, distribution lines). Hence no attempt is made here to apportion the costs among the various LBs. However, an idea of the investments needed in the LBs can be obtained from the chapters on the respective sectors. Exact figures for each Grama Panchayat/ Municipality/ Corporation will be worked out in the Detailed Project Reports.

13.3 Integrating ADB Assisted KSUDP into JNNURM.

The guidelines of JNNURM permit inclusion of other externally aided projects under JNNURM. The guidelines (Clause 18.3) is as follows:

"In case any JNNURM Project is also approved as Externally Aided Project (EAP), the EAP funds can be passed through as Additional Central Assistance to State Government as funds contributed by State/ULB/FIS…"

The following is the estimated investment for Kochi under Asian Development Bank (ADB) assisted Kerala Sustainable Urban Development Project.

Table 13.3: Estimated Outlay of ADB Assisted KSUD Project for Kochi

Sl.	Name of the Sector	Investment in Rs. Crores
1	Water supply	46.44
2	Sewerage	99.28
3	Urban Drainage	15.03
4	Solid Waste Management	10.98
5	Roads	25.74
6	Equipment (sanitation and SWM)	3.00
7	Community Upgrading	30.00
8	Consultancy	15.00
9	Others	4.53
	Total estimates	**250.00**

It has been decided that the ADB assisted KSUD Project would be taken as part of JNNURM and the investment plan amount of CDP would include ADB assisted KSDU Project outlay.

13.4 Investment Sustenance

From the investment plan, it is clear that during the plan period i.e., up to 2011-12, the constituent local bodies together will have to mobilize funds to the tune of 30% of Rs.10983.45 crores, which comes to Rs.3295.04 crores, which is much above their own resources as on today. In order to realize the visions of the CDP, concrete efforts are to be taken to improve the own sources.

On the basis of a study of the 'Strength, Weakness, Opportunities and Threats' of the local bodies, the following assumptions are arrived at regarding the future financial scenario.

13.4.1 Financial Plan Under JNNURM for Providing GoK and ULB Share of Contribution:

- The broad estimated cost for the project components envisaged under various sectors in CDP for JNNURM Projects – Rs.10983.45 crores;
- The share expected from GoI as grants is 50% - Rs.5491.73 crores;
- 20% contribution by GoK, which would be made by budgetary allocation – Rs.2196.68;
- 30% contribution by Kochi Corporation and constitutent ULBs – Rs.3295.04.

JNNURM guidelines permit integration of other externally aided projects (ADB assisted KSUDP with JNNURM for considering such funds as the share of GoK and KMC):

ADB assisted KSUDP (Receipt from ADB) Rs.175.00 crores (would be taken as ULB contribution). The share of contribution expected from Kochi and other ULBs is Rs.3120.04 crores.

It would be possible to mobilize funds by identifying components which can be considered for implementation under public private partnership (PPP). Projects which can be considered for PPP can be identified when (DPRs) are prepared after approval of CDP by GoI. It would also be possible to seek share of support from Local Area Development (LAD) funds of MPs and MLAs. KMC and ULBs may also borrow from Finance institutions during project period 2006-2011.

State Government Revenue Transfers. Assigned and shared taxes and grants-in-aid are estimated to increase.

Other own Source Income. Profession tax, entertainment tax, other municipal taxes, receipts from municipal properties, license fees and other miscellaneous own source income are projected to increase equivalent to the assumed inflation rate of 60% over the forecast period.

In addition to this, non-conventional sources of revenue like vacant land tax, street tax, front footage levy and betterment levy are to be imposed.

Apart from the above, to strengthen the financial position of the corporations Government of Kerala provides grants in three streams – Development, Maintenance and General purpose. Some of the important ongoing fiscal reforms emerging out of State Finance Commissions would make available additional resources to the Kochi Corporation as detailed in Chapter 2 - 2.1.2. The main reforms are:

i. Introduction of plinth area based Property Taxation to be effective from the second half of 2006-07;
ii. It is envisaged that the number of taxable properties will increase by 1.0% annually;
iii. It is envisaged that in FY 2006-07 and FY 2011-12 increase in number of properties 10% and 20% respectively by undertaking property survey and increasing tax coverage to all properties and every years thereafter, property survey will be undertaken resulting in an increase in number of properties by 5% for those years;
iv. Introduction of seating capacity-linked taxation for Entertainment Tax;
v. Introduction of presumptive taxes for certain categories of professions under Profession Tax;
vi. Introduction of a new Service Tax to realize the cost of providing special services to localities, as a kind of benefits tax;
vii. Linking general non-tax revenues like rents, license fees to the value of money through a system of graduated automatic increases linked to indices reflecting value of money;
viii. Linking devolution of a portion of the Development Fund to increased revenue efforts on the part of the local governments;
ix. Tax mapping to reduce escaped tax; and
x. Updation of asset registers.

In addition to this, non-conventional sources of revenue like vacant land tax, street tax, front footage levy and betterment levy are envisaged to be imposed.

Revenue Expenditures. Projected salaries, establishment costs, operation and maintenance costs of existing Municipal services and facilities are based on actual and budgeted financial data. These existing costs are estimated to increase equivalent to the assumed inflation rate of 6% over the forecast period. The operation and maintenance costs for the new works are based on engineering estimates. Operation and maintenance unit costs for the new works are estimated to increase equivalent to the assumed inflation rate of 6% over the forecast period.

The Financial Statement is enclosed vide **Annexure 7**.

13.5 Alternate Sources

Even with all the above improvement measures, the ULBs will not be able to mobilize funds towards 30% of the project costs from own resources. Hence, alternate sources of finance will have to be identified. The following options either single or in combination, will be adopted based on the merits of individual projects.

Raising Municipal Infrastructure Bonds, City Development Bond, Loan from financial institutions like HUDCO, KUDFC, GoK, ADB and ILFS and resorting to PPP on a sustainable level will have to be adopted based on the merits of each project.

Conclusion. The projects envisaged in the CDP are the result of detailed discussions of aspirations at stakeholders' level, technical and financial viability evaluation by experts and acceptance by people's representatives. There is gap between the funds required and available.

But projects like these should not be held up due to lack of finance. These projects for the development of basic infrastructure are to lay the ground for a sustainable development of the city. The return there of are not always tangible. The social aspects are to be given due weightage. Firm determination and strict discipline adhering to the institutional reforms are needed to achieve the vision. Strengthening the financial base of the local bodies and resorting to the alternate sources of finance mentioned above wherever necessary are tools to realize the projects of this City Development Plan for Kochi.

14. IMPLEMENTATION ARRANGEMENTS

14.1 Project Management and Implementation Mechanism

Government of Kerala had earlier constituted a Project Management and Implementation Mechanism for the Asian Development Bank (ADB) assisted Kerala Sustainable Urban Development Project (KSUDP) which has been approved as a multi-component urban development project for the five cities of Thiruvananthapuram, Kollam, Kochi, Thrissur and Kozhikode in the State of Kerala. This Project Implementation Mechanism has been approved by Government of India.

As laid out in the norms of JNNURM, the KSUDP as the Externally Assisted project (EAP) has been brought under the JNNURM. In this context GOK has proposed to appoint the same Project management and Implementation Unit as the State level Nodal Agency for JNNURM. This is as per the JNNURM Guidelines issued by the Ministry of Urban development, Government of India. The implementation mechanism proposed through this Nodal Agency is detailed subsequently.

14.2 Implementing Agencies

JNNURM is conceived as a multi-component, multi-sectoral programme. The implementation of the projects would necessitate involvement of a number of sectoral agencies, both Government Departments and Quasi- Government Organizations. In addition to this, there are a few projects which need participation of private sector and Voluntary Organizations. Therefore the Project Nodal Agency has to interact with a large number of organizations and also with the State and Central Governments.

The task would be much more important in the Project Cities, where arranging for preparation of Detailed Project reports, arranging for implementation through the responsible organization, mobilizing participation of people, implementation monitoring, channeling of funds to the responsible organization, project accounting etc. would be tasks to be undertaken diligently. Given the multiplicity of functions and the overlap in service provision, identifying the implementing agency is critical for smooth operations.

The Municipal Corporations will be the implementing agencies conforming to GoK’s policy of decentralizing planning and service delivery. A City-level Steering Committee (CSC) would be constituted for overcoming any bottlenecks in project progress. The CSC would consist of the Mayor of the KMC, the District Collector, the Secretary of KMC, representatives of State-level Departments in the city (Public Works Department, Kerala Water Authority, NATPAC, GIDA, GCDA Department of Tourism, Irrigation Department, Department of Town & Country Planning, Kerala State Pollution Control Board etc.), and representatives of Kochi Chamber of Commerce, representatives from Industry and NGOs / CBOs. Besides reviewing project progress, the CSC would also sort out local issues and would provide guidance on policy matters. Kudumbashree set up will continue to play an active role in advising and monitoring activities facilitating poverty alleviation.

14.3 Project Management

14.3.1 Project Management Unit

The PMU would be responsible for –

i. Appointing project management consultants, arranging for preparation of detailed design / project reports and appointment of construction supervision consultants, mobilization of private sector participation, appointment of public support mobilization groups, and ensuring participation of voluntary organizations;
ii. Approving the design of the investment components in consultation with KMC (Kochi Municipal Corporation and other ULBs);
iii. Pre-qualifying contractors;
iv. Implementing public relations and community awareness programs;
v. Preparing standard bid documents;
vi. Monitoring the tendering process and guiding the project cities in bid evaluation and preparing bid evaluation reports for approval by GoK and GoI;
vii. Procuring equipment at the state-level;
viii. Coordinating with GoK and GoI on matters related to disbursements;
ix. Conducting the training and capacity building programs;
x. Providing support under the institutional development assistance; and
xi. Maintaining project documents and submitting timely reports (including monthly project performance reports, quarterly progress reports, etc.) to GoK and GoI.

The PMU will be headed by a Project Director and supported by deputies, based on the project size. The PMU will be staffed with senior level technical, financial, social, capacity building/management and procurement officers to manage all technical and funding account administration. An accounting and administrative unit will manage funding account administration.

14.3.2 Project Implementation Units

PIU would be established within Kochi Municipal Corporation. The responsibilities of the PIU would include:

i. Carrying out detailed surveys, investigations and engineering designs of individual city components;
ii. Tendering, evaluating bids and awarding works, contract administration, supervision and quality control;
iii. Measuring works carried out by the contractors and certifying payments;
iv. Conducting public awareness campaigns and participation programs,
v. Carrying out the Benefit Monitoring and Evaluation (BME) studies;
vi. Carrying out inventory of environmental assessments;
vii. Ensuring compliance with funding amount and loan covenants, if any; and
viii. Preparing monthly reports.

The Design Supervision Consultant (DSC) supports the PIU in all the aforesaid activities. A Project Manager will head the PIU and will be supported by sector specialists in environmental and civil engineering, as appropriate. The PIU will also comprise of staff involved in procurement, accounts and community development. Staff deputed from the Revenue Department shall handle all land acquisition and resettlement and rehabilitation issues, wherever required. The Project Manager at the PIU will report to the Secretary / Mayor, Kochi Municipal Corporation, and the Project Director at the PMU. All administrative and project co-ordination related issues will be handled by Additional Secretary of the KMC, who will be a senior officer appointed by Government. The Additional Secretary of the KMC will also be authorized to release payments to contractors based on the approval / certification of the Project Manager, PIU, and subject to fund release by the PMU. The Additional Secretary shall interface with the Municipal Corporation Council and the PMU regarding Project progress.

14.3.3 Project Management and Design Consulting Services

Consultancy services are required for project management, engineering design, construction supervision, procurement of goods and services, and public relations and awareness. Consultants would be selected and engaged in accordance with accepted guidelines approved by international funding agencies and Government of India.

Project Management Consultant (PMC). A Consultancy Group for Project Management will assist the PMU in project management activities including reviewing engineering designs, procurement, and implementation. The Project Management Consultants (PMC) will also assist the Project Management Unit (PMU) and the Project Implementation Unit (PIU) in project formulations, management, monitoring and evaluation, financial and environmental management aspects, public relations and awareness, training and capacity building, and institutional development / strengthening.

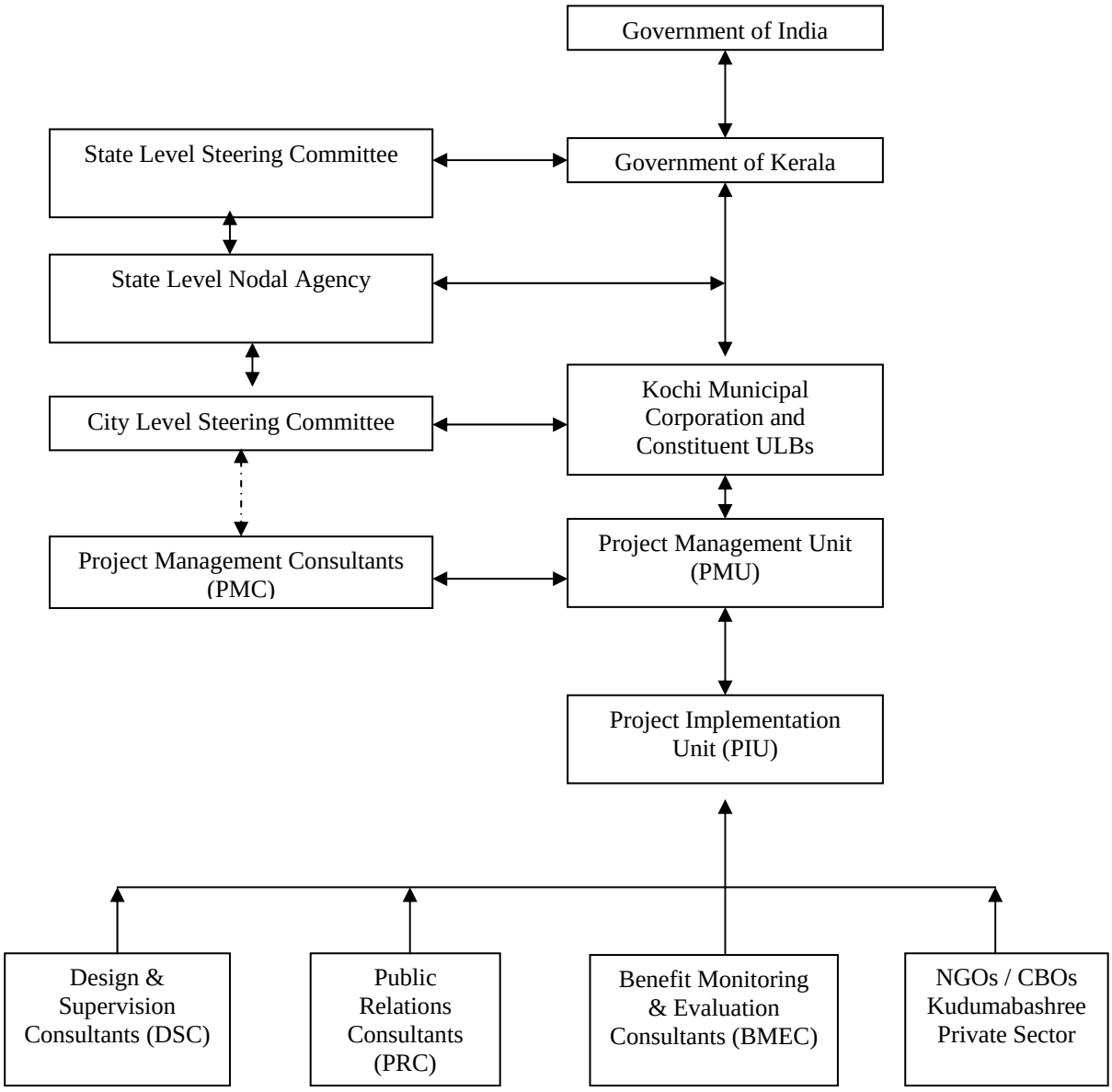
Design and Supervision Consultant (DSC). The main objectives of the DSC is to update maps and plans, undertake surveys & investigations and to prepare detailed designs of various project components for Kochi CDP area, prepare technical specifications and contract documents, assist in construction supervision and quality control, and undertake works measurement.

Public Relations Consultant (PRC). A domestic Public Relations Consultant firm appointed will facilitate public relations and arrange awareness programs (PRAP) on project related issues. The Information, Education and Communication (IEC) materials developed by the PRC would be utilized in public awareness campaigns. This Consultancy group would also be responsible for assessment of benefits accruing out of the proposed projects and continuous monitoring of the implementation process on the socio-economic and environmental impact.

Non-Governmental Organizations (NGOs). Accredited NGOs based on their past performance and past experience in related aspects would be empanelled for participation in project detailing and implementation of the various components of the JNNURM Project.

The following figure indicates the proposed project management structure.

Figure 14.1: Proposed Project Management Structure



15. ESTIMATES OF COST

Summary of Proposals of JNNURM Project (Rs. Crores)

Investment Sector	FY-1 (05-06)	FY-2 (06-07)	FY-3 (07-08)	FY-4 (08-09)	FY-5 (09-10)	FY-6 (10-11)	FY-7 (11-12)	Total
Spatial Growth & Land utilization	0.00	11.50	10.00	4.50	3.50	0.50	0.00	30.00
Water Supply								
a. Conventional	0.00	1.63	84.01	210.12	216.89	332.06	327.59	1,172.30
b. Desalination	0.00	6.50	23.50	0.00	0.00	0.00	0.00	30.00
c. Special Water supply Eloor & Kalamaserry	0.00	1.00	2.00	2.00	5.00	1.20	0.00	11.20
d. Rain Water Harvesting	0.00	0.84	2.36	0.00	0.00	0.00	0.00	3.20
Sewerage	0.00	18.25	223.25	562.80	1,102.75	315.00	406.95	2,629.00
Drainage	0.00	142.85	183.40	208.15	166.60	128.50	72.50	902.00
Solid Waste Management	0.00	40.41	45.57	27.79	14.71	11.96	11.96	152.40
Traffic & Transportation	0.00	692.00	1,041.00	1,093.00	847.00	519.00	60.00	4,252.00
Basic Service to the Urban Poor	0.00	206.15	184.93	183.73	142.13	92.13	75.93	885.00
Heritage	0.00	11.42	11.42	15.22	19.01	11.42	7.61	76.10
Tourism	0.00	42.20	51.20	66.60	67.00	36.20	21.55	284.75
Environmental Protection	0.00	7.05	64.80	64.01	63.90	48.70	42.45	291.00
Urban Renewal & Social Amenities	0.00	31.10	64.20	65.20	51.00	40.00	8.00	259.50
O & M – Institutional strengthening	0.00	2.00	0.60	0.60	0.60	0.60	0.60	5.00
Total	**0.00**	**1,214.90**	**1,992.24**	**2,503.81**	**2,700.09**	**1,537.27**	**1,035.14**	**10,983.45**

1. SPATIAL GROWTH AND LAND UTILIZATION

Table A: Line Estimate

Sl. No.	Particulars	Estimated Cost (Rs. Crores)
1	Creation of land use data base on GIS format For the entire Greater Kochi Region	10
2	Preparation of perspective plan for Greater Kochi Region	3
3	Preparation of Master Plan for CDP Area	3
4	Conservation of Water sheets by creating public walkway on the water edge including shore protection • Corporation Area - Rs. 3 Crores • Municipal Area - Rs. 6 Crores • Panchayat Area - Rs. 5 Crores	14
	Total Cost	**30**

Table B: Investment Plan

No.	Projects		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total Rupees Crores
I	Creation of land use data base on GIS format for the entire Greater Cochin Region		0	8	2	0	0	0	0	10
II	Preparation of perspective plan for Greater Kochi Region		0	1	2	0	0	0	0	3
III	Preparation of Master Plan for CDP area		0	1	2	0	0	0	0	3
IV	Conservation of Water sheets by creating public walkway on the water edge including shore protection	a. Corporation area	0	0.5	0.5	1	1	0	0	3
		b. Municipal area	0	0.5	2	2	1	0.5	0	6
		c. Panchayat area	0	0.5	1.5	1.5	1.5	0	0	5
TOTAL			**0**	**11.5**	**10**	**4.5**	**3.5**	**0.5**	**0**	**30**

Table C: Strategy for Achieving the Vision

No.	Projects		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
I	Creation of land use data base on GIS format for the entire Greater Cochin Region			✓	✓				
II	Preparation of perspective plan for Greater Cochin Region			✓	✓	✓			
III	Preparation of Master Plan for CDP area			✓	✓				
IV	Conservation of Water sheets by creating public walkway on the water edge including shore protection	a. Corporation area		✓	✓	✓	✓		
		b. Municipal area		✓	✓	✓	✓	✓	
		c. Panchayat area		✓	✓	✓	✓		

2. WATER SUPPLY

Table A: Line Estimate – Total Water Supply Sector

Sl. No	Particulars	Estimated Cost (Rs. Crores)
1	Regular water supply	1172.30
2	Special Water Supply Projects	11.20
3	Setting up of Desalination Plants	30.00
4	Rain Water Harvesting	3.20
	Total Water Supply	**1,216.70**

Table B: Investment Plan (Regular Water Supply)

Activity	05-06	06-07	07-08	08-09	09-10	10-11	11-12	Total	JNNURM			
	(Rs. Crores)								GOI	GOK	IR/IF	Total
									(Rs. Crores)			
Comprehensive Water Sector Development Master Plan	0	0.08	1.50	1.50				3.08	1.54	0.62	0.92	3.08
Energy Audit Studies	0	0.08	1.50	1.50				3.08	1.54	0.62	0.92	3.08
Water Quality Studies and Monitoring	0	0.08	1.50	1.00	0.50	0.50	0.50	4.08	2.04	0.82	1.22	4.08
Design and Implementation of Communication Strategy	0	0.10	1.00	1.00	1.00	0.75	0.75	4.60	2.30	0.92	1.38	4.60
Baseline Survey	0		0.75					0.75	0.38	0.15	0.23	0.75
Human Resources Development	0	0.10	1.00	2.00	2.00	1.75	1.50	8.35	4.18	1.67	2.51	8.35
Establishment of Regulatory Authority	0	0.10	0.75	1.50	1.50	1.50	1.50	6.85	3.43	1.37	2.06	6.85
GIS Mapping of Water and Sewerage Utility Mapping	0		1.00	2.00	0.50	0.50	0.50	4.50	2.25	0.90	1.35	4.50
Community Initiatives Support	0		0.50	0.50	0.50	0.50		2.00	1.00	0.40	0.60	2.00

Activity	05-06	06-07	07-08	08-09	09-10	10-11	11-12	Total	JNNURM			
	(Rs. Crores)								GOI	GOK	IR/IF	Total
									(Rs. Crores)			
Modernizing Financial Management and MIS	0	0.75	1.00	1.00	1.00			3.75	1.88	0.75	1.13	3.75
E-Governance	0		0.60	0.60	0.60	0.60	0.60	3.00	1.50	0.60	0.90	3.00
Sub-Total	**0**	**1.29**	**11.10**	**12.60**	**7.60**	**6.10**	**5.35**	**44.04**	22.02	8.81	13.21	44.04
Protection of river sources, Periyar and Muvattupuzha rivers	0	0.10	0.13	0	0	0	0	0.23	0.11	.05	.07	0.23
Construction of Intake arrangements at Aluva	0	0	0.50	2.00	2.00	0.50	0	5.00	2.50	1.00	1.50	5.00
Construction of Intake arrangements at Pazhoor	0	0	0.25	0.50				0.75	.38	0.15	.23	0.75
Construction of 100 mld Water Treatment plant at Maradu	0	0	2.50	5.00	6.00	3.00		16.50	8.25	3.30	4.95	16.50
Construction of 285 mld Water Treatment Plant at Kalamassery	0	0	3.00	5.00	8.00	9.00	4.50	29.50	14.75	5.90	8.85	29.50
Sub-Total	**0**	**10**	**6.38**	**12.50**	**16.00**	**12.50**	**4.50**	**51.98**	25.99	10.40	15.59	51.98
Laying Raw Water Pumping Mains	0	000	20.00	20.00	24.00	36.00	48.74	148.74	74.37	29.75	44.62	148.74
Laying Clear Water Pumping Mains	0		8.00	6.09	5.00	6.00	5.00	30.09	15.05	6.02	9.03	30.09
Construction of GL sumps and service reservoirs	0			8.63	15.00	7.56	2.00	33.19	16.60	6.64	9.96	33.19
Construction of Electrical Sub-station and Pump Houses	0		1.30	3.00	4.00	3.00	3.00	14.30	7.15	2.86	4.29	14.30
Supply and Erection of Pump sets	0		0.63	3.00	3.00	3.00	2.00	11.63	5.82	2.33	3.49	11.63

