CHAPTER - 9
INDUSTRIES

Kollam is well known for the traditional industries such as coir, handloom, cashew etc. As per the economic review 2019, 25 % contribution to Net State Domestic Product of the district is from the secondary sector. Even though corresponding figures exclusively for the planning area is not available, as this area is the most vibrant area of the district. It may be considered that major share of the secondary sector to the economy of the district is contributed by the planning area. In this chapter analysis of the present status of the industrial sector with respect to landuse, types of industries including traditional industries, Industrial parks/plots, exports and various issues associated with the industrial sector are discussed.

9.1 INDUSTRIAL LANDUSE

From the analysis of existing landuse map, it is found that the share of landuse for the industrial activities in Kollam Municipal Corporation area is 0.876 km² (1.22%) of total geographical area. Industrial landuse in each ward is shown in table 9.1 and the spatial distribution is shown in figure 9.1. From the figure, it is seen that maximum industrial landuse is in Udayamarthandapuram division (Division 45). From the analysis of concentration index of industrial use (figure 5.8), industrial concentration is seen in 45,19,13,34,22,30 and 29 divisions.

9.2 TYPES OF INDUSTRIES

Industries are classified as large and Micro Small and Medium enterprises depending on the investment. However traditional industries are separately taken for analysis irrespective of investment as the nature of manufacturing is different from other types of industries. 2 large and medium industries are there within the planning area (figure 9.2). They are Parvathi Mills Limited and United Electrical Industries Limited. The details of these industries are summarized in table 9.2.

Parvathi Mills Limited

Parvathi Mills Limited is a textile manufacturing company owned by the National Textile Corporation (NTC) in Kollam city. The company was

Ward No.	Name of Ward	Ward wise industrial area(sq. km)	% of Total	Ward No.	Name of Ward	Ward wise industrial area(sq.km)	% of Total
1	Maruthadi	0.000	0	29	Ayathil	0.028	0.032
2	Sakthikulangara	0.000	0	30	Kilikolloor	0.035	0.047
3	Meenathucherry	0.035	0.043	31	Punthalathazham	0.005	0.006
4	Kavanad	0.009	0.013	32	Palathara	0.034	0.043
5	Vallikeezhu	0.011	0.017	33	Manakkad	0.011	0.018
6	Kureepuzha west	0.008	0.004	34	Kollurvila	0.028	0.033
7	Kureepuzha	0.017	0.022	35	Kayyalakkal	0.005	0.003
8	Neeravil	0.000	0	36	Valathungal	0.009	0.01
9	Anchalummoodu	0.016	0.02	37	Akkolil	0.004	0.006
10	Kadavoor	0.004	0.004	38	Thekkumbhagom	0.002	0.001
11	Mathilil	0.004	0.006	39	Eravipuram	0.017	0.02
12	Thevally	0.031	0.04	40	Bharanicavu	0.007	0.008
13	Vadakkumbhagom	0.070	0.092	41	Thekkevila	0.005	0.004
14	Asramam	0.004	0.004	42	Mundakkal	0.000	0
15	Uliyakovil	0.013	0.018	43	Pattathanam	0.000	0
16	Uliyakovil East	0.007	0.004	44	Cantonment	0.007	0.004
17	Kadappakada	0.014	0.017	45	Udayamarthanda puram	0.134	0.17
18	Koikkal	0.021	0.021	46	Thamarakkulam	0.014	0.015
19	Kallumthazham	0.095	0.121	47	Pallithottam	0.000	0
20	Mangad	0.015	0.02	48	Port	0.000	0.001
21	Arunoottimangalam	0.024	0.031	49	Kacherry	0.001	0.01
22	Chathinamkulam	0.043	0.047	50	Kaikulangara	0.001	0.001
23	Karicode	0.019	0.02	51	Thangassery	0.000	0
24	College Division	0.009	0.008	52	Thirumullavaram	0.006	0.008
25	Palkulangara	0.019	0.028	53	Mulamkadakam	0.006	0.007
26	Ammannada	0.006	0.006	54	Alattucavu	0.000	0
27	Vadakkevila	0.008	0.008	55	Kannimel	0.008	0.01
28	Pallimukku	0.001	0.001				

Source:Primary Survey

Table 9.1 Division-wise industrial landuse in KLMC area



Figure 9.1 Industrial landuses within KLMC



Figure 9.2 Large and medium industrial units within KLMC area

Name of major industries	Investment in lakhs	Product	Number of employees
Parvathi Mills Limited	272	Fabric	120
United Electrical Industries Ltd.	435	Air brake switch and motor starter	78

Source: District industries Centre, Kollam(2019)

Table 9.2 Details of large and medium industrial units within KLMC area

founded in 1884 by British citizen A.D. Cotton was the lifeline of Kollam before independence. It was able to provide employment to about 200 people. However, at present the company has 120 employees only. Six of them are NTC staff and 17 are casual workers. The plant has been shut down since 2008 pending modernization. It is situated very close to the heart of the city spreading over an area of 16 acres with a land value of more than Rs.4 billion (US$64 million) as per the market value of 2014. At present the mill compound is kept vacant without any activity.