Activity	05-06	06-07	07-08	08-09	09-10	10-11	11-12	Total	JNNURM			
	(Rs. Crores)								GOI	GOK	IR/IF	Total
									(Rs. Crores)			
Laying transmission mains and rehabilitation of existing distribution system	0		4.00	5.00	5.00	4.00	2.00	20.00	10.00	4.00	6.00	20.00
Laying additional distribution net works	0		5.00	98.00	98.00	199.00	200.00	600.00	300.00	120.00	180.00	600.00
Sub-Total	**0**	**0**	**38.93**	**143.72**	**154.00**	**258.56**	**262.74**	**857.95**	428.98	171.59	257.39	857.95
a) SCADA Project b)	0		8.30	12.50	12.50	16.60	16.60	66.50	33.25	13.30	19.95	66.50
b) UFW Reduction Project	0		8.00	12.00	12.00	19.90	19.90	71.80	35.90	14.36	21.54	71.80
c) 24 Hr. Water Supply Project	0		9.20	13.80	13.80	18.40	18.40	73.60	36.80	14.72	22.08	73.60
Sub-Total	**0**	**0**	**25.50**	**38.30**	**38.30**	**54.90**	**54.90**	**211.90**	105.95	42.38	63.57	211.90
1. O & M of Water Supply system	**0**											
a) Motor & Electrical repairs and up gradation	0	0.18	0	0	0	0	0	0.18	.09	.04	.05	0.18
b) Distribution network reforms rationalization	0	0	0.80	1.70	0.34	0	0.10	2.94	1.47	0.59	0.88	2.94
Sub-Total	**0**	**0.18**	**0.80**	**1.70**	**0.34**	**0**	**0.10**	**3.12**	1.56	0.62	0.94	3.12
Citizen feed back mechanisms to be established	0	0.03	0.65	0.65	0.65	0	0	**1.98**	0.99	0.40	0.59	1.98
Modernization of Complaint redressal system	0	.03	0.65	0.65	0	0	0	**1.33**	.67	0.27	.40	1.33
Sub-Total	**0**	**.06**	**1.30**	**1.30**	**60.5**	**0**	**0**	**3.31**	1.66	0.66	0.99	3.31
Grand Total	**0**	**1.63**	**84.01**	**210.12**	**216.89**	**332.06**	**327.59**	**1172.30**	586.15	234.46	351.69	1172.30

Table C: Investment Plan - Special Water Supply Projects

Name of Local body	05-06	06-07	07-08	08-09	09-10	10-11	11-12	Total
	(Rs. Cores)							
Eloor Panchayat	0.00	1	1.10	2.00	5.00	1.20	0.00	10.30
Kalamaserry Municipality	0.00	0.00	0.9	0.00	0.00	0.00	0.00	0.90
Total	**0.00**	**1.00**	**2.00**	**2.00**	**5.00**	**1.20**	**0.00**	**11.20**

Table D: Investment Plan - Setting up Desalination Plants in Coastal Areas

No	Place	Capacity of Plant In Lakh Liters./day	2005 -06	2006 -07	2007 -08	2008 -09	2009 -10	2010 -11	2011 -12	Total
			Rs. Crores							
1	Mattanchery-Fort Cochin area of Cochin Corporation									
	a) Desalination Plant	8	0	0.5	6.0	0	0	0	0	6.5
	b) Bottling plant		0	0.5	0	0	0	0	0	0.5
2	Palluruthy Edakochi area of Cochin Corporation									
	a) Desalination Plant	5	0	0.5	4	0	0	0	0	4.5
	b) Bottling plant		0	0.5	0	0	0	0	0	0.5
3	Elamkunnapuzha Panchayat									
	a) Desalination plant	2.5	0	0.2	2.4	0	0	0	0	2.6
	b) Bottling plant		0	0.25	0	0	0	0	0	0.25
4	Njarakkal Panchayat									
	c) Desalination plant	1	0	0.2	1	0	0	0	0	1.2
	d) Bottling plants		0	0.25	0	0	0	0	0	0.25
5	Chellanam									
	a) Desalination plant	1.25	0	0.2	1.3	0	0	0	0	1.5
	b) bottling plants		0	0.25	0	0	0	0	0	0.25
6	Kumbalangi									
	a) Desalination plant	1.25	0	0.2	1.3	0	0	0	0	1.5
	b) Botling plant		0	0.25	0	0	0	0	0	0.25
7	Maradu									
	a) Desalination plant	1.75	0	0.2	1.8	0	0	0	0	2.0
	b) Bottling plants		0	0.25	0	0	0	0	0	0.25

No	Place	Capacity of Plant In Lakh Liters./day	2005 -06	2006 -07	2007 -08	2008 -09	2009 -10	2010 -11	2011 -12	Total
			Rs. Crores							
8	Kumbalam a) Desalination plant b) Bottling plants	1.25	0 0	0.2 0.25	1.3 0	0 0	0 0	0 0	0 0	1.5 0.25
9	Mulavukad a) Desalination plant b) Bottling plant	1.25	0 0	0.2 0.25	1.3 0	0 0	0 0	0 0	0 0	1.5 0.25
10	Kadamakkudy a) Desalination plant b) Bottling plants	0.75	0 0	0.2 0.25	0.8 0	0 0	0 0	0 0	0 0	1.0 0.25
11	Cheranaloor a) Desalination Plant b) Bottling Plant	1.25	0 0	0.2 0.25	1.3 0	0 0	0 0	0 0	0 0	1.5 0.25
12	Varappuzha a) Desalination plant b) Bottling plants	1.0	0 0	0.2 0.25	1 0	0 0	0 0	0 0	0 0	1.2 0.25
TOTAL			**0**	**6.5**	**23.5**	**0**	**0**	**0**	**0**	**30.00**

Table E: Investment Plan Rain Water Harvesting

No		Proposals	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total Cost
			(Rs. Crores)							
1	a	Purchase of Ferrocement Tanks for public Buildings in 13 panchayat areas	0	0.4	1.97	0	0	0	0	2.37
	b	Construction of re charge pits	0	0.1	0.05	0	0	0	0	0.15
2	a	Purchase of Ferrocement Tanks for public buildings in 2 municipal areas.	0	0.2	0.2	0	0	0	0	0.4
	b	Construction of re charge pits in municipal areas	0	0.03	0.03	0	0	0	0	0.06
3	a	Purchase of Ferrocement Tanks for public buildings in Corporation area	0	0.1	0.1	0	0	0	0	0.2
	b	Construction of re charge pits in municipal areas	0	.01	0.01	0	0	0	0	0.02
		Total		**0.84**	**2.36**	**0**	**0**	**0**	**0**	**3.20**

Table F: Water Supply – Strategy to Achieve Vision

Component	Activity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Planning, Reforms and Institutional Strengthening	Comprehensive Water Sector Development Master Plan							
	Energy Audit Studies							
	Water Quality Studies and Monitoring		√	√	√	√	√	√
	Design and Implementation of Communication Strategy		√	√	√	√	√	√
	Baseline Survey							
	Human Resources Development					√	√	√
	Establishment of Regulatory Authority	**Proposed scheme is augmentation of the existing one under KWA**						
	GIS Mapping of Water and Sewerage Utility Mapping		√					
	Community Initiatives Support					√		
	Modernizing Financial Management and MIS		√	√	√			
	E-Governance		√	√	√	√	√	√
Water Resource Management	Protection of river sources , Periyar and Muvattupuzha rivers		√	√	√	√	√	√
	Construction of Intake arrangements at Aluva		√	√	√			
	Construction of Intake arrangements at Pazhoor		√	√	√			
	Construction of 100 mld Water Treatment plant at Maradu		√	√	√			
	Construction of 285 mld Water Treatment Plant at Kalamassery		√	√	√	√		
Augmentation of Water Supply	Laying Raw Water Pumping Mains		√	√	√	√		
	Laying Clear Water Pumping Mains		√	√	√	√		
	Construction of GL sumps and service reservoirs		√	√	√	√	√	
	Construction of Electrical Sub-station and Pump Houses		√	√	√	√	√	
	Supply and Erection of Pump sets				√	√	√	
	Laying transmission mains and rehabilitation of existing distribution system		√	√	√	√	√	
	Laying additional distribution net works		√	√	√	√	√	
Service Delivery	a) SCADA Project		√	√	√	√	√	√
	b) UFW Reduction Project		√	√	√	√	√	√
	c) 24 Hr. Water Supply Project		√	√	√	√	√	√
Governance	**1. O & M of Water Supply system**							
	a) Motor & Electrical repairs and upgradation		√	√	√	√		
	b) Distribution network reforms rationalization		√	√	√	√	√	√
Citizens Relations Management	Citizen feed back mechanisms to be established			√	√	√		
	Modernization of Complaint redressal system		√	√				

3. SEWERAGE SYSTEM

Table A: Line Estimate

Sl. No	Particulars	Estimated cost (Rs. Crores)
1	Planning, Reforms and Institutional Strengthening	32.95
2.	Construction of TP, and Service Delivery System	2596.05
	Total	**2629.00**

Table B: Investment Plan

Component	Activity	06-07	07-08	08-09	09-10	10-11	11-12	Total	JNNURM			
		(Rs Crores)							GoI	GoK	IR/IF	Total
Planning, Reforms and Institutional Strengthening	Comprehensive Sewerage Sector Development Master Plan	1.00	1.50	1.50	2.00	1.00	1.00	8.00	4.00	1.60	2.40	8.00
	Energy Audit Studies	1.00	1.50	1.50	0.50	0.50	0	5.00	2.50	1.00	1.50	5.00
	Sewerage Quality Studies and Monitoring	1.00	2.00	1.00	0.50	0.50	0.50	5.50	2.75	1.10	1.65	5.50
	Design and Implementation of Communication Strategy	0.10	1.00	1.00	1.00	0.75	0.75	4.60	2.30	0.92	1.38	4.60
	Human Resources Development	0.05	0.25	0.25	0.25	0.50	0.20	1.50	0.75	0.30	0.45	1.50
	Community Initiatives Support	0.10	1.00	2.00	2.00	1.75	1.50	8.35	4.18	1.67	2.51	8.35
	Sub Total	3.25	7.25	7.25	6.25	5.00	3.95	32.95	16.48	6.59	9.89	32.95
Construction of TP, and Service Delivery System	Construction of TP	1.00	20.00	50.00	100.00	30.00	36.00	237.00	118.50	47.40	71.10	237.00
	Construction of Lifting station	1.00	11.00	27.00	55.00	16.00	20.00	130.00	65.00	26.00	39.00	130.00
	Laying Trunk Sewers	7.00	80.00	197.00	402.00	117.00	146.00	949.00	474.50	189.80	284.70	949.00
	Laying Distribution Sewers	6.00	68.00	169.00	344.00	100.00	125.00	812.00	406.00	162.40	243.60	812.00
	Supplying & Errection of Pump sets	0	1.00	4.00	7.00	2.00	3.00	17.00	8.50	3.40	5.10	17.00
	Road Restoration Charges & Railway Crossings	0	10.00	39.00	67.00	19.00	29.00	164.00	82.00	32.80	49.20	164.00
	Power allocation	0	1.00	2.55	4.50	1.00	2.00	1.105	5.53	2.21	3.32	11.05
	Rehabilitation of Existing Sewerage System	0	16.00	40.00	72.00	16.00	32.00	176.00	88.00	35.20	52.80	176.00
	Procurement of Tools & Plants, Machineries , Vehicles etc.	0	9.00	27.00	45.00	9.00	10.00	100.00	50.00	20.00	30.00	100.00
	Sub Total	15.00	216.00	555.55	1,096.50	310.00	403.00	2,586.11	1,330.99	519.21	778.82	2596.05
	TOTAL	**18.25**	**223.25**	**562.80**	**1102.75**	**315.00**	**406.95**	**262.900**	**1314.50**	**525.80**	**788.70**	**2629.00**

Table C: Strategy to Achieve Vision

Component	Activity	06-07	07-08	08-09	09-10	10-11	11-12
Planning, Reforms and Institutional Strengthening	Comprehensive Sewerage Sector Development Master Plan	✓	✓	✓	✓	✓	✓
	Energy Audit Studies	✓	✓	✓	✓	✓	
	Sewerage Quality Studies and Monitoring	✓	✓	✓	✓	✓	✓
	Design and Implementation of Communication Strategy	✓	✓	✓	✓	✓	✓
	Human Resources Development	✓	✓	✓	✓	✓	✓
	Community Initiatives Support	✓	✓	✓	✓	✓	✓
Construction of TP, and Service Delivery System	Construction of TP	✓	✓	✓	✓	✓	✓
	Construction of Lifting station	✓	✓	✓	✓	✓	✓
	Laying Trunk Sewers	✓	✓	✓	✓	✓	✓
	Laying Distribution Sewers	✓	✓	✓	✓	✓	✓
	Supplying & Errection of Pump sets		✓	✓	✓	✓	✓
	Road Restoration Charges & Railway Crossings		✓	✓	✓	✓	✓
	Power allocation		✓	✓	✓	✓	✓
	Rehabilitation of Existing Sewerage System		✓	✓	✓	✓	✓
	Procurement of Tools & Plants, Machineries , Vehicles etc.		✓	✓	✓	✓	✓

4. STORM WATER DRAINAGE

Table A: Line Estimates

Sl. No.	Particulars	Estimated Cost (Rs. Crores)
1	Capacity building	36.00
2	Primary Drains Rehabilitation	265.71
3	Construction of secondary drain (natural and man- made)	361.82
4	Construction of Area drains	177.07
5	Others	61.40
	Total	**902.00**

Table B: Investment Plant

Component	Activity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total
		(Rs. Crores)							
1. Capacity building	Identification of problem areas	0.00	1.50						1.50
	R & R Planning	0.00	2.50	2.00	1.50	1.00	0.50	0.50	8.00
	Comprehensive Drainage Master Plan	0.00	2.50	0.50					3.00
	Preparation of feasibility report and detailed engineering studies	0.00	18.50	5.00					23.50
	Sub Total	**0.00**	**25.00**	**7.50**	**1.50**	**1.00**	**0.50**	**0.50**	**36.00**
2. Primary Drains Rehabilitation	Desilting and removal of weeds	0.00	4.78	5.00	4.00	1.00			14.78
	Removal and rehabilitation of encroachments	0.00	5.70	7.50	7.50	5.00			25.70
	Widening & Deepening	0.00	5.50	5.00	5.00	3.00	2.00		20.50
	Construction of side walls & lining	0.00	10.77	20.00	25.00	20.00	15.00	10.00	100.77
	Construction of cross drainage works	0.00	6.12	16.00	15.00	11.00	10.00	6.00	64.12
	Construction of canal side roads	0.00	5.45	3.00	5.00	5.00	4.00	3.00	25.45
	Landscaping	0.00	1.39	3.00	4.00	3.00	2.00	1.00	14.39
	Sub Total	**0.00**	**39.71**	**59.50**	**65.50**	**48.00**	**33.00**	**20.00**	**265.71**
3. Construction of secondary drain (natural and man- made)	Desilting and removal of weeds	0.00	4.12	1.50	1.00				6.62
	Removal and rehabilitation of encroachments	0.00	1.50	1.50	1.00				4.00
	Widening and deepening	0.00	1.65	1.00	0.50	0.50			3.65
	Construction of side walls and lining	0.00	35.35	60.00	75.00	60.00	45.00	15.00	290.35

Component	Activity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total
		(Rs. Crores)							
	Construction of cross drainage works	0.00	5.80	10.00	12.50	7.50	5.00	5.00	45.80
	Construction of canal side roads	0.00	0.55	2.00	2.00	1.50	1.00	0.50	7.55
	Landscaping	0.00	0.35	0.50	1.00	1.00	0.50	0.50	3.85
	Sub Total	**0.00**	**49.32**	**76.50**	**93.00**	**70.50**	**51.50**	**21.00**	**361.82**
4. Construction of Area drains	Desilting and removal of weeds	0.00	0.25	0.40	0.15	0.10			0.90
	Construction of interior drains	0.00	21.28	30.00	35.00	35.00	30.00	22.00	173.28
	cross drainage works	0.00	0.39	0.50	0.50	0.50	0.50	0.50	2.89
	Sub Total	**0.00**	**21.92**	**30.90**	**35.65**	**35.60**	**30.50**	**22.50**	**177.07**
5. Others	Public awareness	0.00	1.00	1.00	1.00	1.00	1.00		5.00
	Feasibility study of ground water charging and implementation	0.00	1.40	3.00	4.00	2.00	1.00		11.40
	Canal water quality improvement	0.00	1.00	1.00	1.50	1.50	3.00	2.00	10.00
	Regulatory pumping system	0.00	0.50	1.00	2.00	2.00	3.00	1.50	10.00
	Unforeseen items	0.00	2.00	3.00	4.00	5.00	5.00	5.00	25.00
	Sub Total	**0.00**	**6.90**	**9.00**	**12.50**	**11.50**	**13.00**	**8.50**	**61.40**
	Grant Total	**0.00**	**142.85**	**183.40**	**208.15**	**166.60**	**128.50**	**72.50**	**902.00**

Table C: Strategy to Achieve Vision

Component	Activity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
1. Capacity Building	Identification of problem areas		√					
	R & R Planning		√	√	√	√	√	√
	Comprehensive Drainage Master Plan		√	√				
	Preparation of feasibility report and detailed engineering studies		√	√				
2. Primary Drains Rehabilitation	Desilting and removal of weeds		√	√	√	√		
	Removal and rehabilitation of encroachments		√	√	√	√		
	Widening & Deepening		√	√	√	√	√	
	Construction of side walls & lining		√	√	√	√	√	√
	Construction of cross drainage works		√	√	√	√	√	√
	Construction of canal side roads		√	√	√	√	√	√

Component	Activity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
	Landscaping		√	√	√	√	√	√
3. Construction of secondary drain (natural and man-made)	Desilting and removal of weeds		√	√	√			
	Removal and rehabilitation of encroachments		√	√	√			
	Widening and deepening		√	√	√	√		
	Construction of side walls and lining		√	√	√	√	√	√
	Construction of cross drainage works		√	√	√	√	√	√
	Construction of canal side roads		√	√	√	√	√	√
	Landscaping		√	√	√	√	√	√
4. Construction of Area drains	Desilting and removal of weeds		√	√	√	√		
	Construction of interior drains		√	√	√	√	√	√
	cross drainage works		√	√	√	√	√	√
5. Others	Public awareness		√	√	√	√	√	
	Feasibility study of ground water charging and implementation		√	√	√	√	√	
	Canal water quality improvement		√	√	√	√	√	√
	Regulatory pumping system		√	√	√	√	√	√
	Unforeseen items		√	√	√	√	√	√

5. SOLID WASTE MANAGEMENT

Table A: Line Estimates

Sl. No	Particulars	Estimated Cost (Rs. Crores)
1.	Awareness cum Live Model Demonstration	48.55
2.	Segregation of Solid Waste at Source	20.89
3.	Special Purpose Vehicles	11.19
4.	Secondary Collection	5.00
5.	Slaughter House/Main Market Waste	0.7
6.	Litter Bins	0.54
7.	Incineration Units	0.75
8.	Weighing Mechanism	2
9.	Sorting Bio-non-Degradable Waste	2
10.	Composting	6
11.	Bio-Methanation Plant	9
12.	Secure Land Filling Facility	18
13.	Excavators	0.32
14.	Effluent Treatment Plant	6
15.	Drinking Water at Main Processing Site	2
16.	Green Belt & Picnic Spot	5.5
17.	Capacity Building	12
18.	Building Waste	0.96
	Total	**151.40**

Table B: Investment Plan

Sl. No	Description	Funding Pattern	Fund	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total
				(Rs. Crores)							
1.	**Awareness cum Live Model Demonstration**										
1.1	Schools.	Sponsorship	30% fund from sponsors	0	6	10	5	2	2	2	27
1.2	Institution	Private Participation	fund given, to be repaid		2.5	5	2.5	1	1	1	13
1.3	Community	Community Participation	fund given,to be repaid		1	2.5	1.65	0.5	0.5	0.5	6.65
1.4	Biogas based Power	ULB	30%fund through sponsors		1	1					2
1.5	Sludge Extraction and transport equipment for 1.2 to 1.4	Private Participation	fund given, to be repaid		0.3	0.3	0.3				0.9
	Sub-Total										**49.55**
2.	**Segregation of Solid Waste at Source**										
2.1	Domestic Waste Bins	Sponsorship	30% fund from sponsors	0	7.85	3.9	3.9	1.56	1.56	1.56	20.33
2.2	Domestic Vermi-composting units	User to Pay	Fund given, to be repaid	0	0.16	0.08	0.08	0.08	0.08	0.08	0.56

Sl. No	Description	Funding Pattern	Fund	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total
				(Rs. Crores)							
2.3	Door to door primary collection	User to Pay	Pay urban poor employment								
	Sub-Total										**20.89**
3.	**Special Purpose Vehicles**										
3.1	SPVs	Private Participation	Fund given, to be repaid		3.9	1.95	1.95	0.78	0.78	0.78	10.14
3.2	Cleaning Service for SPVs	Private Participation	Fund given, to be repaid		0.39	0.18	0.21	0.09	0.09	0.09	1.05
	Sub-Total										**11.19**
4.	**Secondary Collection**										
4.1	Secondary Collection	private participation	fund given, to be repaid		1.9	1	0.9	0.4	0.4	0.4	5
4.2	Waste from institutions	user to pay	pay, urban poor employment								
	Sub-Total										**5**
5.	**Slaughter House/Main Market Waste**	user to pay	ULB /Private Fund		0.2	0.1	0.1	0.1	0.1	0.1	0.7
6.	**Litter Bins**	sponsors	30%fund through sponsors	0	0.39	0.03	0.03	0.03	0.03	0.03	0.54
7.	**Incineration Units**	users to pay	fund given, to be repaid		0.5	0.05	0.05	0.05	0.05	0.05	0.75
	Main Solid Waste Processing At Brahmapuram										
8.	**Weighing Mechanism**	ULB	ULB fund		2						2
9.	**Sorting Bio-non-Degradable Waste**	Private Participation	fund given, to be repaid		2						2
10.	**Composting**	Private participation	fund given, to be repaid		1	1	1	1	1	1	6
11.	**Bio-Methanation Plant**	Private participation	fund given, to be repaid		3	3	3				9
12.	**Secure Land Filling Facility**	Private participation	fund given, to be repaid		3	3	3	3	3	3	18
13.	**Excavators**	Private participation	fund given, to be repaid		0.32						0.32
14.	**Effluent Treatment Plant**	Private participation	fund given, to be repaid			6					6
15.	**Drinking Water at Main Processing Site**	ULB	fund given, to be repaid			2					2
16.	**Green Belt & Picnic Spot**	Corporate participation	fund given, to be repaid		1	2	1	1	0.25	0.25	5.5
17.	**Capacity Building**										
17.1	Training	ULB	ULB			2	3	3	1	1	10
17.2	Computerization	ULB	ULB		2						2
	Sub Total										**12**
18.	**Building Waste**	Private participation	fund given, to be repaid			0.48	0.12	0.12	0.12	0.12	0.96
	Total			**0**	**40.41**	**45.57**	**27.79**	**14.71**	**12**	**11.96**	**152.4**

Table C: Strategy to Achieve Vision

Sl. No	Description	Funding Pattern	Fund	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
				(Rs. Crores)						
1.	**Awareness cum Live Model Demonstration**									
1.1	Schools.	Sponsorship	30% fund from sponsors		✓	✓	✓	✓	✓	✓
1.2	Institution	Private Participation	fund given, to be repaid		✓	✓	✓	✓	✓	✓
1.3	Community	Community Participation	fund given,to be repaid		✓	✓	✓	✓	✓	✓
1.4	Biogas based Power	ULB	30%fund through sponsors		✓	✓				
1.5	Sludge Extraction and transport equipment for 1.2 to 1.4	Private Participation	fund given, to be repaid		✓	✓	✓			
2.	**Segregation of Solid Waste at Source**									
2.1	Domestic Waste Bins	Sponsorship	30% fund from sponsors		✓	✓	✓	✓	✓	✓
2.2	Domestic Vermi-composting units	User to Pay	Fund given, to be repaid		✓	✓	✓	✓	✓	✓
2.3	Door to door primary collection	User to Pay	Pay urban poor employment							
3.	**Special Purpose Vehicles**									
3.1	SPVs	Private Participation	Fund given, to be repaid		✓	✓	✓	✓	✓	✓
3.2	Cleaning Service for SPVs	Private Participation	Fund given, to be repaid		✓	✓	✓	✓	✓	✓
4.	**Secondary Collection**									
4.1	Secondary Collection	private participation	fund given, to be repaid		✓	✓	✓	✓	✓	✓
4.2	Waste from institutions	user to pay	pay, urban poor employment							
5.	**Slaughter House/Main Market Waste**	user to pay	ULB /Private Fund		✓	✓	✓	✓	✓	✓
6.	**Litter Bins**	sponsors	30%fund through sponsors		✓	✓	✓	✓	✓	✓
7.	**Incineration Units**	users to pay	fund given, to be repaid		✓	✓	✓	✓	✓	✓
	Main Solid Waste Processing At Brahmapuram									
8.	**Weighing Mechanism**	ULB	ULB fund		✓					
9.	**Sorting Bio-non-Degradable Waste**	Private Participation	fund given, to be repaid		✓					
10.	**Composting**	Private participation	fund given, to be repaid		✓	✓	✓	✓	✓	✓
11.	**Bio-Methanation Plant**	Private participation	fund given, to be repaid		✓	✓	✓			
12.	**Secure Land Filling Facility**	Private participation	fund given, to be repaid		✓	✓	✓	✓	✓	✓
13.	**Excavators**	Private participation	fund given, to be repaid		✓					