United Electrical Industries Limited (UNILEC)

United Electrical Industries Limited or UNILEC or UEIL (locally known as Meter Company) is an ISO 9001:2000 certified State Level Public Enterprise, operating in the electrical engineering sector since 1950. Now, only 11 KV air brake switches and motor starters are produced in the company. The total number of employees is 78.

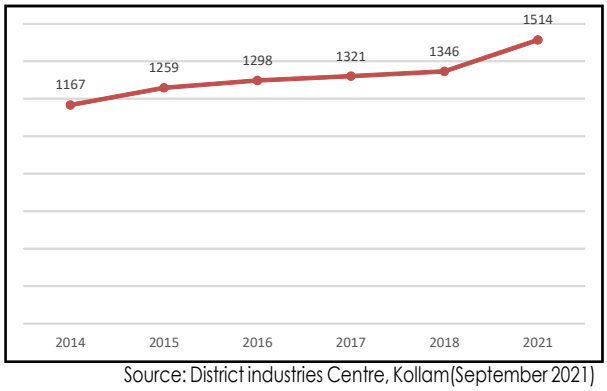
MSME is the backbone of any economy and is an engine of economic growth, promoting equitable and inclusive development. Total number of MSME units in KLMC including 19 small scale and medium scale industries registered as on 2021 is 1514. The total number of employment generation from these units is 7218. The growth of MSME units and category wise registration details are shown in figure 9.3 and table 9.3 respectively. It is observed that the number of MSME are constantly increasing during the period from 2014-2021 (1167 to 1514).

Growth of employment from MSME and category wise employment generation are shown in figures 9.4

	Micro	Small	Medium	Total
Number	1495	18	1	1514
Investment (in lakhs)	32474.32	2834.5	1100	36408.82
Employment	6688	471	59	7218

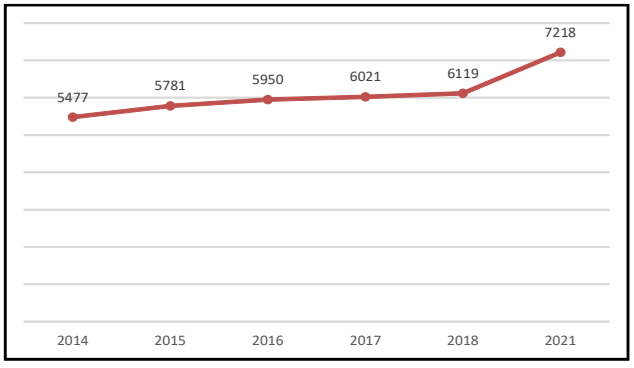
Source: District industries Centre, Kollam(September 2021)

Table 9.3 Category wise details of MSMEs registrations within KLMC



Source: District industries Centre, Kollam(September 2021)

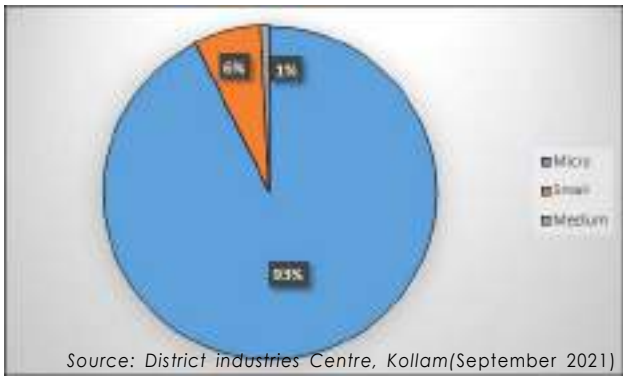
Figure 9.3 Growth of MSME units within KLMC area



Source: District industries Centre, Kollam(September 2021))

Figure 9.4 Growth of employment in MSME within KLMC area

and 9.5 respectively. The growth of employment from MSME shows an increasing trend from 2014 to 2021 (5477 to 7218). Among MSME Units, 93% of employment is generated from the micro industry.



Source: District industries Centre, Kollam(September 2021)

Figure 9.5 Category wise employment generation from MSME within KLMC

Table 9.4 shows the types of existing Micro industrial units. Among the total number of MSME units registered, maximum units are industries other than common industries like food, agro, engineering based etc. (33%) (figure 9.6). Maximum employment generation is also from other types of industries (38%) (figure 9.7). Engineering based industries (13%) are the second highest employment provider in the micro industry followed by food based and agro based (10%). Which analysing the ownership of building used for MSME as

Sl. No.	Type of industry	No of units	Investment (in Lakhs)	No of employees
1	Agro based	141	5262.9	689
2	Food Based	122	6718.5	724
3	Cement Based	1	0.0	3
4	Plastic Based	7	330.3	48
5	Textile Based	180	1576.3	645
6	Chemical Based	21	941.4	82
7	Engineering Based	206	3516.5	924
8	Electrical & Electronics based	160	1963.9	586
9	Building material	46	1880.9	225
10	Forest Based	93	5197.6	458
11	Rubber Based	30	468.7	90
12	Others	488	8551.9	2743
	Total	**1495**	**36408.8**	**7218**

Source: District industries Centre, Kollam(September 2021)

Table 9.4 Existing micro industrial units in KLMC area

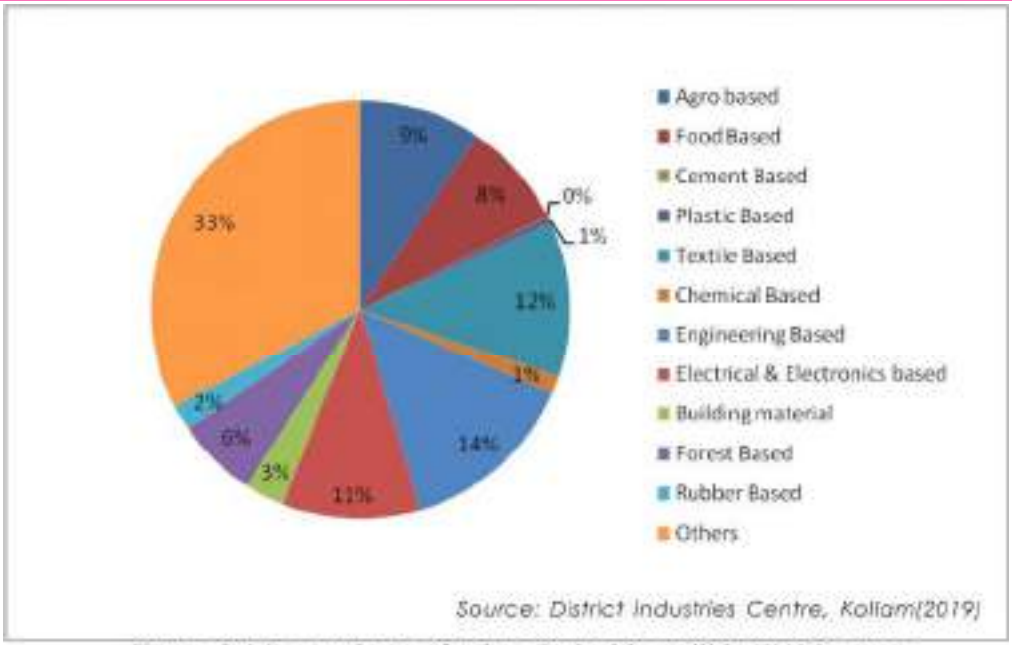


Figure 9.6 Percentage of micro industries within KLMC area

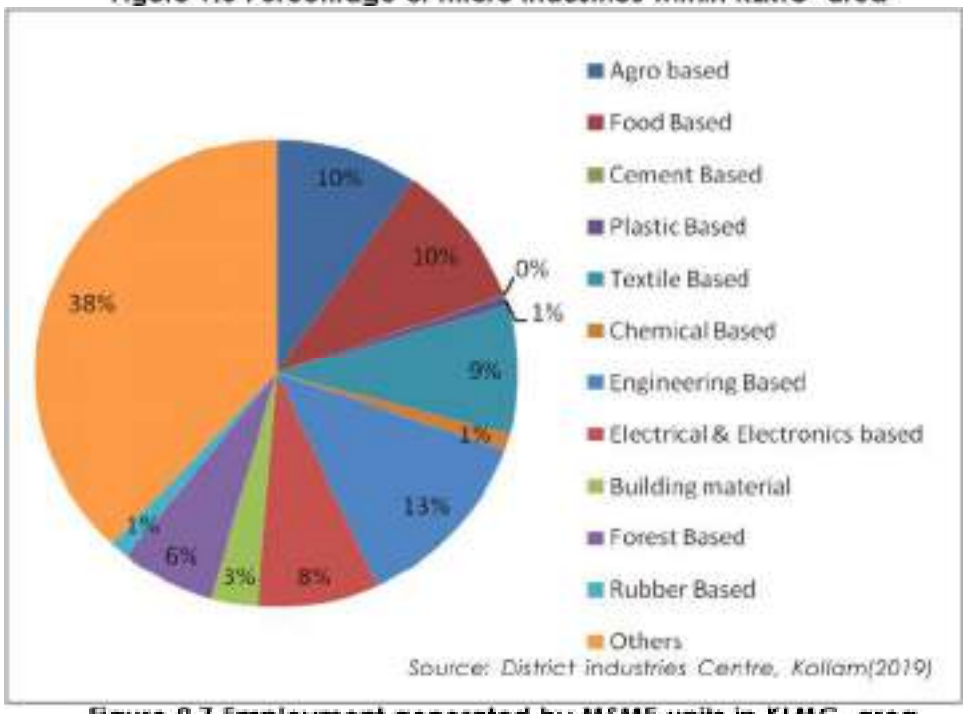


Figure 9.7 Employment generated by MSME units in KLMC area

shown in figure 9.8, it can be inferred that about 62% of the MSME units are working in rented buildings. Running an MSME in rental building is increasing the cost of production. If alternatives like common buildings which can house a group of MSMEs or provision of space in their own house for MSME can attract many people to start MSME profitably.