Sl. No	Description	Funding Pattern	Fund	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
				(Rs. Crores)						
14.	**Effluent Treatment Plant**	Private participation	fund given, to be repaid			✓				
15.	**Drinking Water at Main Processing Site**	ULB	fund given, to be repaid			✓				
16.	**Green Belt & Picnic Spot**	Corporate participation	fund given, to be repaid		✓	✓	✓	✓	✓	✓
17.	**Capacity Building**									
17.1	Training	ULB	ULB			✓	✓	✓	✓	✓
17.2	Computerization	ULB	ULB		✓					
18.	**Building Waste**	Private participation	fund given, to be repaid			✓	✓	✓	✓	✓

6. TRAFFIC AND TRANSPORTATION

Table A: Line Estimates

Sl No	Particulars	Length in KM/Nos	Estimated Cost (Rs. Crores)
1	RFB Projects (16 Nos), Improvement to NH Standard	8.30	163.00
2	Outer Ring Roads	35.00	140.00
3	Inner Ring Roads	42.00	85.00
4	Link Roads	17.20	93.00
5	Roads Through CBD Area	26.00	37.00
6	Radial Roads	110.50	233.00
7	Water Front Road	40.00	132.00
8	Secondary Roads	1325.20	675.00
9	Rail Over Bridges	18	332.00
10	Fly Overs/ Sub Ways	9	415.00
11	Bridges	74	915.00
12	Multi Level Parking	39	59.00
13	Public Comfort Centres connected to bus station and traffic centres	7	2.00
14	Moffusil Bus Terminals	15	130.00
15	Peripheral Parkings	5	15.00
16	Truck Terminals	4	70.00
17	Pedestrian crossing/ escalator facilities	8	16.00
18	Road Markings and Sign Boards	LS	14.00
19	Signals	LS	25.00
20	Waiting Sheds	LS	6.00
21	Bus Bays	250	12.00
22	Inland Water transport Terminals, Navigational aids, Canal dredging and scientific disposal	36	48.00
23	Metro rail, Viability Gap		635.00
	Total		**4,252.00**

Table B: Investment Plan

Sl No	Name of Project	Length in KM/Nos	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Amount in Crores
1	RFB Projects (16 Nos), Improvement to NH Standard	8.30	0	43	30	30	30	30	0	163.00
2	Outer Ring Roads	35.00	0	27	30	45	20	18	0	140.00
3	Inner Ring Roads	42.00	0	15	20	20	20	10	0	85.00
4	Link Roads	17.20	0	13	30	20	20	10	0	93.00
5	Roads Through CBD Area	26.00	0	14	10	10	3	0	0	37.00
6	Radial Roads	110.50	0	40	47	50	55	40	1	233.00
7	Water Front Road	40.00	0	22	30	40	20	20	0	132.00
8	Secondary Roads	1325.20	0	114	119	130	150	150	12	675.00
9	Rail Over Bridges	18	0	72	100	120	40	0	0	332.00
10	Fly Overs/ Sub Ways	9	0	46	110	110	120	29	0	415.00
11	Bridges	74	0	110	180	180	195	205	45	915.00
12	Multi Level Parking	39	0	7	20	20	12	0	0	59.00
13	Public Comfort Centres connected to bus station and traffic centres	7	0	1	1	0	0	0	0	2.00
14	Moffusil Bus Terminals	15	0	22	50	50	8	0	0	130.00

Sl No	Name of Project	Length in KM/Nos	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Amount in Crores
15	Peripheral Parkings	5	0	5	5	5	0	0	0	15.00
16	Truck Terminals	4	0	17	25	28	0	0	0	70.00
17	Pedestrian crossing/ escalator facilities	8	0	3	6	5	2	0	0	16.00
18	Road Markings and Sign Boards	LS	0	5	3	3	3	0	0	14.00
19	Signals	LS	0	5	5	5	5	5	0	25.00
20	Waiting Sheds	LS	0	3	3	0	0	0	0	6.00
21	Bus Bays	250	0	2	2	2	2	2	2	12.00
22	Inland Water transport Terminals, Navigational aids, Canal dredging and scientific disposal	36	0	6	15	20	7	0	0	48.00
23	Metro rail, Viability Gap		0	100	200	200	135	0	0	635.00
Grant Total			**0**	**692**	**1041**	**1093**	**847**	**519**	**60**	**4,252.00**

Table C: Strategy to Achieve Vision

Component	Institution	Activity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Planning, Reforms and Institutional Strengthening	CoC	Upgradation of Traffic & Transportation Study for entire for the Designated area		✓					
	GoK	Constitution and Operationalisation of Greater Cochin Transport Authority (GCTA)		✓					
	CoC	Transport Assets and utilities mapping using G.I.S. Technology		✓	✓	✓	✓	✓	
	CoC, Police dept.	Traffic and Transportation Management using G.I.S. and G.P.S. technology		✓	✓	✓			
	CoC, Police dept.	Design and Implementation of IEC campaign for improved traffic awareness		✓	✓	✓	✓	✓	
	CoC	Capacity building initiatives for better traffic management		✓	✓	✓	✓	✓	
	CoC/ Municipality / Panchayath	Provision of bus bays, including waiting Sheds in identified locations including signage		✓	✓				
		Signage improvement at bus bays to streamline bus and passenger mobility		✓	✓	✓	✓	✓	✓
		Development of bus terminals, 16 Nos		✓	✓	✓	✓		
		Development of required infrastructure (signage, signal system, separators, etc.)		✓	✓	✓	✓	✓	
		Inland Water Transport Terminals, Major jetties 2 Nos, Minor jetties 36 Nos, Navigational Aids and Dredging of Water ways of 60 KMs		✓	✓	✓	✓		

Component	Institution	Activity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
	GoK/CoC/ Municipality	Provision of MRTS (length in km)		✓	✓	✓	✓		
Improved Safety, Service delivery and Customer Satisfaction by providing better infrastructure	CoC/ Municipality	Road Fund Board Projects (16 Nos), Improvement of existing roads to NH Standard		✓	✓	✓	✓	✓	
		Forming a new Outer Ring Road for stream lining Traffic		✓	✓	✓	✓	✓	
		Development of Inner Ring Roads for stream lining Traffic		✓	✓	✓	✓	✓	
		Forming a new Link Roads for stream lining Traffic		✓	✓	✓	✓	✓	✓
		Development of existing Roads of CBD area		✓	✓	✓	✓		
		Development of Radial Roads		✓	✓	✓	✓	✓	✓
		Development of Water front Roads			✓	✓			
		Development of secondary roads of the City		✓	✓	✓	✓	✓	✓
		Railway Over bridges 18 Nos		✓	✓	✓	✓	✓	
		Bridges 72 Nos		✓	✓	✓	✓	✓	✓
		Multi Level Parking 39 Nos of 50 Passenger car capacity		✓	✓	✓	✓		
		Public Comfort Centres, 7 Nos		✓	✓				
		Peripheral Parking at 5 Places		✓	✓	✓			
		Truck Terminals 4 Places		✓	✓	✓			
		Road Markings and Sign Boards		✓	✓	✓	✓		
		Signals		✓	✓	✓	✓	✓	
		Fly Overs and Sub Ways		✓	✓	✓	✓	✓	
		Pedestrian Crossing with Escalator Facilities		✓	✓	✓			

Component	Institution	Activity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Environemntal upgradation	CoC	Development of Green Belts along the Road Margins			✓	✓	✓	✓	✓
	PCB, RTA	Effective monitoring and pollution check		✓	✓	✓	✓		
	RTA, Traffic Police	Impose ban the use of air horns causing noise pollution		✓	✓				
Finance	CoC/ Mun/Panch, state govt	Constitution of Urban Transport Development Fund		-	-	-	-	-	-
		Loans/Bonds		-	-	-	-	-	-

7. BASIC SERVICES TO URBAN POOR

Table A: Line Estimates

SL. No	Components	Amount (in Rs. Crores)
1	Development of Comprehensive Data Base	3.00
2	Institutional Strengthening and Capacity Building	6.00
3	Environmental improvement of slums	39.60
4	Electricity and street light	18.00
5	Civic Amenities	166.00
6	Land Tenure and Housing	307.60
7	Social Security	62.00
8	Livelihood	35.00
9	Health	158.30
10	Education	64.50
11	Operation & Maintenance Cost	25.00
	Grand Total	**885.00**

Table B: Investment Plan

Component	Activity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total
		(Rs. Crores)							
Development of Comprehensive Data Base		0.00	2.00	1.00					3.00
	Sub Total	**0.00**	**2.00**	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**
Institutional Strengthening and Capacity Building		0.00	5.00	1.00	0.00	0.00	0.00	0.00	6.00
	Sub Total	**0.00**	**5.00**	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**6.00**
Environmental improvement of slums	Individual pipe connections to all slum dwellers	0.00	3.00	2.00	1.00	1.00	0.00	0.00	7.00
	Rain water harvesting	0.00	1.50	0.50	0.50	1.00	0.50	0.00	4.00
	construction o f bore wells to slum dwellers	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.50
	Water connections to all civic amenities	0.00	0.50	0.00	0.00	0.00	0.00	0.50	1.00
	Silt removal from culverts and drains	0.00	1.00	1.00	1.00	1.00	1.00	0.00	5.00
	Construction of small drains	0.00	2.00	1.00	1.00	1.00	1.00	1.00	7.00
	Construction of bye-lanes	0.00	4.00	2.00	2.00	2.00	2.00	2.00	14.00
	Purchase of mini buses	0.00	0.50	0.00	0.50	0.00	0.00	0.00	1.00
	Revolving Fund for O&M	0.00	0.00	0.02	0.02	0.02	0.02	0.02	0.10
	Sub Total	**0.00**	**13.00**	**6.52**	**6.02**	**6.02**	**4.52**	**3.52**	**39.60**
Electricity and street light	Electric wiring to individual house holds	0.00	1.00	1.00	1.00	1.00	1.00	1.00	6.00
	Street lights covering slum locality	0.00	1.00	1.00	1.00	1.00	1.00	1.00	6.00
	Electricity connections to all civic amenities	0.00	1.00	1.00	1.00	1.00	1.00	1.00	6.00

Component	Activity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total
		(Rs. Crores)							
	Sub Total	**0.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**18.00**
Civic Amenities	Recreational facilities to slum dwellers., Parks, Mini theatres etc	0.00	0.00	2.00	2.00	2.00	3.00	1.00	10.00
	Construction & renovation of Community Hall Centres	0.00	2.00	1.00	3.00	0.50	2.00	0.50	9.00
	Construction & renovation of community toilets& washing areas	0.00	2.00	1.25	2.00	0.50	0.50	0.75	7.00
	Setting up of day- care centres/play schools	0.00	6.00	4.00	5.00	5.00	3.00	2.00	25.00
	Day care centres for senior citizens	0.00	0.00	5.00	5.00	5.00	0.00	0.00	15.00
	Construction & Renovation of Anganwadies	0.00	10.00	5.00	5.00	4.00	4.00	2.00	30.00
	setting up of working women's hostel	0.00	5.00	5.00	5.00	2.00	3.00	0.00	20.00
	Individual Sanitary Toilets and sewerage connection	0.00	5.00	10.00	10.00	15.00	4.00	6.00	50.00
	Sub Total	**0.00**	**30.00**	**33.25**	**37.00**	**34.00**	**19.50**	**12.25**	**166.00**
Land Tenure and Housing	Registration of puramboke dwellers, Issuing photo identity cards	0.00	0.20	0.10	0.00	0.00	0.00	0.00	0.30
	Conferring Tenural rights	0.00	11.25	0.70	0.50	0.20	0.10		12.75
	Land Management Unit		0.30	0.70	0.50	0.50	0.30	0.20	2.50
	Acquisition and development of land for housing	0.00	5.10	10.00	8.00	1.00	1.90	0.00	26.00
	Access to Legal Support	0	0.15	0.50	0.15	0.15	0.05	0.05	1.05
	Housing	0	41.00	53.00	57.00	55.00	28.5	30.5	265.00
	Sub Total	**0.00**	**58.00**	**65.00**	**66.15**	**56.85**	**30.85**	**30.75**	**307.60**
Social Security	Community based rehabilitation including food and medicine	0	2.00	2.00	2.00	2.00	2.00	2.00	12.00
	Linkage with NGO's working with most vulnerable	0.00	1.10	1.00	1.00	1.00	0.50	0.40	5.00
	Night shelters for women and migrant labourers	0	0.50	1.00	1.00	1.00	0.75	0.75	5.00
	Construction and infrastructure facilities to rehabilitation centers	0.00	9.00	9.00	7.00	6.00	3.00	6.00	40.00
	Sub Total	**0.00**	**12.60**	**13.00**	**11.00**	**10.00**	**6.25**	**9.15**	**62.00**
Livelihood	Low cost workspace with multi-dwelling houses and slum pockets.	0	2.00	2.00	2.00	2.00	2.00	0.00	10.00
	Construction of marketing, resource and advisory centers including setting up of fish landing facilities in coastal areas and inland locations (15)	0.00	3.00	9.00	4.00	3.00	2.00	4.00	25.00
	Advanced Entrepreneurial Training	0.00	1.00	0.50	0.50	0.50	0.50	2.00	5.00
	Sub Total	**0.00**	**6.00**	**6.50**	**6.50**	**5.50**	**4.50**	**6.00**	**35.00**
Health	Infrastructure facilities to Govt. hospitals	0.00	38.50	19.00	16.00	5.00	5.00	5.00	88.50

Component	Activity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total
		(Rs. Crores)							
	Health awareness & CHV Strengthening	0.00	1.50	1.00	0.50	0.50	0.50	1.00	5.00
	Health Insurance	0.00	20.00	10.00	10.00	10.00	10.00	0.00	60.00
	Health Cards to urban poor	0.00	0.50	0.50	0.25	0.50	0.25	0.00	2.00
	Mobile Clinic & Ambulance	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.50
	O&M of Mobile clinic &Ambulance	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.05
	Nutritional food supply	0.00	0.80	0.40	0.30	0.25	0.25	0.25	2.25
	Sub Total	**0.00**	**61.80**	**30.91**	**27.06**	**16.26**	**16.01**	**6.26**	**158.30**
Education	Strengthening of Balasabha	0.00	2.25	1.25	1.25	1.25	0.50	0.00	6.50
	Infrastructure facilities to continuing education centres	0	0.50	0.50	0.75	0.25	0.00	0.00	2.00
	Infrastructure & other facilities to Govt. Schools	0.00	10.00	15.00	20.00	4.00	2.00	0.00	51.00
	Sub Total	**0.00**	**12.75**	**21.75**	**22.00**	**5.50**	**2.50**	**0.00**	**64.50**
Operation & Maintenance Cost		0.00	2.00	3.00	5.00	5.00	5.00	5.00	25.00
	Grand Total	**0.00**	**206.15**	**184.93**	**183.73**	**142.13**	**92.13**	**75.93**	**885.00**

Table C: Strategy to achieve Vision

Component	Activity	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Development of Comprehensive Data Base		✓	✓	✓				
Institutional Strengthening and Capacity Building		✓	✓	✓	✓	✓	✓	✓
Environmental improvement of slums	Individual pipe connections to all slum dwellers	✓	✓	✓	✓	✓		
	Rain water harvesting	✓	✓	✓	✓	✓	✓	
	construction o f bore wells to slum dwellers	✓	✓	✓				
	water connections to all civic amenities	✓	✓	✓	✓	✓	✓	✓
	Silt removal from culverts and drains	✓	✓	✓	✓	✓	✓	
	Construction of small drains	✓	✓	✓	✓	✓	✓	✓
	Construction of bye-lanes	✓	✓	✓	✓	✓	✓	✓
	Purchase of mini buses		✓	✓	✓	✓	✓	
	Revolving Fund for O&M Mini buses		✓	✓	✓	✓	✓	✓
Electricity and street light	Electric wiring to individual house holds	✓	✓	✓	✓	✓	✓	✓
	Street lights covering slum locality	✓	✓	✓	✓	✓	✓	✓
	Electricity connections to all civic amenities		✓	✓	✓	✓	✓	✓
Civic Amenities	Recreational facilities to slum dwellers., Parks, Mini theatres etc	✓	✓	✓	✓	✓	✓	✓
	Construction & renovation of Community Hall Centres		✓	✓	✓	✓	✓	✓
	Construction & renovation of community toilets& washing areas	✓	✓	✓	✓	✓	✓	✓

Component	Activity	Y1	Y2	Y3	Y4	Y5	Y6	Y7
	Setting up of day- care centres/play schools	✓	✓	✓	✓	✓	✓	✓
	Day care centres for senior citizens	✓	✓	✓	✓	✓	✓	
	Construction & Renovation of Anganwadies	✓	✓	✓	✓	✓	✓	✓
	setting up of working women's hostel		✓	✓	✓	✓	✓	✓
	Individual Sanitary Toilets and sewerage connection	✓	✓	✓	✓	✓	✓	✓
Land Tenure and Housing	Registration of puramboke dwellers, Issuing photo identity cards	✓	✓	✓	✓	✓	✓	✓
	Conferring Tenural rights	✓	✓	✓	✓	✓	✓	
	Land Management Unit		✓	✓	✓	✓	✓	✓
	Acquisition and development of land for housing	✓	✓	✓	✓	✓	✓	✓
	Access to Legal Support		✓	✓	✓	✓	✓	✓
	Housing	✓	✓	✓	✓	✓	✓	✓
Social Security	Community based rehabilitation including food and medicine		✓	✓	✓	✓	✓	✓
	Linkage with NGO's working with most vulnerables	✓	✓	✓	✓	✓	✓	✓
	Night shelters for women and migrant labourers		✓	✓	✓	✓	✓	✓
	Construction and infrastructure facilities to rehabilitation centers	✓	✓	✓	✓	✓	✓	✓
Livelihood	Low cost work space with multi-dwelling houses and slum pockets.		✓	✓	✓	✓	✓	✓
	Construction of marketing, resource and advisory centers		✓	✓	✓	✓	✓	✓
	Advanced Entrepreneurial Training	✓	✓	✓	✓	✓	✓	✓
Health	Infrastructure facilities to Govt. hospitals	✓	✓	✓	✓	✓	✓	✓
	Health awareness & CHV Strengthening	✓	✓	✓	✓	✓	✓	✓
	Health Insurance	✓	✓	✓	✓	✓	✓	
	Health Cards to urban poor	✓	✓	✓	✓	✓	✓	
	Mobile Clinic & Ambulance		✓					
	O&M of Mobile clinic &Ambulance			✓	✓	✓	✓	✓
	Nutritional food supply	✓	✓	✓	✓	✓	✓	✓
Education	Strengthening of Balasabha	✓	✓	✓	✓	✓	✓	✓
	Infrastructure facilities to continuing education centres	✓	✓	✓	✓	✓	✓	
	Infrastrucure & other facilities to Govt. Schools		✓	✓	✓	✓	✓	
Operation & Maintenance Cost			✓	✓	✓	✓	✓	✓

8. Heritage

Table A: Line Estimate

	Particulars	Amount (in Rs. Crores)
1	Heritage Management Plan for Heritage Precincts of Cochin.	5.00
2	Heritage Base Map Preparation Program.	1.00
3	Heritage Master Plan Preparation.	2.00
4	Heritage forums – integrating heritage education in all schools mediating the subject & its relevance to the next generation.	0.10
5	Urban renewal scheme for fort Vypeen heritage zone.	5.00
6	Conservation plan for heritage water edge of Mattancherry	5.00
7	Broadway Urban Renewal	10.00
8	Mattancherry Spice Museum	5.00
9	Ernakulam Broadway Urban Renewal and Renewal of Pond and Waterway to the Pond	20.00
10	Conservation and Urban Renewal Schemes for Thripunithura Heritage Zone	12.75
11	Total Management Heritage Scheme to Sub-Zonal Area	5.00
12	City Museum	2.00
13	An Effective Management Programme for Cultural Institutions	1.00
14	Conservation of Venduruthy bridge & mattancherry bridge as heritage relics	2.25
Total		76.10

Table B: Investment Plan

	Activity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total Amt in Crores
				(Rs	*Crores)*				
1	Heritage Management Plan for Heritage Precincts of Cochin.	0.00	0.75	0.75	1.00	1.25	0.75	0.50	**5.00**
2	Heritage Base Map Preparation Program.	0.00	0.15	0.15	0.20	0.25	0.15	0.10	**1.00**
3	Heritage Master Plan Preparation.	0.00.	0.30	0.30	0.40	0.50	0.30	0.20	**2.00**
4	Heritage forums – integrating heritage education in all schools mediating the subject & its relevance to the next generation.	0.00	0.02	0.02	0.02	0.01	0.02	0.01	**0.10**
	Sub Total								**8.10**
5	Urban renewal scheme for fort Vypeen heritage zone.	0.00	0.75	0.75	1.00	1.25	0.75	0.50	**5.00**

Activity		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total Amt in Crores
				(Rs Crores)					
6	Conservation plan for heritage water edge of Mattancherry	0.00	0.75	0.75	1.00	1.25	0.75	0.50	**5.00**
	Sub Total								**10.0**
7	Broadway Urban Renewal	0.00	1.50	1.50	2.00	2.50	1.50	1.00	**10.00**
8	Mattancherry Spice Museum	0.00	0.75	0.75	1.00	1.25	0.75	0.50	**5.00**
9	Ernakulam Broadway Urban Renewal and Renewal of Pond and Waterway to the Pond	0.00	3.00	3.00	4.00	5.00	3.00	2.00	**20.00**
10	Conservation and Urban Renewal Schemes for Thripunithura Heritage Zone	0.00	2.25	2.25	3.00	1.50	2.25	1.50	**12.75**
11	Total Management Heritage Scheme to Sub-Zonal Area	0.00	0.75	0.75	1.00	1.25	0.75	0.50	**5.00**
12	City Museum	0.00	0.30	0.30	0.40	0.50	0.30	0.20	**2.00**
13	An Effective Management Programme for Cultural Institutions	0.00	0.15	0.15	0.20	0.25	0.15	0.10	**1.00**
14	Conservation of Venduruthy bridge & mattancherry bridge as heritage relics	0.00	.25	.50	.50	.50	.50	0.00	**2.25**
Total amount for each year		**0.00**	**11.67**	**11.92**	**15.72**	**17.26**	**11.92**	**7.61**	**76.10**

Table C: Strategy to Achieve the Vision

Activity		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
1	Heritage Management Plan for Heritage Precincts of Cochin.		✓	✓	✓	✓	✓	✓
2	Heritage Base Map Preparation Program.		✓	✓	✓	✓	✓	✓
3	Heritage Master Plan Preparation.		✓	✓	✓	✓	✓	✓
4	Heritage forums – integrating heritage education in all schools mediating the subject & its relevance to the next generation.		✓	✓	✓	✓	✓	✓
5	Urban renewal scheme for fort Vypeen heritage zone.		✓	✓	✓	✓	✓	✓
6	Conservation plan for heritage water edge of Mattancherry		✓	✓	✓	✓	✓	✓
7	Broadway Urban Renewal		✓	✓	✓	✓	✓	✓
8	Mattancherry Spice Museum		✓	✓	✓	✓	✓	✓
9	Ernakulam Broadway Urban Renewal and Renewal of Pond and Waterway to the Pond		✓	✓	✓	✓	✓	✓
10	Conservation and Urban Renewal Schemes for Thripunithura Heritage Zone		✓	✓	✓	✓	✓	✓
11	Total Management Heritage Scheme to Sub-Zonal Area		✓	✓	✓	✓	✓	✓
12	City Museum		✓	✓	✓	✓	✓	✓
13	An Effective Management Programme for Cultural Institutions		✓	✓	✓	✓	✓	✓
14	Conservation of Venduruthy bridge & mattancherry bridge as heritage relics		✓	✓	✓	✓	✓	✓

9. TOURISM

Particulars		Estimated cost (Rs Crores)
1	Developing and maintaining public spaces for Cochin urban region	10
2	Renovation of DH Ground	0.2
3	Mulavukadu village tourism	5
4	Construction of Tourism complex at Edappally	0.5
5	Kumbalam Tourism Project	5
6	Renovation of Bastian Bungalow at Fort Cochin	0.2
7	Landscape of Palm Avenue project from Thevara Junction to BOT Bridge	1
8	Integrated tourism proposal and management programme for Fort Kochi and Mattanchery tourism zone including 'historic walk'	10
9	Beautification of M.G.Road from Mattancherry bridge to north over bridge	1
10	Developing Chellanam as a tourist center	10
11	Introducing various projects and programmes to strengthen the model village tourism project at Kumbalangi	15
12	Strengthening the Grahsthali Programme	5
13	ACochin brand film festival	0.72
14	Padmasarovaram land scape project	15
15	Queen of Arabian Sea project	50
16	Subhash Park Improvement	0.5
17	Kunnara Park Improvement	0.3
18	P.J.Antony Memorial Cultural Centre Improvement	0.5
19	Pallathuraman Cultural Centre improvement	0.2
20	Water edge Walkway from Thoppumpady to Kamalakkadavu	5
21	Natural History Museum	0.5
22	Establishing Kerala Village – Thanthonnithuruthu	6
23	Martial ArtsCentre	0.1
24	Valanthu kadu Keraleeya Gramam	20
25	Backwater walkway from Valanthukadu – Chambakkara canal	10
26	Kunnarapallimattam improvement	5
27	Water Sports Centre at Chilavannur Lake & Pandarachira	10
28	Murikkal-Pulikapuram Tourism Development Project at Kadamakkudy	2
29	Kannakatt-Veliakulam Tourism Project at Palluruthy	0.5
30	Poonthuruthy Island Development	0.5
31	I-MAX Theatre	4
32	Nehru Park	0.1
33	Mehboob Park	0.1
34	Mahakavi G Memorial	0.5
35	Organizing Festivals and fairs including Boat Races	0.1
36	Development of Planetarium & Science City	10
37	Development of Thanneerchal at Thiruvankulam	3.5
38	Ring road around Eloor Panchayat along the water front	26.73
39	Thoombunkal thodu improvement	50
Total		**284.75**

Table B: Investment Plan

Activity		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total Amt in Crores
		(Rs Crores)							
1	Developing and maintaining public spaces for Cochin urban region	0	1.5	1.5	2	2.5	1.5	1	10
2	Renovation of DH Ground	0	0.03	0.03	0.04	0.05	0.03	0.02	0.2
3	Mulavukadu village tourism	0	0.75	0.75	1	1.25	0.75	0.5	5
4	Construction of Tourism complex at Edappally	0	0.08	0.08	0.1	0.13	0.06	0.05	0.5
5	Kumbalam Tourism Project	0	0.75	0.75	1	1.25	0.75	0.5	5
6	Renovation of Bastian Bungalow at Fort Cochin	0	0.03	0.03	0.04	0.05	0.03	0.02	0.2
7	Landscape of Palm Avenue project from Thevara Junction to BOT Bridge	0	0.15	0.15	0.2	0.25	0.15	0.1	1
8	Integrated tourism proposal and management programme for Fort Kochi and Mattanchery tourism zone including 'historic walk'	0	1.5	1.5	2	2.5	1.5	1	10
9	Beautification of M.G.Road from Mattancherry bridge to north over bridge	0	0.15	0.15	0.2	0.25	0.15	0.1	1
10	Developing Chellanam as a tourist center	0	1.5	1.5	2	2.5	1.5	1	10
11	Introducing various projects and programmes to strengthen the model village tourism project at Kumbalangi	0	2.25	2.25	3	3.75	2.25	1.5	15
12	Strengthening the Grahsthali Programme	0	0.75	0.75	1	1.25	0.75	0.5	5
13	ACochin brand film festival	0	0.11	0.11	0.14	0.18	0.11	0.07	0.72
14	Padmasarovaram land scape project	0	2.25	2.25	3	3.75	2.25	1.5	15
15	Queen of Arabian Sea project	0	7.5	7.5	10	12.5	7.5	5	50
16	Subhash Park Improvement	0	0.08	0.08	0.1	0.13	0.08	0.03	0.5
17	Kunnara Park Improvement	0	0.05	0.05	0.06	0.08	0.03	0.03	0.3
18	P.J.Antony Memorial Cultural Centre Improvement	0	0.08	0.08	0.1	0.13	0.08	0.03	0.5
19	Pallathuraman Cultural Centre improvement	0	0.03	0.03	0.04	0.05	0.03	0.02	0.2
20	Water edge Walkway from Thoppumpady to Kamalakkadavu	0	0.75	0.75	1	1.25	0.75	0.5	5
21	Natural History Museum	0	0.08	0.08	0.1	0.13	0.06	0.05	0.5
22	Establishing Kerala Village – Thanthonnithuruthu	0	0.9	0.9	1.2	1.5	0.9	0.6	6
23	Martial ArtsCentre	0	0.02	0.02	0.02	0.01	0.02	0.01	0.1
24	Valanthu kadu Keraleeya Gramam	0	3.75	3.25	5	5	3	0	20

Activity		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total Amt in Crores
		(Rs Crores)							
25	Backwater walkway from Valanthukadu – Chambakkara canal	0	1.5	1.5	2	2.5	1.5	1	10
26	Kunnarapallimattam improvement	0	0.75	0.75	1	1.25	0.75	0.5	5
27	Water Sports Centre at Chilavannur Lake & Pandarachira	0	1.5	1.5	2	2.5	2.5	0	10
28	Murikkal-Pulikapuram Tourism Development Project at Kadamakkudy	0	0.3	0.3	0.4	0.5	0.3	0.2	2
29	Kannakatt-Veliakulam Tourism Project at Palluruthy	0	0.08	0.08	0.1	0.13	0.06	0.05	0.5
30	Poonthuruthy Island Development	0	0.08	0.08	0.1	0.13	0.06	0.05	0.5
31	I-MAX Theatre	0	0.6	0.6	0.8	1	0.6	0.4	4
32	Nehru Park	0	0.02	0.02	0.02	0.02	0.02	0	0.1
33	Mehboob Park	0	0.02	0.02	0.02	0.02	0.02	0	0.1
34	Mahakavi G Memorial	0	0.08	0.08	0.1	0.13	0.06	0.05	0.5
35	Organizing Festivals and fairs including Boat Races	0	0.02	0.02	0.02	0.02	0.02	0	0.1
36	Development of Planetarium & Science City	0	1.5	1.5	2	2.5	1.5	1	10
37	Development of Thanneerchal at Thiruvankulam	0	0.53	0.53	0.7	0.88	0.53	0.33	3.5
38	Ring road around Eloor Panchayat along the water front	0	1	5	10	5	5	0.73	26.73
39	Thoombunkal thodu improvement	0	10	15	15	10	0	0	50
Total amount for each year		**0**	**43.02**	**51.52**	**67.6**	**67.02**	**37.15**	**18.44**	**284.75**

Table C: Strategy to Achieve the Vision

Activity		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
1	Developing and maintaining public spaces for Cochin urban region		✓	✓	✓	✓	✓	✓
2	Renovation of DH Ground		✓	✓	✓	✓	✓	✓
3	Mulavukadu village tourism		✓	✓	✓	✓	✓	✓
4	Construction of Tourism complex at Edappally		✓	✓	✓	✓	✓	✓
5	Kumbalam Tourism Project		✓	✓	✓	✓	✓	✓
6	Renovation of Bastian Bungalow at Fort Cochin		✓	✓	✓	✓	✓	✓
7	Landscape of Palm Avenue project from Thevara Junction to BOT Bridge		✓	✓	✓	✓	✓	✓
8	Integrated tourism proposal and management programme for Fort Kochi and Mattanchery tourism zone including ‘historic walk’		✓	✓	✓	✓	✓	✓
9	Beautification of M.G.Road from		✓	✓	✓	✓	✓	✓

Activity		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
	Mattancherry bridge to north over bridge							
10	Developing Chellanam as a tourist center		✓	✓	✓	✓	✓	✓
11	Introducing various projects and programmes to strengthen the model village tourism project at Kumbalangi		✓	✓	✓	✓	✓	✓
12	Strengthening the Grahsthali Programme		✓	✓	✓	✓	✓	✓
13	ACochin brand film festival		✓	✓	✓	✓	✓	✓
14	Padmasarovaram land scape project		✓	✓	✓	✓	✓	✓
15	Queen of Arabian Sea project		✓	✓	✓	✓	✓	✓
16	Subhash Park Improvement		✓	✓	✓	✓	✓	✓
17	Kunnara Park Improvement		✓	✓	✓	✓	✓	✓
18	P.J.Antony Memorial Cultural Centre Improvement		✓	✓	✓	✓	✓	✓
19	Pallathuraman Cultural Centre improvement		✓	✓	✓	✓	✓	✓
20	Water edge Walkway from Thoppumpady to Kamalakkadavu		✓	✓	✓	✓	✓	✓
21	Natural History Museum		✓	✓	✓	✓	✓	✓
22	Establishing Kerala Village – Thanthonnithuruthu		✓	✓	✓	✓	✓	✓
23	Martial ArtsCentre		✓	✓	✓	✓	✓	✓
24	Valanthu kadu Keraleeya Gramam		✓	✓	✓	✓	✓	
25	Backwater walkway from Valanthukadu – Chambakkara canal		✓	✓	✓	✓	✓	✓
26	Kunnarapallimattam improvement		✓	✓	✓	✓	✓	✓
27	Water Sports Centre at Chilavannur Lake & Pandarachira		✓	✓	✓	✓	✓	
28	Murikkal-Pulikapuram Tourism Development Project at Kadamakkudy		✓	✓	✓	✓	✓	✓
29	Kannakatt-Veliakulam Tourism Project at Palluruthy		✓	✓	✓	✓	✓	✓
30	Poonthuruthy Island Development		✓	✓	✓	✓	✓	✓
31	I-MAX Theatre		✓	✓	✓	✓	✓	✓
32	Nehru Park		✓	✓	✓	✓	✓	
33	Mehboob Park		✓	✓	✓	✓	✓	
34	Mahakavi G Memorial		✓	✓	✓	✓	✓	✓
35	Organizing Festivals and fairs including Boat Races		✓	✓	✓	✓	✓	
36	Development of Planetarium & Science City		✓	✓	✓	✓	✓	✓
37	Development of Thanneerchal at Thiruvankulam		✓	✓	✓	✓	✓	✓
38	Ring road around Eloor Panchayat along the water front		✓	✓	✓	✓	✓	✓
39	Thoombunkal thodu improvement		✓	✓	✓	✓		

10. ENVIRONMENT SECTOR

Table A: Line Estimates

Sl. No.	Activity/Year	Estimated cost (Rs Crores)
1	Establishing & maintaining Environmental Management Centre	0.8
2	Supporting laboratory for air, water and noise (PCB accredited)	1.8
3	Community education for Schools, institutions, residents associations	2.0
4	Urban forestry	20.4
5	Sea shore protection	120.0
6	Water resource Restoration of wetlands	25.0
7	Wetland parks or Parks	40.0
8	Public comfort stations	9.0
9	Conservation of mangroves 40 km patches along the water body	41.0
10	Health Status - Participatory survey	1.0
11	Crematoria	30.0
	Grand Total	**291.00**

Table B: Investment Plan

Sl. No.	Activity/Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Sub Total	Remarks	Addl. Remarks
1	Establishing & maintaining Environmental Management Centre	0	0.1	0.2	0.2	0.1	0.1	0.1	0.8	To assist ULB and community on environmental issues, disaster management	To work with volunteers
2	Supporting laboratory for air, water and noise (PCB accredited)	0	0.1	1	0.3	0.2	0.1	0.1	1.8	Surveillance monitoring of air, noise, water at nominal charges, assimilation of technology	Generation and compilation of data, information dissemination
3	Community education for Schools, institutions, residents associations	0	0.2	0.4	0.4	0.4	0.3	0.3	2	Water quality monitoring, climate recording, health survey, communication	To train, support and cooperate with community; environmental theme park with rainwater harvesting, waste disposal technologies at display
4	Urban forestry	0	0.4	4	4	4	4	4	20.4	Development of canopy to reduce flash run off	Roadside and private un-built space 400 ha

Sl. No.	Activity/Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Sub Total	Remarks	Addl. Remarks
5	Sea shore protection	0	2	30	30	30	15	13	120	Geotextile protection, sea wall,tree belt with local participation	30 km Stretch from Chellanam - Frot Kochi & Fort Vypeen - Njarakkal
6	Water resource Restoration of wetlands	0	1	5	5	5	5	4	25	Design, construction, protection with barrier, maintenance	40 km fringe land at 5m width
7	Wetland parks or Parks	0	1	8	8	8	8	7	40	with private participation; these are fallow paddy fields - originally wetland	10 units of 5 ha in Trikkakara, Kakkanad, Chottanikkara; 50 ha near Panar
8	Public comfort stations	0	0.2	2	2	2	2	0.8	9	With urine recovery and conversion	50 in the city; 20 in municipalities; 40 in panchayaths
9	Conservation of mangroves 40 km patches along the water body	0	1	8	8	8	8	8	41	with protection, regeneration and community involvement in conservation at all suitable water fringes	at the fringe of all canals and islands
10	Health Status - Participatory survey	0	0.05	0.2	0.2	0.2	0.2	0.15	1	Continuous survey with student & NGOs; awareness education	All residential and industrial areas.
11	Crematoria	0	1	6	6	6	6	5	30	Scientifically & aesthetically designed (30)	Community association to operate on Build & operate basis
	Grand Total	**0**	**7.05**	**64.8**	**64.1**	**63.9**	**48.7**	**42.45**	**291**		

Table C: Strategy to Achieve the Vision

Sl. No.	Activity/Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
1	Establishing & maintaining Environmental Management Centre		✓	✓	✓	✓	✓	✓
2	Supporting laboratory for air, water and noise (PCB accredited)		✓	✓	✓	✓	✓	✓
3	Community education for Schools, institutions, residents associations		✓	✓	✓	✓	✓	✓
4	Urban forestry		✓	✓	✓	✓	✓	✓
5	Sea shore protection		✓	✓	✓	✓	✓	✓
6	Water resource Restoration of wetlands		✓	✓	✓	✓	✓	✓
7	Wetland parks or Parks		✓	✓	✓	✓	✓	✓
8	Public comfort stations		✓	✓	✓	✓	✓	✓
9	Conservation of mangroves 40 km patches along the water body		✓	✓	✓	✓	✓	✓
10	Health Status - Participatory survey		✓	✓	✓	✓	✓	✓
11	Crematoria		✓	✓	✓	✓	✓	✓

11. URBAN RENEWAL & SOCIAL AMENITIES

Table A: Line Estimates

Sl. No	Particulars	Estimated cost (Rs Crores)
1	Area Development scheme for Ernakulam Market Area.	75
2	Conservation of Bazaar Road, and vicinity area -	21
3	Facility for Women's Enterprises Goods distribution	5
4	Facility augmentation in Orphanages and Old age Homes	5
5	Provision of roofing to International	20
6	Stadium	10
7	Reconstruction of Ambedkar Stadium	2
8	Maharaja's college Stadium Improvement	4
9	Development of Joggers' track in Marine Drive Maidan	2
10	Improvement to the Indoor Stadium at Varappuzha	2
11	District level Stadium and Sports Hostel at Thrikkakkara	5
12	International level swimming training center (Ernakulam & Palluruthy)	10
13	Redevelopment of Ernakulam North Area	42
14	Redevelopment of the area surrounding the present Corporation Office – Area Development Scheme	10
15	Redevelopment of old market areas in Municipal areas	20
16	Renovation and environmental improvement in Panchayath market areas	26
17	Community Hall at pathalam in Eloor panchayat	0.50
	Total	**259.50**

Table B: Investment Plan

Sl. No.		Proposal	FY1 05-06	FY 2 06- 07	FY 3 07-08	FY 4 08-09	FY 5 09-10	FY 6 10-11	FY 7 11-12	Total
			(Rs. Crores)							
1		**Area Development scheme for Ernakulam Market Area.**								
	a	Shifting of Building Materials Market-rehabilition of Shop owners	0	2	5	8	3	2	0	20
	b	Construction of a new wholesale Building materials market outside Corporation area	0	3	8	8	5	4	2	30
	c	Reconstruction of the present Ernakulam market into a modern retail market	0	1	1	3	5	5	0	15
	d	Environmental improvement, Landscaping and realignment of roads	0	0	0	0	5	5	0	10
2		**Conservation of Bazaar Road,and vicinity area -**								
	a	Listing of buildings and Preparation of control drawings	0	1	0	0				1
	b	Development of a water front road approximately 5 km	0	1	5	5	6	3	0	20
3		**Facility for Women's Enterprises Goods distribution**	0	2	3	0	0	0	0	5
4		**Facility augmentation in Orphanages And Old age Homes**	0	2	1	2	0	0	0	5
5		**Provision of roofing to International Stadium**	0	5	5	5	5	0	0	20
6		**Reconstruction of Ambedkar Stadium**	0	2	3	5	0	0	0	10

Sl. No.		Proposal	FY1 05-06	FY 2 06- 07	FY 3 07-08	FY 4 08-09	FY 5 09-10	FY 6 10-11	FY 7 11-12	Total
			(Rs. Crores)							
7		**Maharaja's college Stadium Improvement**	0	0	2	0	0	0	0	2
8		**Development of Veli Maidan in West Kochi**	0	1	2	1	0	0	0	4
9		**Development of Joggers' track in Marine Drive Maidan**	0	0	2	0	0	0	0	2
10		**Improvement to the Indoor Stadium at Varappuzha**	0	0	2	0	0	0	0	2
11		**District level Stadium and Sports Hostel at Thrikkakkara**		1	2	2	0	0	0	5
12		**International level swimming training center (Ernakulam & Palluruthy)**	0	2	2	3	3	0	0	10
13		**Redevelopment of Ernakulam North Area –**								
	a	Area Development Scheme	0	2	2	2	4	0	0	12
	b	Construction of about 20000 Sq.m office	0	2	4	5	5	10	4	30
14		**Redevelopment of the area Surrounding the present Corporation Office-**								
	a	Area Development Scheme		0	2	4	3	1	0	10
15		**Redevelopment of old market areas in Municipal areas**	0	2	4	4	4	4	2	20
16		**Renovation and environmental Improvement in Panchayath Market areas**	0	2	6	6	6	6	0	26
17		**Community Hall at Pathalam in Eloor Panchayat**	0	0.10	0.20	0.20	0	0	0	0.50
TOTAL			**0**	**31.10**	**61.20**	**63.20**	**54.00**	**40.00**	**8.00**	**259.50**

Table C: Strategy for Achieving the Vision

No.		Proposal	FY1 05-06	FY 1 06-07	FY 2 07-08	FY 3 08-09	FY 4 9-10	FY 5 10-11	FY 6 11-12
1		**Area Development scheme for Ernakulam Market Area.**							
	a	Shifting of Building Materials Market-rehabilition of Shop owner		✓	✓	✓	✓	✓	
	b	Construction of a new wholesale Building materials market		✓	✓	✓	✓	✓	✓
	c	Reconstruction of the present Ernakulam market into a modern retail market		✓	✓	✓	✓	✓	
	d	Environmental improvement, Landscaping and realignment of roads					✓	✓	
2		**Conservation of Bazaar Road,and vicinity area -**							
	a	Listing of buildings and Preparation of control drawings		✓	✓	✓			
	b	Development of a water front road approximately 5 km		✓	✓	✓	✓	✓	
3		**Facility for Women's Enterprises Goods distribution**		✓	✓				
4		**Facility augmentation in Orphanages And Old age Homes**		✓	✓	✓	✓	✓	✓
5		**Provision of roofing to International Stadium**		✓	✓	✓	✓		
6		**Reconstruction of Ambedkar Stadium**		✓	✓	✓	✓	✓	

No.		Proposal	FY1 05-06	FY 1 06-07	FY 2 07-08	FY 3 08-09	FY 4 9-10	FY 5 10-11	FY 6 11-12
7		**Maharaja's college Stadium Improvement**			✓				
8		**Development of Veli Maidan in West Kochi**			✓				
9		**Development of Jogger's track in Marine Drive Maidan**			✓				
10		**Improvement to the Indoor Stadium at Varappuzha**			✓	✓	✓	✓	✓
11		**District level Stadium and Sports Hostel at Thrikkakkara**		✓	✓	✓			
12		**International level swimming pool**		✓	✓	✓	✓		
13		**Redevelopment of Ernakulam North Area –**							
	a	Area Development Scheme		✓	✓	✓	✓		
	b	Construction of about 20000 Sqm office		✓	✓	✓	✓	✓	✓
14		**Redevelopment of the area Surrounding the present Corporation Area-**							
	a	Area Development Scheme			✓	✓	✓	✓	
15		**Redevelopment of old market areas in Municipal areas**		✓	✓	✓	✓	✓	✓
16		**Renovation and environmental Improvement in Panchayath Market areas**		✓	✓	✓	✓	✓	

12. O&M – INSTITUTIONAL STRENGTHENING

Table A: Line Estimates

Sl. No	Particulars	Estimated cost (Rs Crores)
1	Institutional Strengthening	5.00

Table B: Investment Plan

Activity		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total Amt in Crores
		(Rs Crores)							
1	O&M – Institutional Strengthening	0	2	0.60	0.60	0.6	0.6	0.6	5.00

Table C: Strategy to Achieve the Vision

Activity		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
		(Rs Crores)						
1	O&M – Institutional Strengthening	✓	✓	✓	✓	✓	✓	✓

Annexure - 1

ANNEXURE 1
STRUCTURE PLAN AREA KOCHI 2001

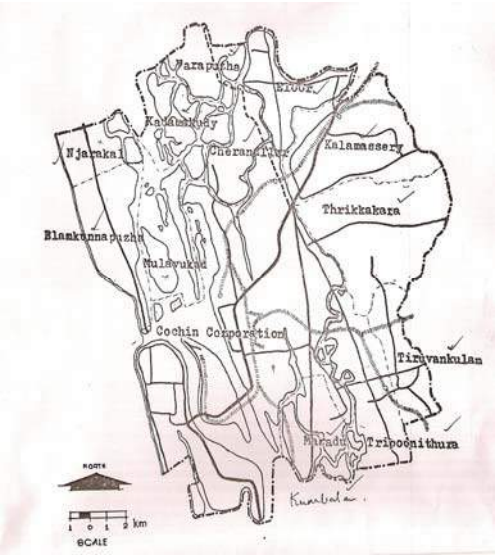
The previous studies and the 'Structure Plan for Central City Cochin 2001' had identified a smaller area covering 275.85 Sq. KM than the present Urban Agglomeration as the proposed 'city growth area', based on the concept adopted in the Regional Development Plan. The structure plan prepared was published and sanctioned by the Govt. This area comprised of Cochin City, 2 Municipalities and 13 Panchayaths lying contiguous to the Cochin Corporation area.

Central city Delineated in the Structure plan

Name of Local Body

- Cochin Corporation;
- Tripunithura Municipality;
- Kalamassery Municipality;
- Thrikkakkara Panchayat;
- Thiruvankulam Panchayat;
- Maradu Panchayat;
- Elamkunnapuzha Panchayat;
- Njarakkal Panchayat;
- Kadamakkudy Panchayat;
- Cheranalloor Panchayat;
- Varappuzha Panchayat;
- Eloor Panchayat; and
- Mulavukadu Panchayat.