9.3 TRADITIONAL INDUSTRIES

Traditional industries once played a prominent role in the social

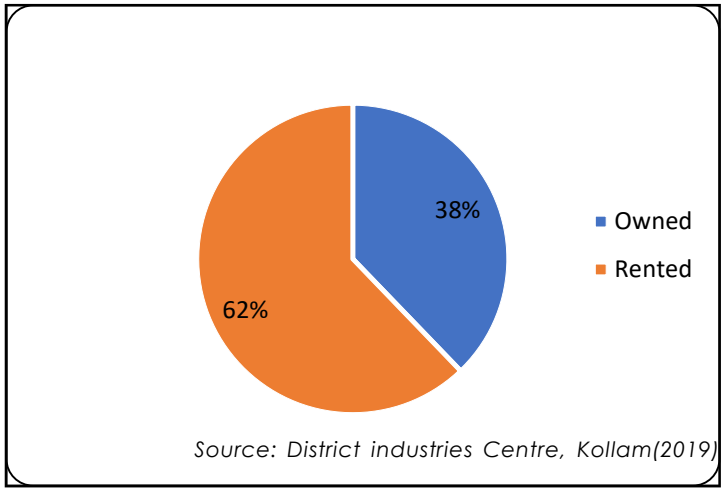


Figure 9.8 Building ownership of MSME units in KLMC

and economic development of Kollam. But now traditional industries are in the decaying stage due to many reasons. The important traditional industries that flourished in KLMC area were Coir, Handloom, Cashew and Khadi. Now total number of traditional industrial units is 61 which includes 10 members of Coir Co-operative Society. Figure 9.9 shows the number of traditional industries in the KLMC area.

Coir

The coir industry was the largest and most important industry in Kerala. It has developed on account of the natural facilities available in the State. The raw material for the industry is husk which is a by-product of coconut and was available in plenty in the State. Another natural facility available for producing coir was waterbodies for retting raw husks. But now due to reduction in production of coconut in the State, husk had to be purchased from other States thereby increasing the cost of production. Also due to pollution of waterbodies retting of husk in not promoted in waterbodies. As per the data available from District Industries Center, it is found that there

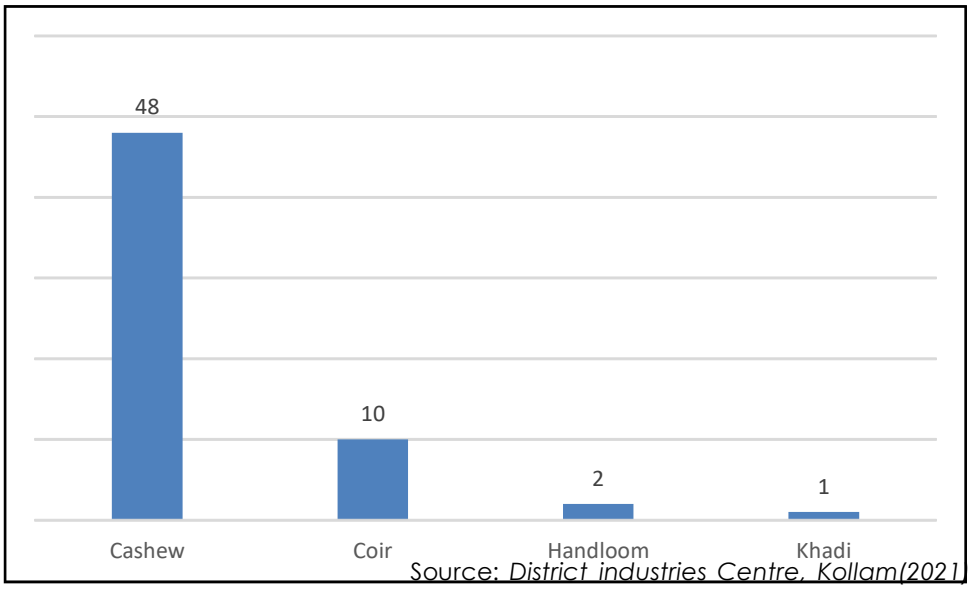


Figure 9.9 Number of units in traditional industries in KLMC area

are 10 Coir Co-operative Societies providing employment to 121 persons running in KLMC area. Most of the coir units are seen near Kureepuzha and Neeravil area located along the side of Ashtamudi Lake. Growth patterns of the coir sector and employment are shown in figure 9.10. It shows that employment is declining till 2016, but in recent years it shows an increasing trend.