Figure 1A: Structure Plan Area



MAJOR INVESTMENTS PROPOSED IN PORT AREA

Table 1A: Major Investments Proposed in Port Area

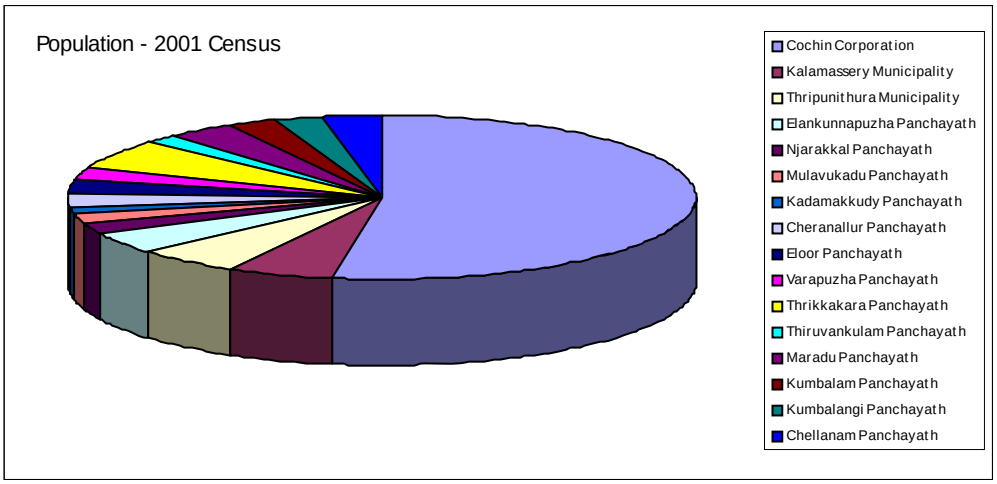
Sl. No	Project	Investment (in crores)	Mode of Execution
(A)	**Terminal and Service Facilities**		
1	International Container Transshipment Terminal (ICTT)	2,118	B.O.T
2	LNG Re-gasification Terminal (LNGT)	2,050	To be funded by PSU (PLL)
3	International Bunkering Terminal	195	License
4	International Ship Repair Complex	315	B.O.T
5	Crude Oil Handling for Kochi Refineries Ltd.	720	To be funded by PSU (KRL)
6	International Cruise Terminal	55	Public - Private
7	Port based Special Economic Zone	1,510	Public - Private
8	Land Acquisition For Special Economic Zone	320	Public - Private
9	Reclamation For Streamlining of Flow in The Port Channel for Reducing Siltation and for Future Development Works	120	Public - Private
	Sub Total of (A)	**7,403**	
(B)	**Common User Infrastructure Facilities**		
1	Capital Dredging of Navigational Channels	464	CoPT
2	National Highway Connectivity (17.2 kms)	374	NHAI
3	Rail Connectivity (8.86 kms)	246	Railways
	Sub Total of (B)	**1,084**	
	GRAND TOTAL	**8,487**	

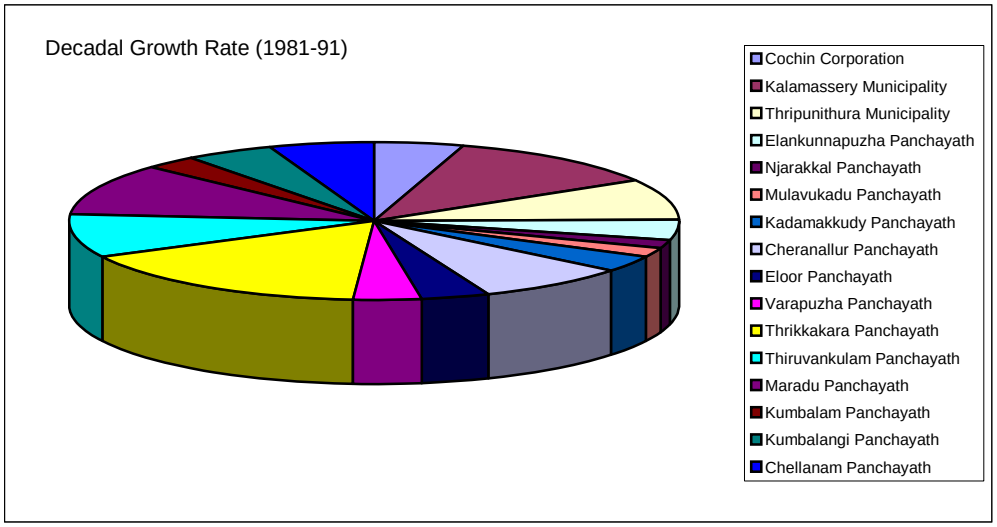
All the above investments fall within the areas in the Central City

Annexure - 2

ANNEXURE 2

Figure 2A Population Growth Rate





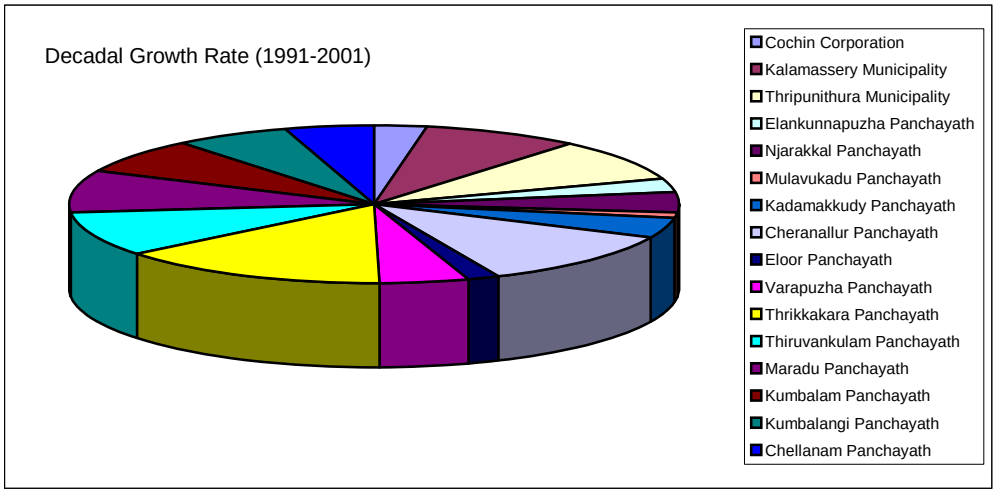


Table 2A Educational Status

Education	Sex	Category					
		MV	JV	UP	LIG	MIG	HIG
Illiterate	Male	15	19	14	24	12	1
		5.3%	5.9%	4.4%	2.6%	1.6%	.8%
	Female	49	51	46	42	23	1
		13.8%	13.7%	13.1%	3.6%	3.3%	.8%
Primary	Male	98	103	79	171	62	7
		34.4%	32.2%	24.8%	18.7%	8.3%	5.8%
	Female	110	99	82	261	85	13
		31.0%	26.5%	23.4%	22.5%	12.1%	10.2%
Secondary	Male	107	149	152	343	235	8
		37.5%	46.6%	47.8%	37.6%	31.5%	6.6%
	Female	109	157	144	379	233	10
		30.7%	42.1%	41.0%	32.7%	33.3%	7.8%
Higher Secondary	Male	16	15	26	170	118	19
		5.6%	4.7%	8.2%	18.6%	15.8%	15.7%
	Female	33	28	23	205	105	16
		9.3%	7.5%	6.6%	17.7%	15.0%	12.5%
Graduate	Male	3	0	6	68	127	25
		1.1%	.0%	1.9%	7.4%	17.0%	20.7%
	Female	10	7	10	119	133	37
		2.8%	1.9%	2.8%	103%	19.0%	28.9%
PG	Male		0	2	21	40	16
			.0%	.6%	2.3%	5.4%	13.2%
	Female		1	3	30	49	21
			.3%	.9%	2.6%	7.0%	16.4%
Proffessional	Male		2	0	6	37	38
			.6%	.0%	.7%	5.0%	31.4%
	Female		0	1	3	7	15
			.0%	.3%	.3%	1.0%	11.7%
Technical	Male		9	3	9	30	3
			2.8%	.9%	1.0%	4.0%	2.5%
	Female		1	2	12	6	1
			.3%	.6%	1.0%	.9%	.8%
NA	Male	46	23	36	101	86	4
		16.1%	7.2%	11.3%	11.1%	11.5%	3.3%
	Female	44	29	40	107	59	14
		12.4%	7.8%	11.4%	9.2%	8.4%	109%
TOTAL	Male	285	320	318	913	747	121
	Female	355	373	351	1158	700	128

Table 2B Population below poverty line

Sl. No	LSG	Population 2006	BPL Population	%
1	Cochin Corporation	603597	213120	35
2	Kalamassery Municipality	71941	10405	14
3	Thrippunithura	68264	8110	12
4	Kumbalam	32232	13901	43
5	Kadamakkudy	18005	10000	56
6	Cheranalloor	32919	9160	28
7	Elamkunnapuzha	59159	26280	44
8	Thiruvankulam	25409	7632	30
9	Kumbalangi	31193	17595	56
10	Chellanam	42365	33090	78
11	Eloor	41620	9000	22
12	Thrikkakkara	78718	18205	23
13	Njarakkal	33605	7526	22
14	Mulavukad	26725	15870	59
15	Maradu	56455	16560	29
16	Varappuzha	28693	8400	29
	TOTAL	**1250900**	**424854**	**34**

Table 2C: Work force – Sector Wise

Category	Persons	% to Total Workers	% to Main workers	Males	%of Males	Females	%of Females
Main Workers	170170	96.20	100%	140114	82.25	30056	17.75
Cultivators	582		0.34	531	91.24	51	8.76
Agricultural Labour	1249		0.73	1083	86.71	166	13.29
Live Stock	4750		2.79	4381	92.23	369	7.77
Mining and Quarrying	65		0.04	61	93.85	4	6.15
Manufacturing	32043		18.83	28836	89.99	3207	10.01
Construction	15079		8.86	14359	94.60	720	4.74
Trade & Commerce	43460		25.54	37586	86.48	5874	13.52
Transportation	27460		16.13	25658	93.44	1802	6.56
Other Services	45482		26.74	27619	60.73	17863	39.27
Marginal workers	6716	3.80		4997	74.40	1719	25.60
TOTAL	**176886**	**100%**		**145111**		**31775**	

Annexure - 3

ANNEXURE 3
SPATIAL GROWTH TRENDS AND LAND UTILIZATION

Table 3A: Growth of Population

Sl. No.	Name of Local Body	Population			Decennial growth rate in %	
		1981	*1991*	*2001*	*81 - 91*	*91- 2001*
1.	Cochin Corporation	513,249	564,589	596,473	10.00	5.64
2.	Thripunithura Municipality	43,640	51,078	59,881	17.03	17.23
3.	Kalamassery Municipality	43,767	54,342	63,176	24.16	16.26
4.	Eloor Panchayat	-	34,455	35,573	-	3.24
5.	Varappuzha panchayat	52,528	22,514	24,524	8.45	8.92
6	Cheranalloor Panchayat	18,381	21,401	26,316	16.46	22.92
7.	Chellanam Panchayat	29,536	32,978	36,209	11.65	9.8
8.	Thrikkakkara Panchayat	38,318	51,166	65,984	33.53	28.96
9.	Thiruvankulam Panchayat	15,517	18,412	21,717	18.66	17.95
10.	Maradu Panchayat	28,749	34,995	41,012	21.73	17.19
11.	Kumbalam Panchayat	21,678	24,143	27,549	11.37	14.16
12.	Kumbalangi Panchayat	22,376	24,601	26,661	9.94	8.37
13.	Mulavukadu Panchayat	21,397	22,322	22,842	4.32	2.33
14.	Njarakkal Panchayat	21,672	22,978	24,166	6.03	5.17
15.	Kadamakkudy Panchayat	19,696	14,668	15,824	5.73	7.87
16.	Elamkunnapuhza Panchayat	43,911	47,877	50,563	9.03	5.61

Table 3B: Change in Density of Population

Sl. No.	Name of Local Body	Area in Hect.	Density in persons per Hect.		
			1981	*1991*	*2001*
1.	Cochin Corporation	9,488	54	60	63
2.	Thripunithura Municipality	1,869	23.0	27.0	32.0
3.	Kalamassery Municipality	2,760	16.0	20.0	23.0
4.	Eloor Panchayat	1,421	-	24.0	25.0
5.	Varappuzha panchayat	774	24.0	29.0	32.0
6	Cheranalloor Panchayat	1,059	17.0	20.0	25.0
7.	Chellanam Panchayat	2,746	14.0	19.0	24.0
8.	Thrikkakkara Panchayat	1,049	15.0	18.0	21.0
9.	Thiruvankulam Panchayat	1,235	23.0	28.0	33.0
10.	Maradu Panchayat	2,079	10.0	12.0	13.0
11.	Kumbalam Panchayat	1,577	14.0	16.0	17.0
12.	Kumbalangi Panchayat	1,927	11.0	12.0	12.0
13.	Mulavukadu Panchayat	866	25.0	27.0	28.0
14.	Njarakkal Panchayat	1,292	17.0	181.0	19.0
15.	Kadamakkudy Panchayat	1,166	17.0	13.0	14.0
16.	Elamkunnapuhza Panchayat	1,760	25.0	27.0	29.0

Annexure - 4

Annexure 4
Summary Chart of Various Proposals of Major/Minor/Canals/Thodus

Sl. No	Name Canals/ Thods	Length k.m	Breadth m	Depth m
1	Valumeel thodu	1.20	8.00	
2	Pandrachira thodu	0.85	30.00	
3	Athipozhi thodu	0.70	8.00	
4	llichuvadu thodu	1.50	5.00	
5	Kazhuthumuttu thodu	0.45	4.00	
6	Poominchal (Philipneri) thodu	1.25	3.00	
7	Frien club thodu	0.75	2.50	
8	Parodoth thodu	0.80	2.00	
9	Anandasseri thoud	0.50	2.50	
10	Post ofiice thoud	0.30	3.00	
11	chakkalakkal thoud	0.40	2.00	
12	Karippalam	0.30	9.00	
13	calvathy	1.20	8.00	
14	Pallichal thodu	1.40	5.00	
15	Mundamveli Manassery boundary	1.20	5.00	
16	Kallukulam to Kanjiram road	1.25	2.50	
17	CBSE road to kallukulam road drain	1.20	2.50	
18	P.T. Jacob road to kankiram road	0.50	1.50	
19	P.T. Jacob road to Athipozhi road	0.35	1.50	
20	Athipozhi Jn. To valummal thodu	1.50	1.50	
21	Karippalam major drain	0.60	1.50	
22	Maliakal drain	0.50	1.50	
23	Drain from SBI to southwards	1.50	1.50	
24	T.D. School to south	1.50	1.00	
25	Kokkers road side	0.75	1.50	
26	K.B. Jacob road to manthras thodu	0.75	1.50	
27	Kokkers road to chirattappalam	0.50	1.50	
28	chirattappalam to fosi road	0.75	1.50	
29	Nazreth park to mantra thodu	0.60	1.50	
30	Arakkapparambu coloy drain	0.70	1.50	
31	Koovappadam drain	0.75	1.50	
32	Ayyan master road drain	0.40	1.50	
33	Kochin college west side drain	0.15	1.00	
34	Sainudeen Naina road drain	0.75	1.50	
35	Maharaja Hospital drain	0.45	1.20	
36	Attaprayil thodu	840	3.2	4
37	Puthenkulangara	1648	2.9	3.6
38	Njanam thuruthu	1580	3.5	4.5
39	Puthssery	1260	3.5	4.5
40	Pointhara thdou	94	4.6	5
41	Andhakara thodu	760	4.6	5
42	Valummel thodu	392	4.6	5
43	Choorakkadu	1332	3.6	4
44	Vellakinavu	4948	2.7	3.1
45	Kalloorkattu	1564	3.6	4.7
46	Chakamkulangara	1760	3.7	5
47	Thevarakkavu	9410	3.7	4

48	Thondoor thdou	840	3.8	2.7
49	Kundettil thodu	1444	3.5	4.5
50	Thammandil thodu	380	3.8	4.5
51	Ambily Nagar	572	3.6	4.7
52	Puthussery	428	3.9	5.1
53	Pottayil	404	3.1	3
54	Eroor	2540	4.7	3.9
55	Arkkakadavu	158	4	5
56	Irimpanam	820	3.7	6
57	Nedungappuzha	540	3	3.9
58	Kalluvachakadu	960	6.5	9
59	Maradu	548	11	
60	Champakkara	1208	9	
61	Muttar kadavu bridge	7	2.8	
62	Methanam bund bridge	11	4	
63	Railway bridge	20	20	
64	G.C.D.A Bridge (F.B)	15	2	
65	Kallu palam bridge	36	7.5	
66	Oriental timber bridge	10	5	
67	Bridge at Padivattom (Pipe line bridge)	15	5	
68	Ayyanad bridge	17	7.5	
69	Palachavadu bridge	27	8.5	
70	N.H. Road bridge at Edappali	20	20	
71	Karipay thodu	3.00	3.00	3.00
72	Chuthakal Thodu	7.00	3.00	3.00
73	Kulithara Thodu	4.00	3.00	3.00
74	Illikkal Thodu	2.50	3.00	6.00
75	Thumbukal Thodu	5.00	4.00	5.00
76	Nadathodu	6.00	3.00	6.00
77	Kampinipeedika thodu	1.00	5.00	1.00
78	Saitu thodu	2.00	3.00	1.00
79	West cost canal	3.00	5.00	1.00
80	Palli thodu	4.00	5.00	1.00
81	R.M. P link. Canal	1.00	2.00	0.60
82	Ground thodu	2.00	4.00	0.70
83	R.M. P link. Canal	1.00	5.00	1.00
84	Puppadi thodu	1.50		
85	Nada thdou	1.00	15.00	1.50
86	Chappam thodu	1.50	4.00	1.00
87	R.M. P link. Canal	2.00	2.00	1.00
88	Muttar puzha	1.00	70.00	6.00
89	Thaynkerry thodu	0.30	8.00	2.50
90	Karikkanthara thodu	0.30	6.00	2.00
91	Vendotti thodu	0.75	5.00	3.00
92	Karethara thodu	0.75	6.00	3.00
93	Chiraka thodu	1.00	4.50	2.50
94	Kakkanadu thodu	0.60	8.00	3.50
95	Andipilly thodu	2.00	2.50	2.00
96	Pappali thodu	3.25	5.00	2.50
97	Malamkuzhi thodu	2.00	6.00	2.50
98	Chettikadu thodu	0.60	8.00	3.50
99	Chala thodu	0.60	8.00	3.50

100	Munduruthi thodu	0.50	4.50	2.50
101	Vezhnattu thodu	1.50	3.00	2.00
102	Kanavallichira thodu	2.00	2.50	2.00
103	Mattalipadam thodu	2.50	3.50	2.50
104	Pallichira - chathamma thodu	0.50	5.00	3.00
105	Ekkala thodu	2.00	5.00	3.00
106	Pulaya thodu	3.00	10.00	5.00
107	Ollari thodu	0.60	3.00	2.50
108	Chalaveed thodu	0.60	2.00	2.00
109	Uthayathum vatil thodu	0.25	2.00	1.50
110	Village thdou	0.25	2.00	1.50
111	W/4 Chamakkad thodu	0.75	2.50	2.50
112	Janatha Road thodu	0.65	3.00	2.50
113	Ollari thodu	0.65	4	2.5
114	Vettikappilly thodu	0.60	5.00	2.00
115	Chettakalil Thodu	0.35	3.00	2.00
116	Mundenpilly thodu	0.16	3.00	2.50
117	Perumanathodu	0.14	6.00	3.00
118	Karukayil Thodu	0.18	6.00	3.00
119	Anguss thodu	0.50	3.00	2.00
120	Arathara Thodu	0.15	3.00	2.00
121	Kunaveettil Thodu - 1	0.15	-	3.00
122	Kunaveettil Thodu - 2	.0.15	-	-
123	Cheriya kadamakudy thodu	0.15	4.00	2.50
124	Thekkepanda,vally thodu	0.22	3.00	1.50
125	Chattahazathu thodu	0.20	3.50	2.00
126	Noth Chellanam thodu	0.80	0.60	
127	Muthukupuram Pathazham thodu	2.00	6.00	
128	Soth chellanam thodu	0.80	6.00	
129	Vadachira thodu	0.60	6.00	
130	Bazar thodu	0.11	6.00	
131	Arakepalam thodu	0.50	20.00	
132	Bazar thodu	0.60	5.00	
133	Kandakadavu thodu	0.60	10.00	
134	Chalakadavu thodu	1.20	20.00	
135	Pandyal muttu thodu	0.80	15.00	
136	Peediyakal thodu	0.80	10.00	
137	Bolummal Jewllery thodu	0.50	6.00	
138	India Sea Food thodu	0.50	5.00	
139	Parathum veedu thodu	0.80	6.00	
140	Manik road thodu	0.60	18.00	
141	Markat bridge thodu	0.50	6.00	
142	Water task thodu	0.80	6.00	
143	Near Electricity office	0.50	7.00	
144	Vijayam kanal	1.40	18.00	
145	Cheriyakadavu thodu	1.00	8.00	
146	Water tank thodu	0.90	10.00	
147	Sree Durga temple thodu	1.20	6.00	
148	Manayil thodu	0.55	6.00	
149	Manayil thodu	0.55	5.00	

150	K.P. Xavier	0.60	6.00	
151	Fishermen Gyap thodu	0.70	8.00	
152	Moorthy thodu	0.90	6.00	
153	Moorthy thodu	0.60	6.00	
154	C.M.s. thodu	0.60	6.00	
155	Konoth thodu	0.80	6.00	
156	Near Velamkanni chapal	0.80	6.00	
157	Thonithodu	0.80	18.00	
158	Aryapadu thodu	0.80	10.00	
159	Nirakkassery thodu	1.00	8.00	
160	Kaithaveli thodu	0.30	6.00	
161	Padma Memorial thodu	0.45	7.00	
162	Pandikudy east kayalk	0.30	5.00	
163	Devaswam thodu	0.50	5.00	
164	Chakarachal Suis thodu	0.50	5.00	
165	Ganapathykadu	0.50	5.00	
166	Bazar thodu	0.30	7.00	
167	Azhipalam athodu	0.80	4.00	
168	Punnakathara colony thodu	0.60	7.00	
169	Maruvakad thodu	0.80	7.00	
170	Puthenthodu	0.65	7	
171	Puthenthodu	0.65	6.00	
172	Puthenthodu	0.50	6.00	
173	North Laksham veedu	0.20	20.00	
174	Markat thodu	0.60	6.00	
175	Kannamali thodu	0.90	7.00	
176	Peediyakal thodu	0.90	8.00	
177	Water tank thodu	0.80	7.00	
178	St. Jossephs School thodu	0.65	8.00	
179	Kattikat thodu	0.65	8.00	
180	Moorthy thodu	0.70	8.00	
181	Water tank thodu	0.20	6.00	
182	CMS Kurisupura thodu	0.60	5.00	
183	Kuthirakoor kari thodu	0.50	8.00	
184	Elavanakari thodu	0.60	8.00	
185	Kuzhiveli thodu	0.10	3.00	
186	Kanichatheri thodu	0.50	8.00	
187	Bandar canal	5.00	12.00	3.00
188	Velan thodu	5.00	3.00	2.00
189	Periyar	15.00		
190	Kuzhikandan -panachi thodu	3.00	8.00	3.00
191	Edampadam - madapatu thodu	3.00	3.00	2.00
192	Valiyachal thodu	1.25	2.00	1.80
193	Chenganal thodu	1.50	2.00	1.00
194	Puthelakad thodu	1.25	2.00	2.00
195	Kandagachira -- Changampathal	0.50	1.00	0.50
196	Kadungamangalam -- Thoppil thazham thodu	0.50	4.50	1.50
197	Thukalazhithadam	0.60	4.00	1.50
198	Pothiyilthazham thodu	0.80	3.00	1.50
199	Varapuzha pallimukku thodu	1.50	5.00	2.00
200	thodu	1.50	2.50	2.00

201	Kappithan thodu	1.50	3.00	1.50
202	Kollanad thodu	1.50	4.00	1.50
203	Chettiyalithazham thodu	0.43	2.00	
204	Pallathupadam thodu	0.86	3.00	
205	Punchathodu	1.52	3.00	
206	Mannukkavu thodu	0.65	3.00	
207	Karikkattupadam thodu	0.84	3.00	
208	Edappally thodu	2.10	9.00	
209	Vadathodu thodu	3.00	5.00	4.00
210	Vymeli thodu	2.00	4.00	4.00
211	Winners thodu	1.50	2.00	3.00
212	Kattakandathil thodu	1.00	5.00	3.00
213	Blayi thodu	1.50	4.00	4.00
214	Kolarikal thodu	1.00	2.00	2.00
215	Thodu behind Simson Talkies	1.00	2.00	2.00
216	Maraparambu -Yasoram thodu	2.00	2.00	2.00
217	Nattu thodu	4.50	6.00	3.00
218	Kaliparambil thodu	0.75	2.50	2.00
219	5th ward thodu Nr.Rajeev Gandhi Road	0.05	3.00	1.50
220	Ward-1, Nr. TV Parameswaran's house	0.06	2.50	1.50
221	Kandathiparambu thodu	0.12	3.50	2.00
222	Priyadarsini thodu	0.09	2.50	1.50
223	Padannakari thodu	0.30	3.00	1.80
224	Koottunkal -- Puthiyamadam thodu	2.00	3.00	2.50
225	Ajantha Thodu	1.00	4.00	2.00
226	Thottathil parambu thodu	1.00	3.00	2.00
227	Boundary thodu	4.00	3.00	1.50
228	Ayani thodu	2.50	4.00	2.00
229	Poonithura thodu	1.00	2.50	2.00
230	Ayani Kodezhathumkadavu thodu	2.00	2.50	2.00
231	Andipilly thodu	0.35	2.00	1.50
232	Vikas nagar thodu	2.00	2.50	2.00
233	Arakkaparambu thodu	0.25	1.00	1.50
234	Appassry thodu	1.50	2.50	2.00
235	Ozhukuthara thodu	0.15	2.50	2.00
236	Netoor thodu	1.00	10.00	3.50
237	Manakachira thodu	1.50	3.00	2.00
238	Thekkethadath Kunduveli thodu	0.60	4.00	3.00
239	Koladath padam thodu	1.00	5.00	2.00
240	Puranneli thodu	1.00	3.00	2.00
241	Puthepadam highway thodui	2.00	3.00	1.50
242	Peringattuthodu	1.50	3.00	1.50
243	Railway puthussery thodu	0.10	2.00	1.50
244	Kattiparambu thodu	0.20	2.50	2.00
245	Kannattukattu thodu	0.25	2.00	1.00
246	Vanissery thodu	0.15	1.50	1.00
247	Kattithara Sahakarana thodu	0.80	2.00	2.00
248	Panchayat Market thodu	0.60	2.00	2.00
249	Ozhukuthara thodu	0.15	2.50	2.00
250	Edakkattu Railway thodu	0.80	3.00	1.50
251	Railway kadavil thodu	0.10	3.00	2.00

252	Railway Vadyappily thodu	0.30	2.00	1.50
253	Thirunettoor Thamarakulam thodu	0.25	3.00	1.50
254	Pattupurackal thdu	0.25	3.50	1.00
255	Madhavappily thodu	0.25	3.00	1.00
256	Kannoth Manachira Thodu	0.25	1.50	1.00
257	Chavuthuruthy thekkedath Thodu	0.20	2.00	1.50
258	Thrithayil Madam Padannaparambu thodu	0.20	2.50	1.50
259	Pulluvally thodu	0.10	3.00	1.50
260	Cherukadu Peruveli Thitta Thodu	0.40	2.50	3.00
261	Chittamana thodu	0.10	3.00	2.50

Details of Drainage Works – Kochi CDP Area

1. Kochi Corporation Area

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Edappally thodu, Mandhra - Rameswaram canal, Pandarachal, Thevara Perandoor thodu, Chilavanoor puzha, Champakara canal, Chitrapuzha, Chengandam pokku thodu, Karanamkodu thodu, Pashnithodu, Pallichal thodu, Valavikadavu thodu, Ponnathuchal thodu Puncha thodu, Rail nagar thodu, Koithara Canal	77.21	154.81
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links		309.94
3	**Area of drains and Others** Total area of drains; Protection, renovation of ponds and other water bodies	330.00	124.76
	Grand Total		**589.51**

2. Tripunithura Muncipality

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Kariyil thodu, Chathari thodu, Palliparambukavu, Mekkara thodu, Monippally thodu, Thamarakulangara, Kozhuveli thodu, Poornipuzha, Kadambrayar, Andhakarathodu, Pallimittam puzha, Kaniyampuzha, Karigachira puzha	50.51	25.62
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	20.00	3.65
3	**Area of drains and Others** Total area of drains; Protection, renovation of ponds and other water bodies	70.00	12.40
	Grand Total		**41.67**

3. Kalamassery Municipality

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Periyapalam thodu, Arimparathodu, Ponnukudathu thodu, Thuruthipadam thodu, Azhakapadam thodu, Mundampalam thodu, Vidapuzha thodu, Plathazhathu thodu, Pathadipalam thodu, Karipayi thodu, Porunnikal thodu, Korakampally thodu, Muttarpuzha	22.39	9.67
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	21.41	4.10
3	**Area of drains and Others** Total area of drains; Protection, renovation of ponds and other water bodies	58.00	7.96
	Grand Total		**21.73**

4. Mulavukad Panchayat

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Valiyaparambu Thodu, Kurisunkal Thodu, Palliparambu Thodu, Valiyathara Thodu, Ettummal Thodu, Keraleswarapuram Thodu, Pappukunju Kadavu, Kalathara Thodu, Pandaserry Thodu, Thandaserry Tholdu, Convent Thodu, Puzhi Thodu, Koonam Thodu, Pallichira West Thodu	8.00	3.09
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	2.45	0.91
3	**Area of drains** Total area of drains	32.00	2.56
	Grand Total		**6.56**

5. Elankunapuzha Panchayat

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** R.M. P. Canal, Bandhar canal, Velan thodu, Kaipilly thodu, Palli thodu	19.50	4.87
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	14.50	5.39
3	**Area of drains** Total area of drains	22.00	1.76
	Grand Total		**12.02**

6. Njarackal Panchayat

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Appangad thodu, Market thodu, Parackal thodu	7.50	2.73
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	2.50	0.93
3	**Area of drains** Total area of drains	18.00	1.44
	Grand Total		**5.10**

7. Kadamakudy Panchayat

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Pizhala thodu, Cheriya kadamakudy thodu, Puthusserry thodu, Kandandu thodu	4.00	1.53
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	0.57	0.21
3	**Area of drains** Total area of drains	11.00	0.88
	Grand Total		**2.62**

8. Cheranalloor Panchayat

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Arattumuttu thodu, Vadathodu thodu, Vymeli thodu, Winners thodu, Blayi thodu, Maraparambu -Yasoram thodu, Chittoor Puzha	15.00	6.75
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	14.50	5.39
3	**Area of drains** Total area of drains	32.00	2.56
	Grand Total		**14.70**

9. Varapuzha Panchayat

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Chettibhagam thodu, Thundathumkadavu, Boatjetty - market thodu, Edampadam thodu	9.50	3.85
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	6.00	2.23
3	**Area of drains** Total area of drains	25.00	2.00
	Grand Total		**8.08**

10. Eloor Panchayat

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Kuzhikandan -panachi thodu, Edampadam - madapatu thodu, Valiyachal thodu, Chenganal thodu, Puthelakad thodu	10.00	3.68
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	10.00	3.72
3	**Area of drains** Total area of drains	42.00	3.36
	Grand Total		**10.76**

11. Thrikkakara Panchayat

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Vazhakala thodu, Kadamakeri thodu, Nampilli thodu, Kannankeri Kalachal thodu, Athikkalil thodu, Korthattunada thodu, Edachira thodu	19.50	7.60
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	10.00	3.72
3	**Area of drains and Others** Total area of drains; Protection, renovation of ponds and other water bodies	53.00	6.24
	Grand Total		**17.56**

12. Thiruvamkulam Panchayat

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Konothupuzha, Kaniyavally puzha, Union bank thodu, Mukkathuthazham thodu, Akathumpadam - Kunnath kulangara thodu, Theneerchal - Chitrapuzha thodu, Kuannpilly thazham thodu	29.10	24.46
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	8.00	2.98
3	**Area of drains and Others** Total area of drains; Protection, renovation of ponds and other water bodies	34.00	3.72
	Grand Total		**31.16**

13. Maradu Panchayat

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Koottunkal -- Puthiyamadam thodu, Ajantha Thodu, Thottathil parambu thodu, Boundary thodu, Ayani thodu, Poonithura thodu, Ayani Kodezhathumkadavu thodu, Vikas nagar thodu, Appassry thodu, Netoor thodu, Manakachira thodu	19.50	7.28
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	13.60	5.05
3	**Area of drains** Total area of drains	39.00	3.12
	Grand Total		**15.45**

14. Kumbalam Panchayat

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Vendotti thodu, Chiraka thodu, Pappali thodu, Vezhnattu thodu, Kanavallichira thodu, Mattalipadam thodu	11.00	4.08
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	21.17	7.87
3	**Area of drains** Total area of drains	16.00	1.28
	Grand Total		**13.23**

15. Chellanam Panchayat

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Vijayan Canal, Uppathikad Thodu, Chakkarachal Thodu, Neendakara Thodu	26.00	3.78
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	41.76	5.00
3	**Area of drains** Total area of drains	16.00	1.28
	Grand Total		**10.06**

16. Kumbalangi Panchayat

Sl.No	Name	Unit (Km/No./Unit area)	Total (Crores)
1	**Primary Drains** Nattu thodu, Kaliparambil thodu	5.25	1.95
2	**Natural and Man made Secondary Drains** Natural Secondary, Man made Secondary, Providing secondary missing links	2.13	0.76
3	**Area of drains** Total area of drains	21.00	1.68
	Grand Total		**4.39**

Storm Water Drainage System Investement Plan

Sl.No	Name of Local Body	Primary Drains Rehabilitation (Crores)	Construction of Secondary Drains (Natural and Man made) (Crores)	Construction of Area Drains & Others (Crores)	Total (Crores)
1	Kochi Corporation Area	154.81	309.94	124.76	**589.51**
2	Tripunithura Municipality	25.62	3.65	12.40	**41.67**
3	Kalamassery Municipality	9.67	4.10	7.96	**21.73**
4	Mulavukad Panchayat	3.09	0.91	2.56	**6.56**
5	Elankunapuzha Panchayat	4.87	5.39	1.76	**12.02**
6	Njarackal Panchayat	2.73	0.93	1.44	**5.10**
7	Kadamakudy Panchayat	1.53	0.21	0.88	**2.62**
8	Cheranalloor Panchayat	6.75	5.39	2.56	**14.70**
9	Varapuzha Panchayat	3.85	2.23	2.00	**8.08**
10	Eloor Panchayat	3.68	3.72	3.36	**10.76**
11	Thrikkakara Panchayat	7.60	3.72	6.24	**17.56**
12	Thiruvamkulam Panchayat	24.46	2.98	3.72	**31.16**
13	Maradu Panchayat	7.28	5.05	3.12	**15.45**
14	Kumbalam Panchayat	4.08	7.87	1.28	**13.23**
15	Chellanam Panchayat	3.78	5.00	1.28	**10.06**
16	Kumbalangi Panchayat	1.95	0.76	1.68	**4.39**
	Total	**265.75**	**361.85**	**177**	**804.60**
	Capacity Building				36.00
	Others				64.00
	Grand Total				**902.00**

ANNEXURE - 5

ANNEXURE 5
TRAFFIC AND TRANSPORTATION

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

Running speed (Km/Hr)	Peak hour		Off-peak hour	
	Road Length in Kms	Percentage (%)	Road length in Kms	Percentage (%)
< 10	6.7	4.10	0	0
10—20	38.45	23.70	12.9	7.90
20—30	54.75	33.70	31.9	19.60
30—40	33.60	20.70	61.6	38.00
40—50	21.10	13.00	36.3	22.40
>50	7.70	4.80	19.6	12.10
Total	162.3	100.00	162.3	100.00

The intensity of traffic at mid block locations is presented in the following table:

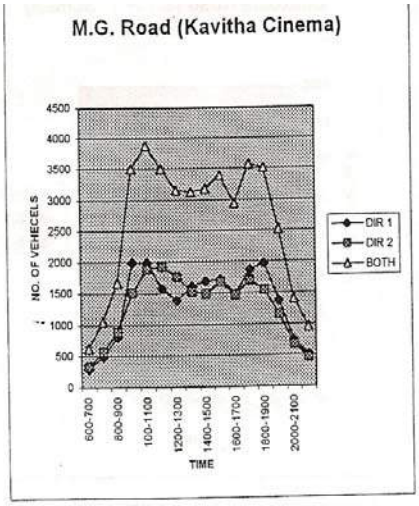
Intensity and Directional Distribution of Traffic at Mid Block Locations

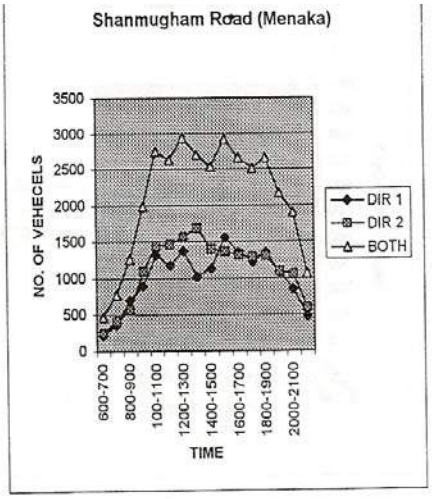
Sl. No	LOCATION	ADT (16 Hours)		MORNING PEAK				EVENING PEAK				DIR.DISTRIBUTION			
		PCUs	Veh.	PCUs	% of ADT	Veh.	% of ADT	PCUs	% of ADT	Veh.	% of ADT	E-W /N-S	%	W-E/S-N	%
1	M.G. Road (Near Dwaraka)	47612	41903	3973	8.3	3830	9.14	3298	6.89	3755	8.97	1313	33	2660	67
2	M.G. Road (north of Rajaji Road)	39121	41998	3628	9.27	4030	9.6	3552	9.08	3873	9.22	1647	45	1981	55
3	Chittor road (between South Jn. & Valanjambalam	11792	7747	1069	9.07	779	10.06	896	7.6	589	7.6	1069	100	0	0
4	Shanmugham Road (near Menka)	42593	33961	3514	8.25	2750	8.1	3682	8.64	2922	8.6	2050	56	1632	44
5	Thevara Road	14829	17763	1296	8.74	1417	7.98	1051	7.09	1157	6.51	770	59	536	41
6	Market Road (near Catholic Syrian Bank)	6162	6832	423	6.86	428	6.26	522	8.47	634	9.28	354	68	168	32
7	T.D. Road	8761	9429	948	10.82	976	10.35	823	9.39	855	9.07	725	76	223	24
8	D.H. Road	11718	9654	1010	8.62	853	8.84	959	8.18	798	8.26	829	87	121	13
9	Old Railway Station Road	6581	5933	518	7.87	486	8.19	701	10.7	617	10.4	385	55	316	45

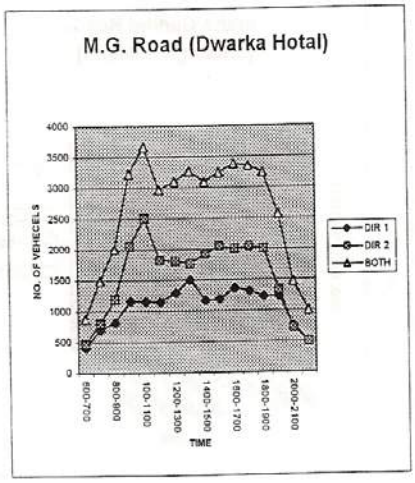
Sl. No	LOCATION	ADT (16 Hours)		MORNING PEAK				EVENING PEAK				DIR.DISTRIBUTION			
10	Edakochi - Pallurthy Road (near SDPY boys school)	17176	14130	1543	8.98	1350	9.55	1329	7.74	1061	7.51	403	26	1140	74
11	Indira Gandhi Road (Willington Island)	9853	8175	926	9.4	883	10.8	975	9.9	899	11	752	77	223	23
12	Bristow Road (Willington Island)	6667	5847	559	8.38	431	7.37	798	12	745	12.7	398	50	401	50
13	Beach Road (near Football Ground)	5033	5610	1013	20.13	951	16.95	401	7.97	464	8.27	101	10	912	90
14	Beach Road (near St. Francis Church)	1800	2475	106	5.89	140	5.66	197	10.9	151	6.1	155	79	42	21
15	P.T. Jacob Road	16282	16127	1858	11.41	1902	11.79	1392	8.55	1353	8.39	552	30	1306	70
16	Bazaar Road	3118	3729	424	13.6	492	13.33	336	10.8	378	10.1	243	57	181	43
17	K.B. Jacob Road	6998	6093	862	12.32	787	12.92	806	11.5	604	9.91	278	32	585	68
18	Amaravathi Road	2834	3161	253	8.93	299	9.46	226	7.97	272	8.6	193	76	60	24
19	Maulana Azad Road	14100	12414	1315	9.33	1176	9.47	1189	8.43	977	7.87	666	51	649	49
20	Parmara Road (West of North ROB)	2305	2847	179	7.77	211	7.41	223	9.67	297	10.4	154	67	77	33
21	Palarivattom - Thammanam - Vytilla Road	3167	3963	360	11.37	422	10.64	262	8.27	301	7.59	212	59	148	41
22	Pottakuzhy Road (North) Parallel to Banerjee Road	7591	8073	887	11.68	1086	13.45	671	8.84	645	7.99	333	38	554	62
23	Moolankuzy Road (North) Parallel to P. T. Jacob Road)	5077	6168	400	7.88	492	7.98	412	8.12	475	7.7	117	28	295	72

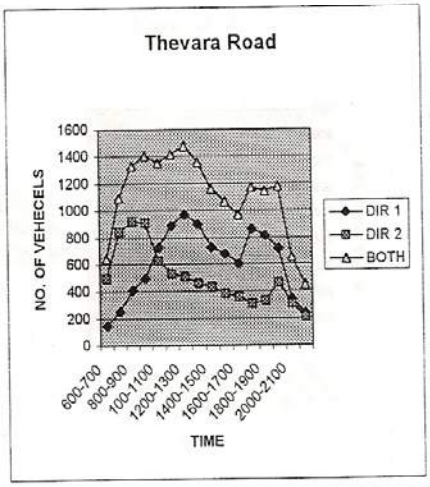
Source: Comprehensive study for the GCDA area by RITES.

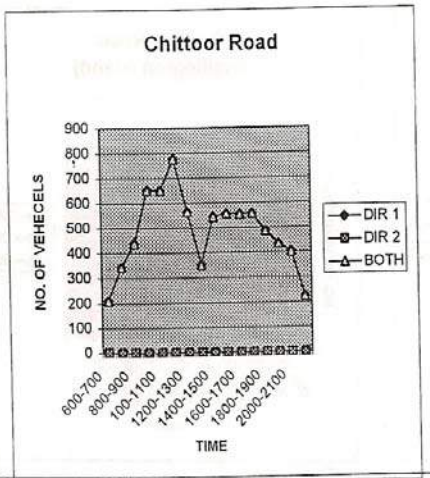
Hourly variation of traffic at mid block locations

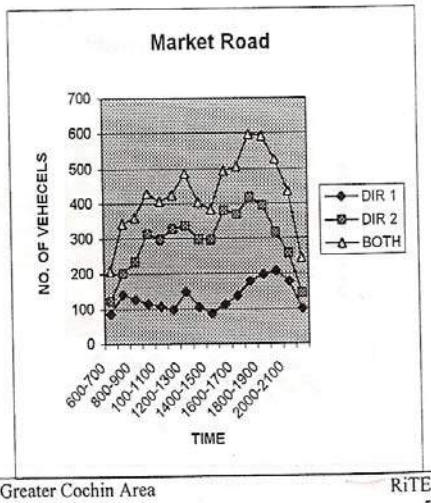












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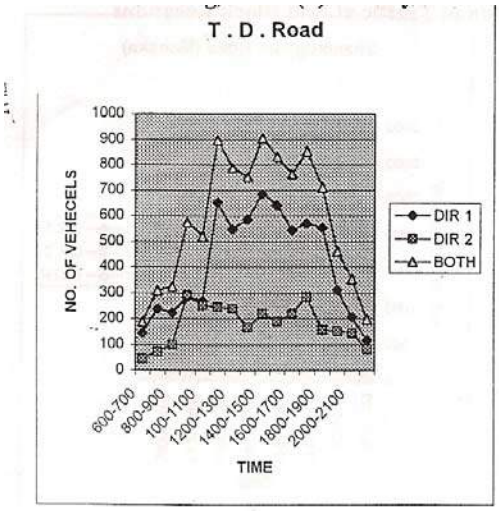
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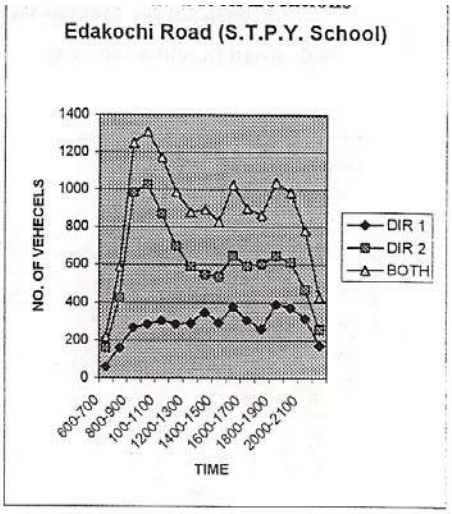
800
700
600
500
400
300
200
100
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH


Edakochi Road (S.T.P.Y. School)
NO. OF VEHECELS
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1000
800
600
400
200
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1200-1300
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1800-1900
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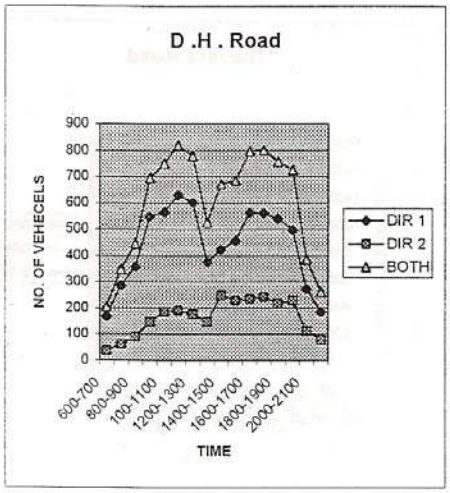
TIME
DIR 1
DIR 2
BOTH


D .H . Road
NO. OF VEHECELS
900
800
700
600
500
400
300
200
100
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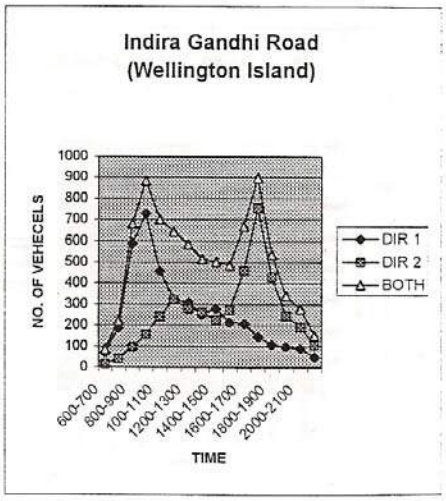
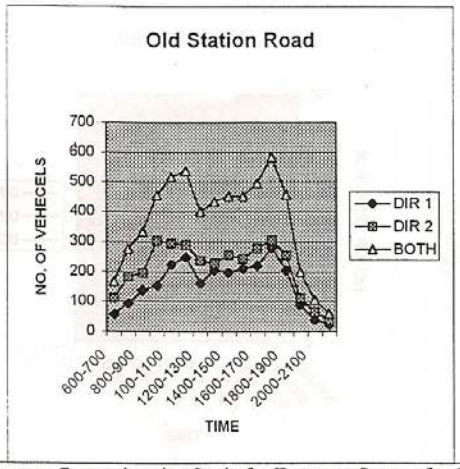
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH


Indira Gandhi Road
(Wellington Island)
NO. OF VEHECELS
1000
900
800
700
600
500
400
300
200
100
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH


Old Station Road
NO. OF VEHECELS
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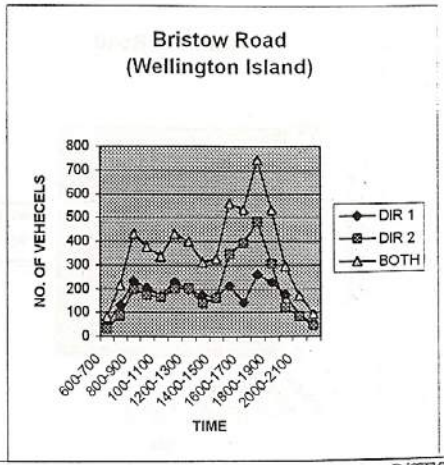
600
500
400
300
200
100
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH


Bristow Road
(Wellington Island)
NO. OF VEHECELS
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700
600
500
400
300
200
100
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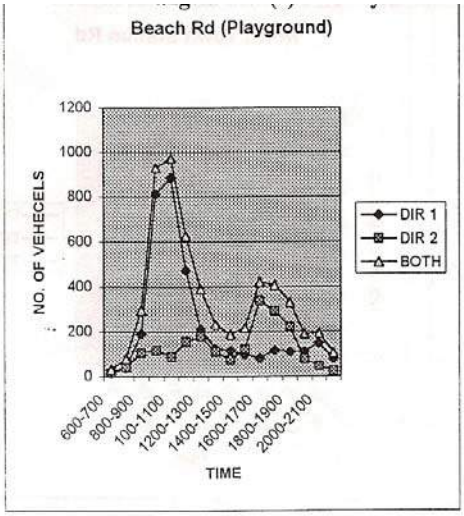
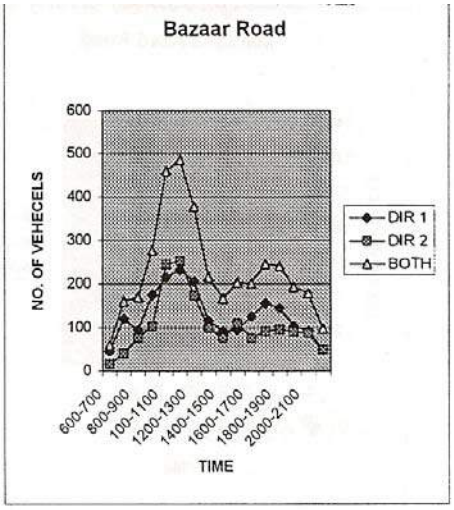
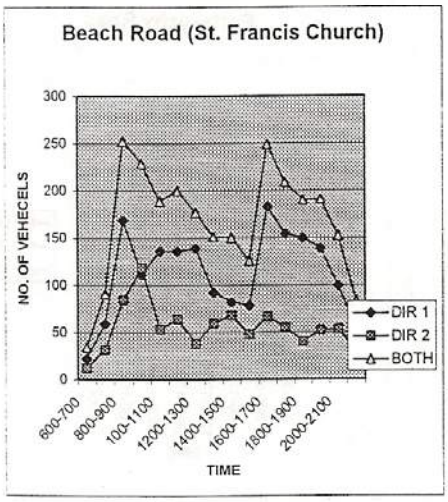
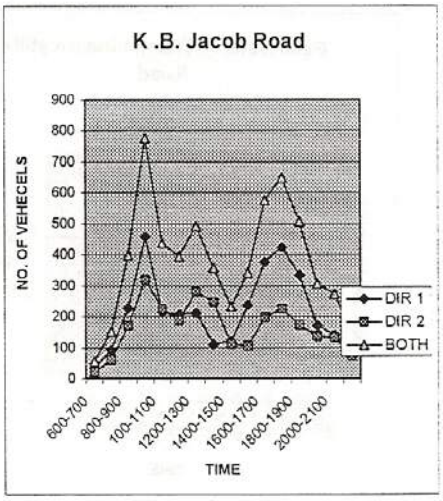
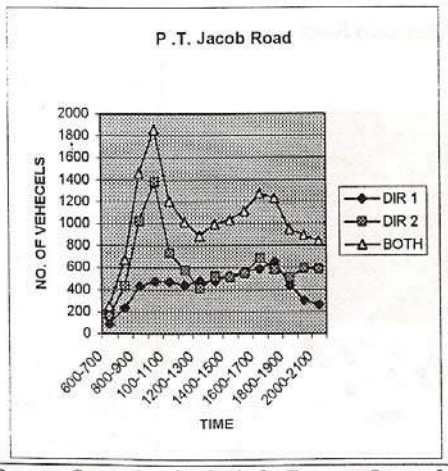
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH

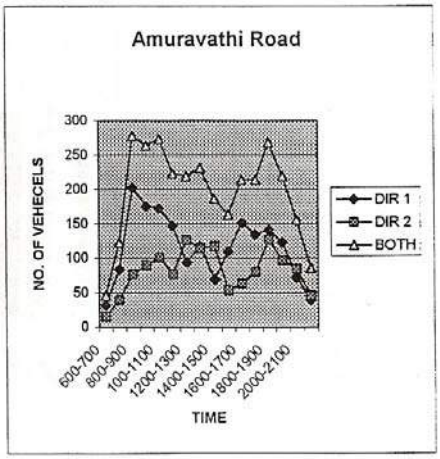

Beach Rd (Playground)
NO. OF VEHECELS
1200
1000
800
600
400
200
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH

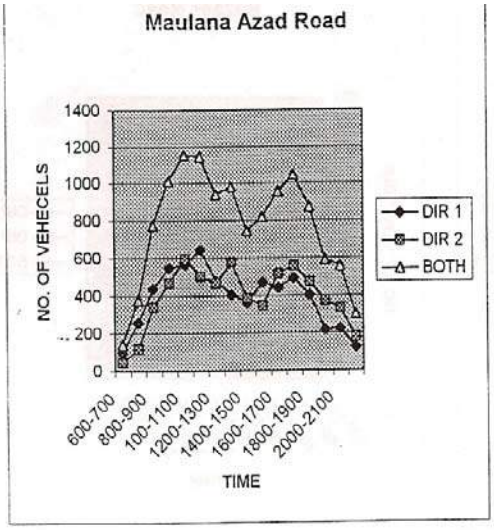

Bazaar Road
NO. OF VEHECELS
600
500
400
300
200
100
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH

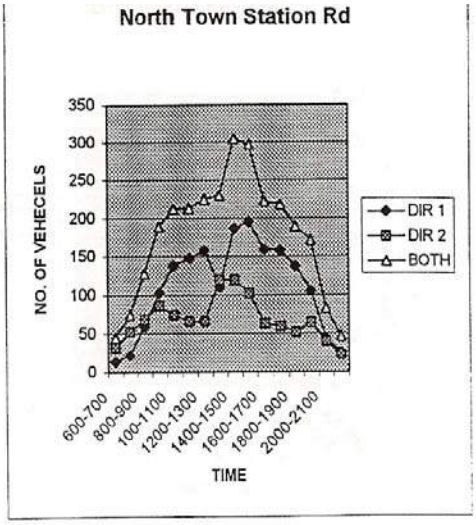

Beach Road (St. Francis Church)
NO. OF VEHECELS
300
250
200
150
100
50
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH

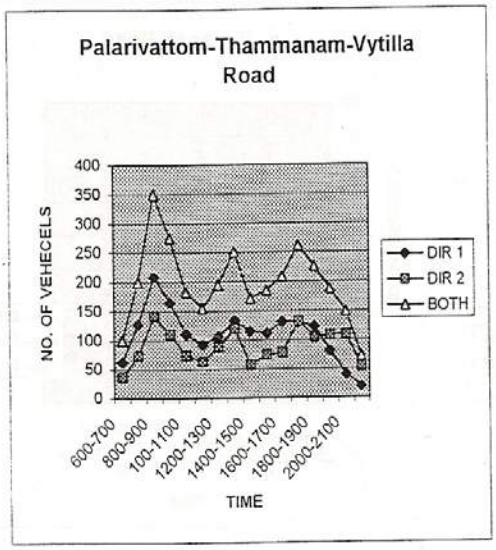

K .B. Jacob Road
NO. OF VEHECELS
900
800
700
600
500
400
300
200
100
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH

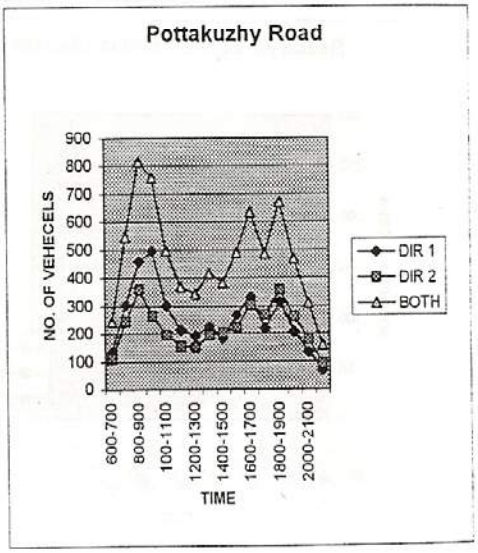

P .T. Jacob Road
NO. OF VEHECELS
2000
1800
1600
1400
1200
1000
800
600
400
200
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH

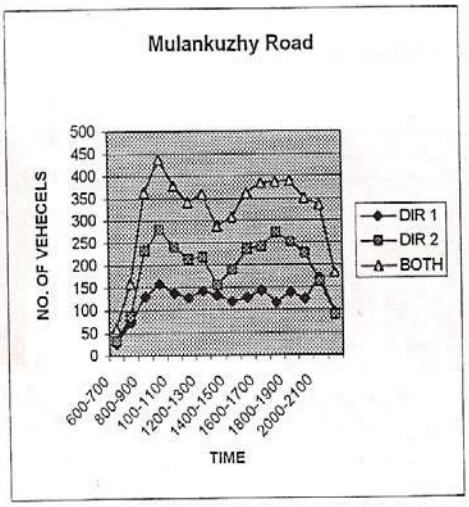

Amuravathi Road
NO. OF VEHECELS
300
250
200
150
100
50
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH


Maulana Azad Road
NO. OF VEHECELS
1400
1200
1000
800
600
400
200
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH


North Town Station Rd
NO. OF VEHECELS
350
300
250
200
150
100
50
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH


Palarivattom-Thammanam-Vytilla Road
NO. OF VEHECELS
400
350
300
250
200
150
100
50
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH


Pottakuzhy Road
NO. OF VEHECELS
900
800
700
600
500
400
300
200
100
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH


Mulankuzhy Road
NO. OF VEHECELS
500
450
400
350
300
250
200
150
100
50
0
600-700
800-900
100-1100
1200-1300
1400-1500
1600-1700
1800-1900
2000-2100
TIME
DIR 1
DIR 2
BOTH

Intensity of traffic at screen line locations

Sl. No	Location	ADT (16 hrs)		Morning Peak				Evening Peak				Dir. Distribution			
		PCUs	*Veh*	*PCUs*	*% of ADT*	*Veh*	*% of ADT*	*PCUs*	*% of ADT*	*Veh*	*% of ADT*	*E-W/N-S*	*%*	*W-E/S-N*	*%*
1	NH-47 (North of Edappally-Bypass Jn)	40588	27199	3790	9.34	2591	9.53	3305	8.14	2286	8.4	1699	45	2093	55
2	Edappally Road (West of Palarivattom)	49371	44741	4043	8.19	3703	8.28	3558	7.21	3234	7.23	2542	63	1503	37
3	Banerjee Road (West of Kaloor)	59075	49537	5121	8.67	4205	8.49	4592	7.77	4003	8.08	3091	64	1768	36
4	North ROB (Banerjee Road)	60833	49225	5142	8.45	4392	8.92	4792	7.88	3998	8.12	3309	64	1834	36
5	South ROB (SA Road)	42672	38619	3466	8.12	3234	8.37	3385	7.93	3197	8.28	2128	61	1340	39
6	Bypass ROB (North of Vyttila)	41644	30683	3452	8.29	2455	8.00	3240	7.78	2510	8.18	2196	64	1258	36
7	Tripunithura Road (power house east of Vyttila)	27982	23379	2262	8.08	1889	8.08	2047	7.32	1797	7.69	1370	61	893	39
8	Venduruthy Bridge	21347	19229	1789	8.38	1766	9.18	1847	8.65	1689	8.78	882	48	967	52
9	Mattanchery Bridge	31164	27367	2258	7.25	1983	7.25	2478	7.95	2112	7.72	1504	61	977	39

Source: RITES Primary Survey 2000

Passenger and vehicular trips at outer cordon points

Sl.No	Movement Type	Passenger Trips	Vehicular Trips
1	Internal to External (%)	112674 (36.67)	14824 (33.68)
2	External to Internal (%)	120401 (39.18)	17672 (40.15)
3	External to External (%)	74214 (24.15)	121514 (26.17)
	Total	**307289 (100.00)**	**44010 (100.00)**

Source: RITES Primary Survey, 2000

Distribution of road network in Kochi city according to availability of carriageway

Sl. No	Carriage way width	Road length (km)	Percentage
1	Less than single lane	100.125	16.3
2	Single lane	347.680	56.6
3	Intermediate lane	81.295	13.2
4	Two lane	52.355	8.5
5	Three lane	4.050	0.7
6	>Four lane	28.460	4.7
	Total	**613.965**	**100**

Source: NATPAC Report 2006, Master Plan study for CoC

Distribution of road network in Kochi city according to surface type and condition of roads

Sl. No	Surface Type		Condition of road			Total
			Good	Fair	Bad	
1	Bituminous	Km	192.740	263.280	99.430	555.450
		%	**34.70**	**47.40**	**17.90**	**100.00**
2	Cement Concrete	Km	28.240	1.840	0.620	30.700
		%	**91.99**	**5.99**	**2.02**	**100.00**
3	WBM	Km	4.210	2.530	9.950	16.690
		%	**25.22**	**15.16**	**59.62**	**100.00**
4	Earthen surface	Km	2.210	3.470	5.455	11.135
		%	**19.85**	**31.16**	**48.99**	**100.00**
	Total	**Km**	227.400	271.120	115.455	613.975
		%	**37.04**	**44.16**	**18.80**	**100.00**

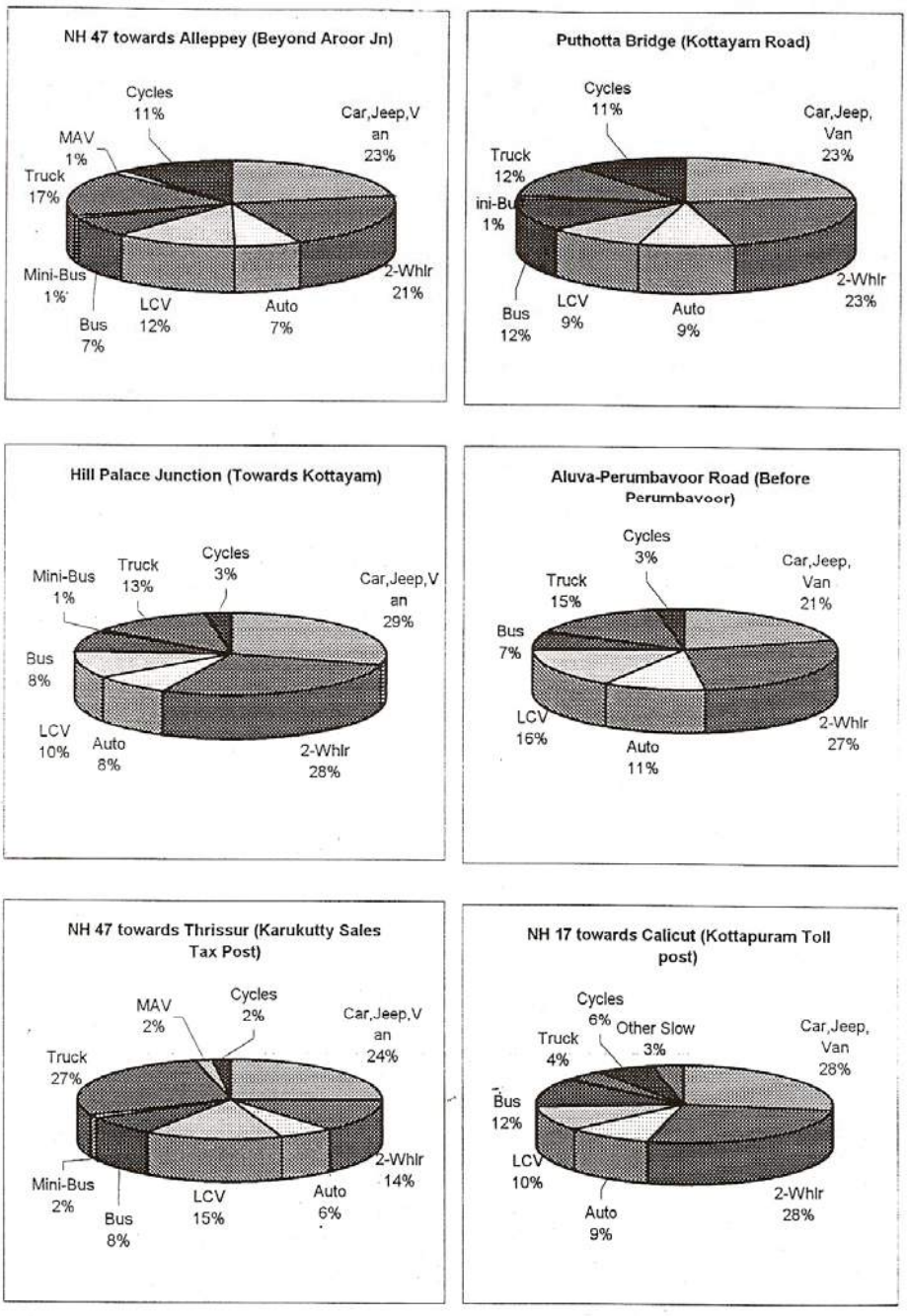
Source: NATPAC Report 2006, Master Plan study for CoC

Details of accident occurred during 2002-04 in Kochi City

Sl. No	Police Station	No. of accidents			Injured			Died		
		2002	*2003*	*2004*	*2002*	*2003*	*2004*	*2002*	*2003*	*2004*
1	Traffic West	1117	1063	1259	1054	1100	1154	46	40	56
2	Traffic East	1691	1895	1932	1757	1788	2070	103	114	121
	Total	2808	2958	3191	2811	2888	3224	149	154	177

Source: NATPAC Report 2006, Master Plan study for CoC

Composition of Traffic at outer cordon locations



FERRY CHARGE

Sl. No.	Name of Route	Fair
1	Ernakulam - Mattanchery	Rs. 3.50
2	Ernakulam - Karuvelipady	Rs. 4.50
3	Ernakulam - Vypeen	Rs. 2.00
4	Fortkochi - Vypeen	Rs 1.75
5	Kalvathy - Ernakulam	Rs 2.50
6	Kalvathy - Wellington Island	Rs 2.50

Parking Duration

Sl No.	Location		Car				Two wheeler		Auto		LCV			
			Short - term		*Long term*		*Short - term*		*Long term*					
			<2 hrs	*2-4 hrs*	*4-6 hrs*	*>6 hrs*	*< 2 hrs*	*2-4 hrs*	*4-6 hrs*	*>6 hrs*	*<2 hrs*	*>2 hrs*	*<2 hrs*	*>2 hrs*
			%	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*
1	M.G. Road	Ravi Puram to Madhav Pharmacy	90	7	2	1	96	2	1	1	99	1		
		Madhav Pharmacy to Ravi Puram	88	7	3	2	92	5	2	1	99	1		
2	Banerjee Road	Kaloor to High Court	93	3	3	1	93	4	2	1	100	0		
		High Court to kaloor	93	444	2	1	94	3	2	1	100	0		
3	Edappaly Road	Kaloor to Jwahar Std.	99	1	0	0	99	1	0	0	100	0		
		Jwahar Std to Kaloor	98	2	0	0	99	1	0	0	100	0		
4	Broadway Road	Banerjee Road to Paico	95	5	0	0	98	2	0	0	100	0	98	2
		Paico to Banerjee Road	94	5	1	0	96	4	0	0	98	2	99	1
5	Shanmugham Road	High Court to Hospital	83	11	4	2	86	10	3	3	95	5		
		Hospital to High Court	81	11	5	3	87	10	2	2	98	2		
6	Market Road	Veg. Market to Hospital	92	5	2	1	97	2	1	1	100	0	99	1
		Hospital to Veg. Market	96	1	3	0	98	1	1	1	98	2	97	3
7	S.A. Road	Pallimuku to Janatha	85	12	3	0	91	7	1	1	98	2		
		Janatha to Pallimuku	90	6	4	0	95	4	1		73	27		
8	South. Jn. Road	South Jn to Jos Jn.	99	1	0	0	96	3	1	1	100	0		
		Jos Jn. to South Jn.	100	0	0	0	95	5	0	0	100	0		
9	D.H. Road	Jos Jn.toB.T.H.	98	2	0	0	98	2	0	0	100	0		
		B.T.H. to Jos Jn.	99	1	0	0	97	2	1	1	100	0		
Source: Comprehensive study for GCDA area by RITES														

Parking Space Hours

Sl No	Location		Car				Two Wheeler				Auto		LCV	
			Short - term		Long term		Short - term		Long term					
			<2 hrs	2-4 hrs	4-6 hrs	>6 hrs	< 2 hrs	2-4 hrs	4-6 hrs	>6 hrs	<2 hrs	>2 hrs	<2 hrs	>2 hrs
1	M.G. Road	Ravi Puram to Madhav Pharmacy	1528	357	170	119	454	28	24	33	962	39		
		Madhav Pharmacy to Ravi Puram	1903	454	324	303	481	78	52	37	1028	42		
2	Banerjee Road	Kaloor to High Court	457	44	74	34	161	21	17	12	428	0		
		High Court to kaloor	815	105	88	61	189	18	20	14	398	0		
3	Edappaly Road	Kaloor to Jawahar Lal Nehru Stadium.	336	10	0	0	121	4	0	0	164	0		
		Jwahar Lal Nehru Stadium to Kaloor	282	17	0	0	116	4	0	0	209	0		
4	Broadway Road	Banerjee Road to Paico	88	14	0	0	16	1	0	0	43	0	29	36
		Paico to Banerjee Road	460	73	24	0	129	16	0	0	210	17	97	93
5	Shanmugham Road	High Court to Hospital	459	182	111	77	97	34	17	8	123	26		
		Hospital to High Court	291	118	90	75	63	22	7	5	81	7		
6	Market Road	Veg. Market to Hospital	445	73	48	34	104	6	5	0	340	0	131	106
		Hospital to Veg. Market	259	8	41	0	93	3	5	0	213	17	119	211
7	S.A. Road	Pallimukku to Janatha	226	96	40	0	61	14	3	5	144	12		
		Janatha to Pallimukku	260	52	58	0	111	14	6	0	149	220		
8	South Jn. Road	South Jn to Jos Jn.	374	11	0	0	48	5	3	0	377	0		
		Jos Jn. to South Jn.	31	0	0	0	26	4	0	0	51	0		
9	D.H. Road	Jos Jn.toB.T.H.	136	8	0	0	49	3	0	0	187	0		
		B.T.H. to Jos Jn.	112	3	0	0	30	2	2	0	94	0		

Source: Comprehensive study for GCDA area by RITES

Traffic and Transportation Sector – List of Improvement Works

Sl No	Name of Project	Length in Km/No	Amt. in Rs. Crores
	RFB Projects (16 Nos), Improvement to NH Standard		
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 of Kaloor 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**

Sl No	Name of Project	Length in Km/No	Amt. in Rs. Crores
	Outer Ring Roads		
1	Outer Ring Road.Ghosree Bridge (Chathiathu) – cheranallor- Kadamakkudy- Varappuzha, Athani,Chemaganad, Sreemulanagaram, Keezmadu, Edathala,Kizhakkambalam, Vadavodu Puthenkurush, Chottanikkara, Thiruvankulam, Udayamperoor, Kumbalam linking Marine Drive N.H.17 at Varappuzha, Ernakulam-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**	35.00	140.00
	Total		**140.00**
	Inner Ring Roads		
1	Improvements to Irimpanam - Kalamassery Rd and Extension Up to Nedumpassery on North end and Extension upto NH 49 on south end **Only for Designated Cochin area**	25.00	50.00
2	Improvements to Panampally Nagar Avenue Rd and Extension of Avenue Road to NH 49 through Konthuruthy.	7.00	15.00
3	Kumbalangi Aroor Road, Kumbalangi Panchayath	10.00	20.00
	Total		**85.00**
	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
2	Road starting from Puthussery passing through Cheriyan Thuruth, Chennur, Pizhala, & meeting Vaduthala Chathanad Road, Kadamakkudi panchayath	2.60	40.00
3	Interlinking Sea Port Air Port Road and Ambalamugal Road from Chitrapuzha area.Thiruvankulam Panchayath	7.00	20.00
4	Kundanoor Chilavanoor Link Road	1.60	3.00
	Total		**93.00**

Sl No	Name of Project	Length in Km/No	Amt. in Rs. Crores
	Road Through CBD Area		
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 of Pullepady 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 disturb the existing corridor to MG Road	1.50	70.00
3	Improvements to the Road from Ernakulam – 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, strengthening and widening of existing road	7.00	13.00
12	Palluruthy Rd from Thoppumpady to Kappalandimukku	4.00	6.00
	Total		**233.00**

Sl No	Name of Project	Length in Km/No	Amt. in Rs. Crores
	Water Front Roads		
1	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 Irimpanam, Manakkapady, Vytila.	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 Jn.	5.00	7.00
12	Thrippunithura Chottanikkara Road (East Fort Jn. –	8.00	12.00

Sl No	Name of Project	Length in Km/No	Amt. in Rs. Crores
	Thiruvankulam Kottayathu Para)		
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 Chellanam 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	Raod 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	Amt. in Rs. Crores
	Rail Over Bridges		
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 Path 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	60.00
5	Vytila, Fly Over	1	70.00
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 extension to Sea Port Air Port Rd	1	60.00
9	Sea Port Air Port Rd, Near Collectorate, Sub way	1	60.00
	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 lane 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

Sl No	Name of Project	Length in Km/No	Amt. in Rs. Crores
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	Ernakulam 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, Mullassery 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	Banerji 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

Sl No	Name of Project	Length in Km/No	Amt. in Rs. Crores
9	Thoppumpady	2	3.00
10	Fort Cochin	2	3.00
11	Palarivattom 2 Nos	2	3.00
	Total		**59.00**
	Public Comfort Centres		
1	Kadavanthra, Pallimukku, Padma, Marine Drive, Banerji Road, Subash Bose Park, North Railway Station	**7**	**2.00**
	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 Hectors Land free surrenderd	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

Sl No	Name of Project	Length in Km/No	Amt. in Rs. Crores
6	Fort Cochin	1	2.00
7	Boat Jetty	1	2.00
8	Kadavanthra	1	2.00
	Total		**16.00**
	Road Markings 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**
	Bus Bays		
1	Providing Bus Bays in Designated area	**250**	**12.00**
	Inland Water transport Terminals		
	(a)Major Jetties		
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	Elamkunnapuzha	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	Edapally Canal	5	1.50
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

Sl No	Name of Project	Length in Km/No	Amt. in Rs. Crores
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 waterways		30.00
	Total		**48.00**
	Metro rail		
1	Metro Rail Cochin City - Viability Gap		**635.00**
	GRAND TOTAL		**4252.00**

ANNEXURE - 6

ANNEXURE 6
ENVIRONMENT

Annual average Concentration in (μg/m^3) in Kerala under National Air Quality Monitoring Programme (NAMP)

Summary of SO_2 levels in various cities during 2004.