Handloom

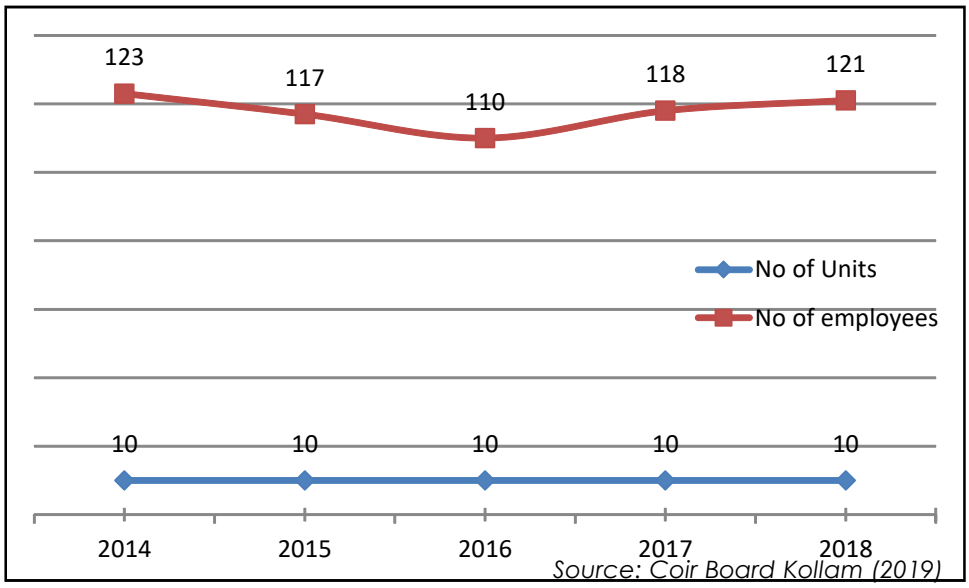
There are 2 handloom units in KLMC area and providing employment to 40 persons. Growth patterns of the Handloom sector and employment are shown in figure 9.11. It shows that employment generation shows an increasing trend in recent years.

Khadi

There is only one Khadi unit namely Ramankulangara spinning unit in KLMC area. As per the available data total number of workers as on 2018 was 16. Growth of employment during 2014-2018 and the production of Khadi hunks in Ramankulangara spinning unit are shown in figure 9.12 and figure 9.13. It shows that employment and production have increased in recent years.

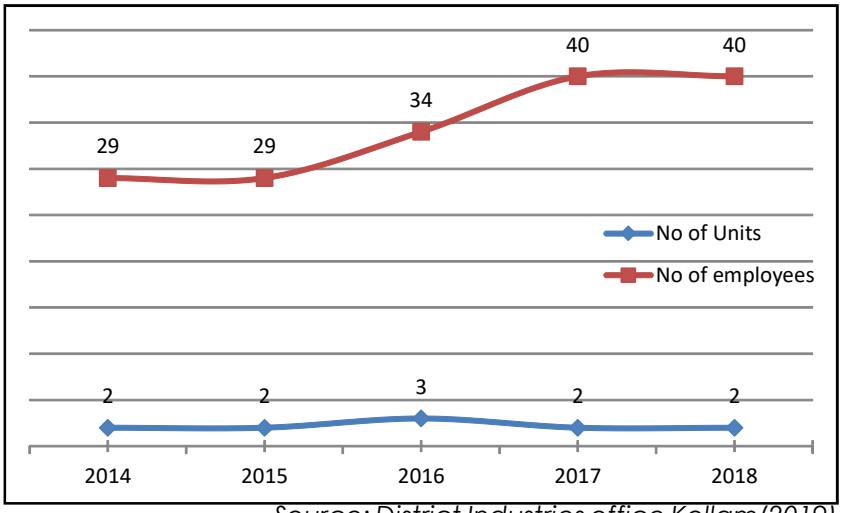
Cashew

As of 2011 there were more than 60 cashew processing units in the planning area. Now it has reduced to 48. Total number of employment generation is 3757. Most of the units (87%) are in the private sector (figure 9.14). Total



Source: Coir Board Kollam (2019)

Figure 9.10 Growth pattern of coir sector in KLMC area

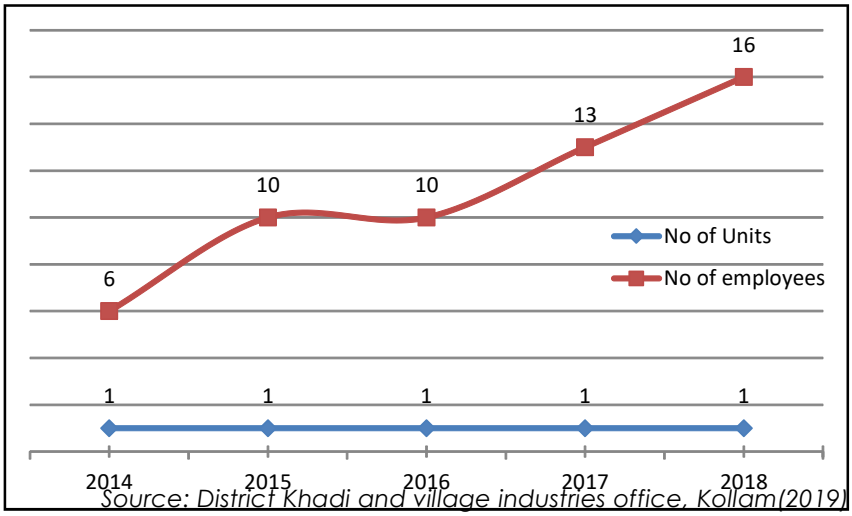


Source; District Industries office Kollam(2019)

Figure 9.11 Growth pattern of handloom sector within KLMC area

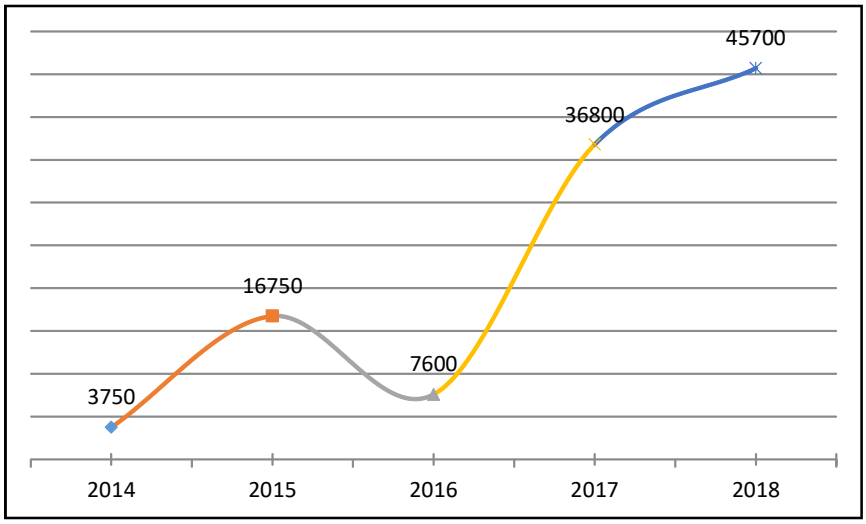
Cashew Export

Cashew exporting has been the backbone of the economic prudence of Kollam. Industrial development of Kollam was entirely developed on cashew exporting till the beginning of 20th century. number of public units in KLMC area is 6 with an employment of 2313. Out of 42 units in the private sector only 10 are working and the total employment in these units is 1444. 95% of workers in cashew industries are women.



Source: District Khadi and village industries office, Kollam(2019)

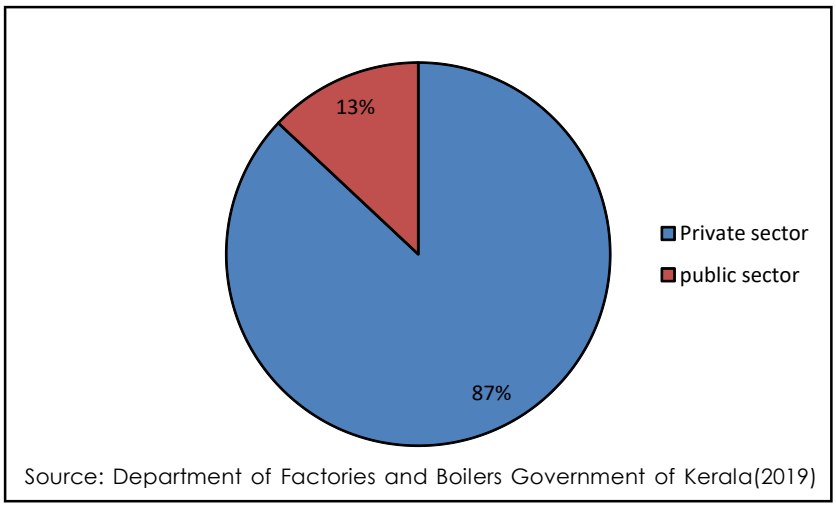
Figure 9.12 Growth of employment in khadi units within KLMC area



Source: District Khadi and village industries office, Kollam(2019)

Figure 9.13 Production of khadi hanks within KLMC area

Companies were getting huge returns through exports and hence many household women and men were engaged in cashew process during its flourishing stage. Due to internal and external issues such as



Source: Department of Factories and Boilers Government of Kerala(2019)

Figure 9.14 Ownership of cashew processing units in KLMC area

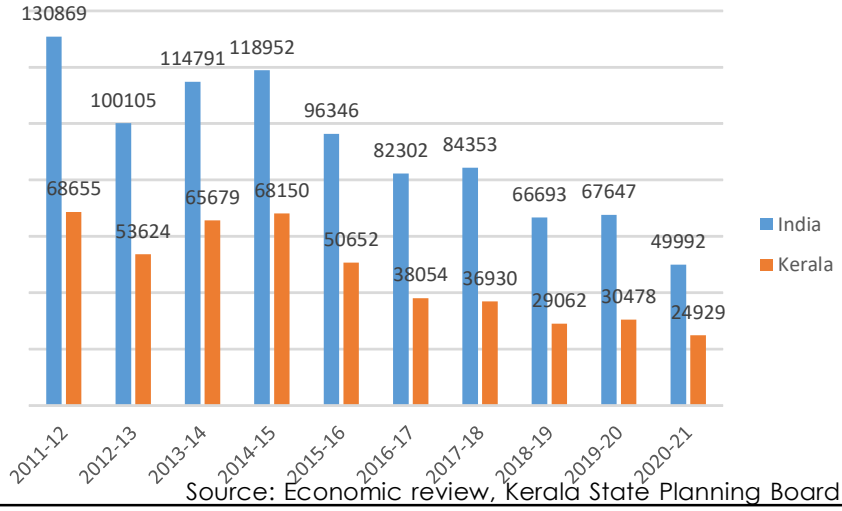
more cashew factories in the district are concentrated in the planning area.