S.No.	State	City	Location	Type	Average (μg/m^3)	Std. Deviation	n	Air Quality
1	**Kerala**	Kochi	Eloor	I	32	26	78	L
			Irumpanam	I	4	5	91	L
			Ernakulum south	R	5	5	96	L
		Tiruvanantha-puram	Hitech Chackai	I	22	4	93	L
			SMV School	R	9	3	105	L
			Sasthamangalam	R	6	2	103	L
			PRS Hospital	S	5	1	20	-
		Kozhikode	Nallalam	I	BDL	0.3	96	L
			Kozhikode City	R	BDL	1	105	L
		Kottayam	Vadavathoor	I	BDL	0.2	95	L
			Kottayam	R	BDL	1	94	L
		Palakkad	M/s Carborandum Universal Ltd./ SEPR Refractories India Ltd. , Kanjikode	I	BDL	1	120	L

Summary of NO_2 levels in various cities during 2004.

S.No.	State	City	Location	Type	Average (μg/m^3)	Std. Deviation	n	Air Quality
1	**Kerala**	Kochi	Eloor	I	15	12	85	L
			Irumpanam	I	BDL	4	91	L
			Ernakulum south	R	11	6	96	L
		Tiruvanantha-puram	Hitech Chackai	I	18	4	93	L
			SMV School	R	28	5	105	L
			Sasthamangalam	R	18	4	103	L
			PRS Hospital	S	27	2	20	-
		Kozhikode	Nallalam	I	BDL	1	96	L
			Kozhikode City	R	BDL	6	105	L
		Kottayam	Vadavathoor	I	BDL	2	95	L
			Kottayam	R	21	3	94	L
		Palakkad	M/s Carborandum Universal Ltd./ SEPR Refractories India Ltd., Kanjikode	I	BDL	2	120	L

Summary of RSPM levels in various cities during 2004.

S.No.	State	City	Location	Type	Average ($\mu g/m^3$)	Std. Deviation	n	Air Quality
1	**Kerala**	Kochi	Eloor	I	67	21	85	M
			Irumpanam	I	62	29	91	M
			Ernakulum south	R	50	15	96	M
		Tiruvanantha-puram	Hitech Chackai	I	126	25	93	H
			SMV School	R	125	38	104	C
			Sasthamangalam	R	78	17	103	H
			PRS Hospital	S	86	15	20	-
		Kozhikode	Nallalam	I	58	12	98	L
			Kozhikode City	R	55	12	106	M
		Palakkad	M/s Carborandum Universal Ltd./ SEPR Refractories India Ltd., Kanjikode	I	107	54	120	M

Summary of SPM levels in various cities during 2004.

S.No.	State	City	Location	Type	Average ($\mu g/m^3$)	Std. Deviation	n	Air Quality
1	**Kerala**	Kochi	Eloor	I	122	25	85	L
			Irumpanam	I	113	29	91	L
			Ernakulum south	R	100	23	96	M
		Tiruvanantha-puram	Hitech Chackai	I	134	25	93	L
			SMV School	R	134	39	104	M
			Sasthamangalam	R	86	18	103	M
			PRS Hospital	S	94	15	20	-
		Kozhikode	Nallalam	I	75	16	98	L
			Kozhikode City	R	89	19	106	M
		Palakkad	M/s Carborandum Universal Ltd./ SEPR Refractories India Ltd., Kanjikode	I	191	52	120	M

Note:- R – Residential and other areas, I – Industrial area, Std deviation – Standard deviation,
n -number of days monitored for 16 and more hours a day
L - Low, M- Moderate, H – High and
C -Critical levels of pollution based on exceedence factor (calculated for n ≥50 days)

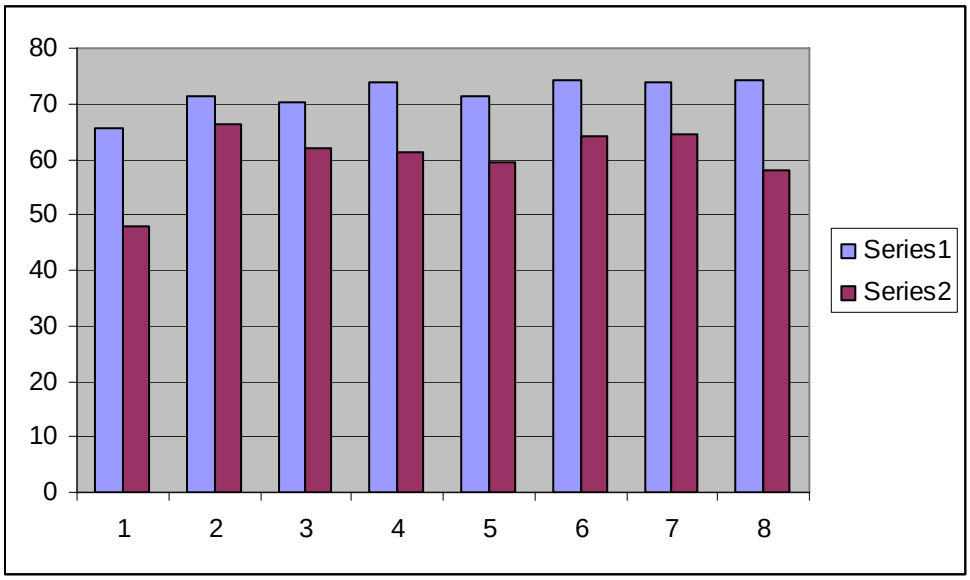
BDL = Below Detection Limit (Concentration less than 4 $\mu g/m^3$ for SO_2)

Summary of Noise Monitoring Data

All values are expressed in dB (A). The upper line in each column represents the range of values and the value in bracket represents the average noise level.

Sl No	Station	Day	Night
1	**Aluva**	60.6 - 70.1 (65.6)	42.3 - 55.6 (48.1)
2	**Kalamassery**	67.3 - 76.6 (71.4)	60. 9- 70.5 (66.2)
3	**Edappally**	64.2 - 73.5 (70.1)	54.3 - 71.2 (62)
4	**Palarivattom**	72.1 - 76.3 (74)	54.7 - 70.1 (61.2)
5	**Ernakulam North**	67.8 - 6.8 (71.2)	52.9 - 65.8 (59.3)
6	**Ernakulam South**	64.5 - 78.8 (74.4)	58.7 - 74.8 (64.3)
7	**Vyttila**	66.8 - 77.9 (73.7)	59.7 - 69.5 (64.4)
8	**Thripunithura**	67.7 - 77.2 (74.2)	50.5 - 64.8 (58)

Summary of Noise Monitoring Data



- Physico-Chemical Characteristics of Soil in Cochin ULB area

Parameter	Edappalli	Mulavukad	Vallarpadom
PH	5.8	6.2	6.8
Texture			
Sand (%)	62.3	56.4	60.7
Silt	21.7	28.2	18.4
Clay	11.1	15.7	21.3

Analytical results of ground water samples

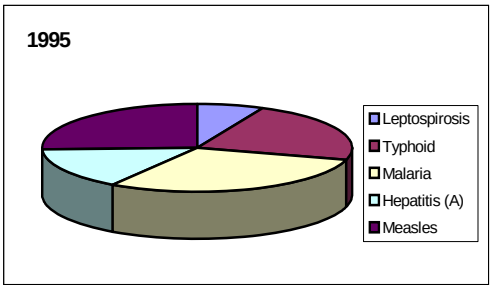
		Requirement	Groundwater quality in Cochin ULB area										
Sl No	**Test Parameters**	**(Desirable limit)**	**Aluva**		**Edappally**		**Ekm. North**		**Ekm. South**	**Vyttila**		**Thripunithura**	
	Unit	*IS-10500, 1993*	*GW 1*	*GW 2*	*GW 1*	*GW 2*	*GW 1*	*GW 2*	*GW 1*	*GW 1*	*GW 2*	*GW 1*	*GW 2*
1	pH	6.5 – 8.5	6.8	5.2	7.9	7.8	7.1	6.6	6.9	7.2	6.7	6.8	6.7
2	Turbidity NTU	5 (Max)	0.9	0.2	0.3	0	98	0.6	2.8	1.3	11	0.9	1.4
3	Hardness as CaCO3 mg/L	300 (Max)	75	48.5	200	186	232.5	176.7	204.7	119	29	141	193
4	Chlorides mg/L	250 (Max)	8.86	18.6	3.54	28.3	77.7	37.7	35.3	7.54	11.3	18.8	58.4
5	Total dissolved solids mg/L	500 (Max)	93	120	60	52	99	59	59	44	10	6	39
6	Sulfates mg/L	200 (Max)	10.5	25	6.5	10.5	5.5	7.5	25	20.5	1	8.5	38
7	Nitrate mg/L	45(Max)	3	2.5	3	0.8	1	,9	0.8	0.9	0.4	0.9	0.3

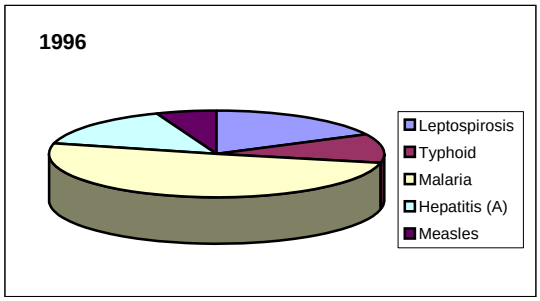
8	Iron as Fe mg/L	0.30 (Max)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	Copper as Cu mg/L	0.05 (Max)	0.01	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.03
10	Zinc as Zn mg/L	5 (Max)	0.1	0.09	0.05	0.05	ND	ND	ND	ND	ND	ND	ND
11	Manganese as Mn mg/L	0.1 (Max)	ND	0.57	0.02	ND	0.23	0.03	ND	ND	ND	ND	0.05
12	Total Chromium as Cr mg/L	0.05 (Max)	ND	0.01	0.03	0.03	0.01	0.01	0.01	0.01	0.02	0.02	0.02
13	Cadmium as Cd mg/L	0.01(Max)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
14	Magnesium mg/L	30(Max)	2.16	1.53	3.75	2.81	7.69	4.18	6.31	3.22	1.01	5.21	3.76
15	Selinium mg/L	0.01(Max)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16	Arsenic as As mg/L	0.05 (Max)	0.02	0.04	0.03	0.03	0.01	0.01	0.01	0.01	ND	ND	ND
17	Mercury mg/L	0.001(Max)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
18	Total Coliforms MPN/100 ml	10	460	43	1100+	93	43	150	1100+	460	1100+	7	93
19	Fecal Coliforms MPN/100 ml	0	290	15	460	9	21	28	150	290	1100	4	23
20	Salmonella	0	Present	Present	Absent	Absent	Absent	Present	Present	Present	Present	Absent	Present

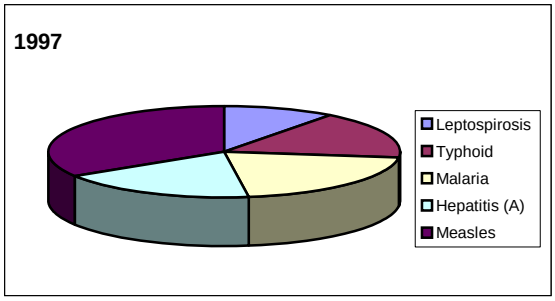
Occurrence of contagious diseases in Cochin ULB area

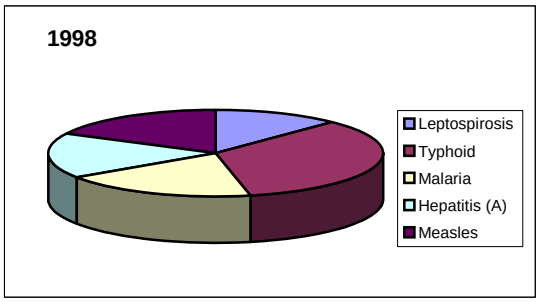
Year	Leptospirosis	Typhoid	Malaria	Hepatitis (A)	Measles
	Affected	Affected	Affected		
1995	140	450	594	309	509
1996	154	98	448	134	52
1997	172	275	341	304	561
1998	160	446	248	219	229
1999	200	1030	200	673	354
2000	478	795	118	209	237
2001	988	810	154	67	133

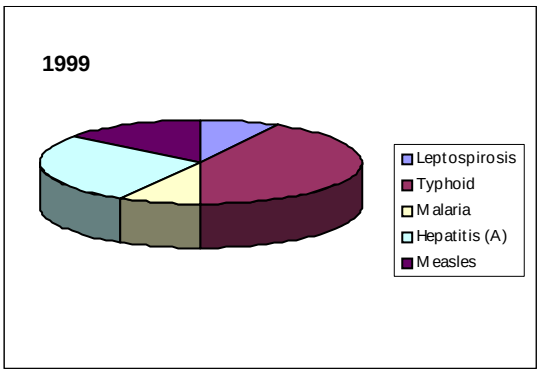
Occurrence of contageous diseases in Cochin ULB area

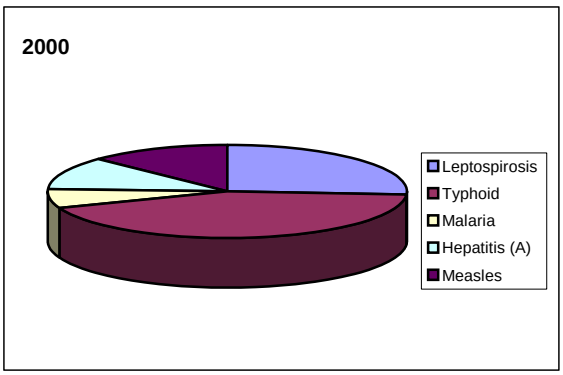


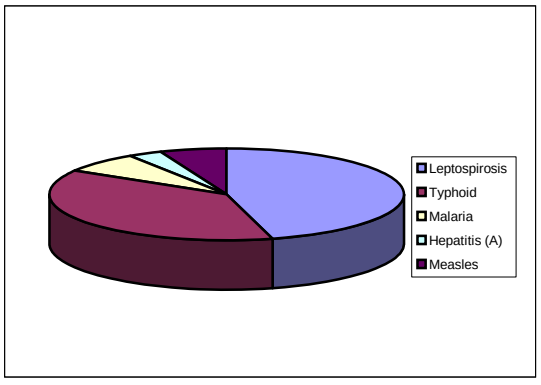












Type and quantity of waste generated from small medium and large scale industries in the region					
	Solids (tpa)	Semi solids (tpa)	Solvents (tpa)	ETP sludge (tpa)	Total (tpa)
Large	1264.9	538399	300	3035.4	542799
Medium	15	341.03		6	362.03
Small	0.2				0.2
Total	1280.1	538740	300	3045.4	543361

Annexure 7

ANNEXURE 7 - FINANCIAL STATEMENT

Kochi Municipal Corporation																
Particulars	**Actual**	**Projections in Rs. Million**														
	2005-06	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**
A. Kochi Municipal Corporation (Revenue Account)																
Opening Balance		**86**	**257**	**802**	**1,401**	**2,042**	**3,550**	**5,038**	**6,660**	**8,329**	**10,313**	**12,355**	**14,423**	**16,504**	**18,597**	**21,071**
Revenue Income																
Tax Revenue	350	396	767	818	855	869	1,710	1,860	1,925	2,259	2,338	2,386	2,424	2,461	2,869	2,966
Non Tax Revenue	59	62	66	70	74	79	84	89	94	100	106	112	119	126	133	141
Assigned Revenues	130	138	146	155	165	174	185	196	208	220	233	248	262	278	295	312
Grants & Contribution	167	245	275	308	345	386	405	426	447	469	493	518	543	571	599	629
Total- Revenue Income	**707**	**842**	**1,255**	**1,352**	**1,439**	**1,509**	**2,384**	**2,571**	**2,674**	**3,048**	**3,170**	**3,263**	**3,349**	**3,435**	**3,897**	**4,049**
Revenue Expenditure																
Management of Taxes	102	108	114	121	128	136	144	153	162	172	182	193	204	217	230	243
Municipal Services (Maintenance)	476	517	548	581	616	652	692	733	777	823	872	924	980	1,038	1,100	1,166
Non-Plan Operation Expenses	34	36	38	40	43	45	48	51	54	57	61	64	68	72	77	81
Miscellaneous Expenses	7	8	8	9	9	10	10	11	12	12	13	14	15	16	16	17
Debt Servicing (Old Loans)	2	2	2	2	2	2	2	2								
Non Debt Liability																
Total- Revenue Expenditure	**621**	**670**	**710**	**753**	**798**	**1**	**896**	**949**	**1,004**	**1,064**	**1,128**	**1,195**	**1,267**	**1,343**	**1,423**	**1,508**
Revenue Surplus /(Deficit)	86	172	544	599	641	1,508	1,488	1,621	1,670	1,984	2,042	2,067	2,082	2,093	2,474	2,541
Closing Balance	**86**	**257**	**802**	**1,401**	**2,042**	**3,550**	**5,038**	**6,660**	**8,329**	**10,313**	**12,355**	**14,423**	**16,504**	**18,597**	**21,071**	**23,612**
B. Kochi Municipal Corporation (CDP Project Account)																
Opening Balance	**86**	**257**	**802**	**1,401**	**2,042**	**3,550**	**5,038**	**3,907**	**2,974**	**2,522**	**2,296**	**2,265**	**2,419**	**2,757**	**3,651**	**4,788**

Kochi Municipal Corporation																
Particulars	**Actual**	**Projections in Rs. Million**														
	2005-06	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**
Sources of Fund																
Debt Drawdown		3,645	5,977	7,511	8,100	4,612	3,105									
Grant – GoI		6,075	9,961	12,519	13,500	7,686	5,176									
Grant – GoK		2,430	3,984	5,007	5,400	3,075	2,070									
Income from Project interventions							2,396	2,545	2,701	2,863	3,032	3,209	3,393	3,585	3,786	3,995
Total- Inflow		**12,149**	**19,922**	**25,037**	**27,001**	**15,373**	**12,748**	**2,545**	**2,701**	**2,863**	**3,032**	**3,209**	**3,393**	**3,585**	**3,786**	**3,995**
Disposition of Funds																
Equity Drawdown																
Project Capex		12,149	19,922	25,037	27,001	15,373	10,351									
Water Supply																
- Debt - Principal							243	243	243	243	243	243	243	243	243	243
- Debt – Interest							146	136	127	117	107	97	88	78	68	58
Sewerage																
- Expenditure - Incremental							184	195	207	219	232	246	261	277	293	311
- Debt - Principal							526	526	526	526	526	526	526	526	526	526
- Debt - Interest							315	294	273	252	231	210	189	168	147	126
Others																
- Expenditure - Incremental							1,136	1,219	1,293	1,370	1,452	1,539	1,632	1,730	1,833	1,943
- Debt - Principal							1,624	1,624	1,624	1,624	1,624	1,624	1,624	1,624	1,624	1,624
- Debt - Interest							974	909	844	779	715	650	585	520	455	390
Total- Outflow		**12,149**	**19,922**	**25,037**	**27,001**	**15,373**	**15,500**	**5,148**	**5,137**	**5,131**	**5,131**	**5,136**	**5,147**	**5,165**	**5,190**	**5,222**
Net Cash Flow							(2,752)	(2,602)	(2,436)	(2,268)	(2,099)	(1,927)	(1,754)	(1,580)	(1,404)	(1,227)
Closing Balance	**86**	**257**	**802**	**1,401**	**2,042**	**3,550**	**2,286**	**1,305**	**538**	**254**	**198**	**337**	**665**	**1,177**	**2,247**	**3,561**

List of Abbreviations

1.	KMC	Kochi Municipal Corporation
2.	CUSAT	Cochin University of Science and Technology
3.	KILA	Kerala Institute of Local Administration
4.	CESS	Centre for Earth Science Studies
5.	RITES	Rail India Technical and Economic Services
6.	NATPAC	National Transportation Planning and Research Centre
7.	L.N.G.	Liquefied Natural Gas
8.	BOT	Build Operate and Transfer
9.	PSU	Public Sector Undertakings
10.	PLL	Petronet LNG LTD
11.	KRL	Kochi Refineries LTD
12.	UA	Urban Agglomeration
13.	K.U.A.	Kochi Urban Agglomeration
14.	M	Municipality
15.	CT	Census Town
16.	CoPT	Cochin Port Trust
17.	NHAI	National Highway Authority of India
18.	L.S.G.	Local Self Govts
19.	BPL	Below Poverty Line
20.	CRZ	Coastal Regulation Zone
21.	GIS	Geographical Information System
22.	ULB	Urban Local Body
23.	CBD	Central Business District
24.	LIC	Life Insurance Corporation of India
25.	HUDCO	Housing and Urban Development Corporation
26.	LPCD	Litre Per Consumer Per Day
27.	CPHEEO	Central Public Health Engineering and Environmental Organization
28.	mld	million litre per day
29.	HMT	Hindustan Machine Tools
30.	WTP	Water Treatment Plant
31.	DWF	Dry Weather Flow
32.	G.O.K.	Govt of Kerala
33.	KWA	Kerala Water Authority
34.	MSL	Mean Sea Level
35.	P.W.D.	Public Works Department
36.	SWM	Storm Water Management / Solid Waste Management
37.	KSRTC	Kerala State Transport Corporation
38.	PCU	Passenger Car Unit
39.	GCDA	Greater Cochin Development Authority
40.	ROB	Road Over Bridge
41.	W.B.M.	Water Bound Macaudum
42.	L.C.V.	Light Cargo Vehicle
43.	NUTP	National Urban Transportation Policy

44.	MRTS	Mass Rapid Transport System
45.	DPR	Detailed Project Report
46.	RTO	Regional Transport Office
47.	IWTA	Inland Water Transport Authority
48.	KINCO	Kerala Inland Navigation Corporation
49.	GIDA	Gosree Island Development Authority
50.	UPAD	Urban Poverty Alleviation Dept.
51.	NABARD	National Bank for Agricultural and Rural Development
52.	NHG	Neighbourhood Group
53.	ADS	Area Development Society
54.	CDS	Community Development Society
55.	SJSRY	Swarna Jayanthi Shahari Rozgar Yojana
56.	SJSY	Swarna Jayanthi Swarosgar Yogana
57.	NSDP	National Slum Development Programme
58.	DFID	Department for International Development (UK)
59.	WAMBAY	Walmiki Ambedkar Malinavasthi Avaz Yojana
60.	ICDS	Integrated Child Development Scheme
61.	PMRY	Prime Minister's Rozgar Yojana
62.	SPEM	State Poverty Eradication Mission
63.	KSWDC	Kerala State Women's Development Corporation
64.	BCDC	Backward Class Development Corporation
65.	S.W.D.	Social Welfare Department
66.	P.R.S.	Palluruthy Relief Settlement
67.	DWCUA	Development of Woman and Children in Urban Area
68.	USEP	Urban Self Employment Programme
69.	UWEP	Urban Wage Employment Programme
70.	KSEB	Kerala State Electricity Board
71.	NGO	Non – Governmental Organization
72.	CUPRP	Cochin Urban Poverty Reduction Programme
73.	CHC	Community Health Centre
74.	MCW	Maternity and Child Welfare
75.	PHC	Primary Health Centre
76.	CBO	Community Based Organization
77.	KSSP	Kerala Sasthra Sahithya Parishath
78.	EMC	Environmental Management Centre
79.	KUDFC	Kerala Urban Development Finance Corporation
80.	SCADA	System Control and Data Acquisition
81.	UDPFI	Urban Development Plans Formulation and Implementation