The new developments like the arrival of an international ship with raw cashew to the Sakthikulangara port in Kollam have given a ray of hope to cashew export. Suitable policies and better infrastructure can still revive the sector.

industrial inefficiency and micro economic competitiveness (internal issues), globalization and free trade agreements, the emergence of global competition from Africa, global quality and standards (external issue) cashew export is declining. This can be observed from figure 9.15. Though figure 9.15 shows trend in export of cashew kernels from Kollam District, it shows the trend of planning area as

9.4 INDUSTRIAL PARK/PLOTS

Under the guidance of District Industrial Centre an Industrial Development Plot and KINFRA Industrial park is running at Mundakkal. The total extent of both park and plot is 20.67 acre. 53 units with a total investment of 1750 are registered in the area of which 50 units are working. 16 of them are women owned enterprises. The total number of workers in the industrial estate is 710. Due to non-availability of land expansion of this area



Source: Economic review, Kerala State Planning Board

Figure 9.15 Export of cashew kernels from India and Kerala

for future development of industries is found difficult.

9.5 ROLE OF INDUSTRIES IN THE SOCIO-ECONOMIC DEVELOPMENT IN KLMC

The employment opportunities provided by the industrial sector may be considered as an indicator for assessing the role of this sector in the socio-economic development of the planning area. For socio-economic development of the area regular employment is required. Total employment generated by various industrial units in the planning area is given in table 9.5.

From the table it is found that about 12060 people work in the industrial sector of which MSME sector provides the maximum employment (59.255.82%) followed by Cashew sector (31%) as shown in figure 9.16.

Types of industries	No of people employed
Large and medium	908
MSME sector	7218
Coir sector	121
Handloom sector	40
Khadi sector	16
Cashew sector	3757
Total	**12060**

Source: Kollam port business development plan April 2018

Table 9.5 Details of employment in industrial sector

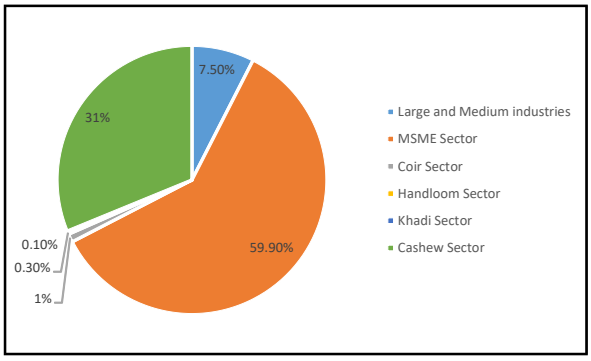


Figure 9.16 Employment generated by various industrial units in planning area

9.6 DEVELOPMENT ISSUES

Even though the industrial sector is one of the key production sectors in KLMC area, this sector is struggling to maintain its status. From the study conducted for the AMRUT scheme, the main issues identified in this sector are listed below.

- Delay in the revival of Parvathy mill.
- Closure of small-scale industrial units after registration due to reasons such as lack of proper management, marketing issues and financial crises.
- Shortage of laborers in the traditional industrial sector.
- Lack of permanent exhibition cum marketing centre for small scale industrial products.
- Lack of awareness among entrepreneurs, management skill.
- Delay in getting statutory licenses from various departments.
- Difficulty in arranging bank loans.

- Lack of innovations to congregate the emerging demands and ineptitude to update systematic and scientific development programmes for developing traditional industrial.
- Non-availability of land for expanding industrial estate.
- Limited capital and an inadequate supply of loans have also contributed to the lesser production quantity in the cashew industry.

In spite of the above problems, following potentials are identified for the development of the industrial sector of the planning area.

- Institutional support from the District Industries Centre situated in the planning area.
- Availability of skilled workers in specialized sectors.
- Women empowerment schemes.
- New trend to avoid the use of artificial and chemical products to protect against environmental degradation can be considered as a potential for the revival of traditional industries. Eco-friendly products of coir, handloom, screw pin mat, bamboo reed etc. can attract foreign markets.
- Tourism potential of the planning area once tapped, will boost the traditional industries.
- Cluster development programs can be developed in food processing, construction materials, diary etc.

CHAPTER - 10
AGRICULTURE AND ANIMAL HUSBANDRY

Agricultural and animal husbandry, included in the primary production sector, play a vital role in the economic development of the district. However, agriculture activities in the planning area is limited to homestead cultivation and paddy contributing to the food supply within the area rather than providing economic support to the people. Even though Animal husbandry sector can take very important role in the livelihood of common people, this sector is not developed so as to consider as an important economy generating sector. This chapter deals with area, production and productivity of various crops in agriculture sector, livestock population and their production in Animal Husbandry sector along with various developmental issues in these sectors.

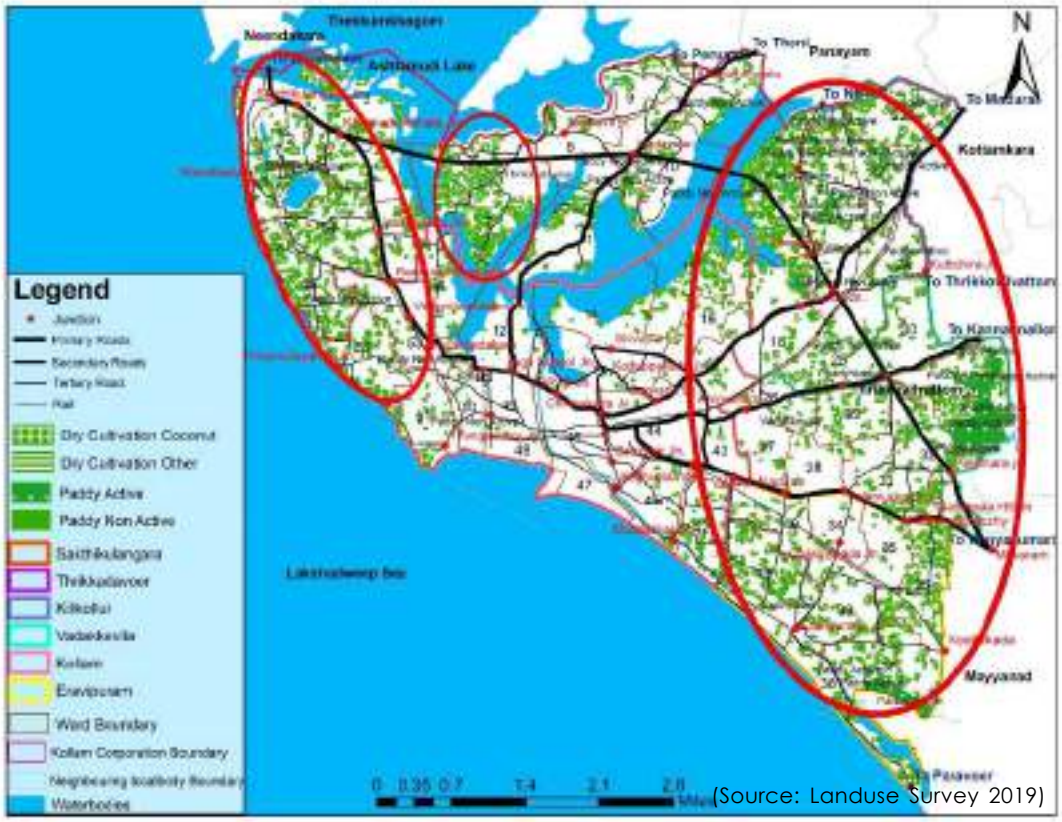
10.1 AGRICULTURE

Agriculture sector in the KLMC area is not so significant as the area is highly urbanized. However due to the initiative of State as well as local government after the outbreak of Covid-19 pandemic, agricultural activities are progressing under the scheme "Subhiksha Keralam" towards attaining self-sufficiency. From the analysis of landuse, it is understood that nearly 9.415 km²of total area (13.13% of total area) as shown in table 10.1 is put under agriculture consisting of both paddy, (active and inactive) and dry agriculture. Figure 10.1 shows the spatial distribution of total agricultural area within KLMC area. It is observed that agricultural land area is concentrated towards the eastern outskirts near Ashtamudi Lake and Sakthikulangara area of KLMC. Coconut, Paddy, Banana, Pepper, Tapioca and Vegetables are found as major crops in the planning area. All the above crops except paddy are cultivated in dry land and hence cultivation of these crops is together termed as dry agriculture.

Type of Cultivation	*Area (km^2)*
Dry Agriculture	*8.249*
Paddy	*0.98*
Paddy inactive	*0.186*
Total Area	***9.415***

(Source: Deduced from Landuse Survey 2019)

Table10.1 Area of dry agriculture and paddy cultivation in KLMC



(Source: Landuse Survey 2019)

Figure 10.1 Spatial distribution of dry agriculture and paddy active areas

10.1.1 Paddy Cultivation

Area under paddy cultivation in KLMC is around 1.63 % (1.66 sq.km) (slightly increased when compared to 2011 data). Area of active paddy cultivation is 0.98 km² and area of non-active paddy cultivation is 0.186km². 55.2% of area under paddy cultivation is at Vadakkevila zone and Kollam zone have the least paddy area (1.5%) as given in table 10.2. Figure 10.2 & 10.3 shows the zone-wise share of paddy area & spatial distribution of paddy cultivation area respectively.

As per the data received from Krishibhavans for the year 2018-2019, the extent of area for paddy cultivation is 24.35 ha. The productivity of rice cultivation of KLMC is compared in different zones and with district as given in table 10.3. The total production is 54.662 MT/year. Hence

Corporation Zones	Area(sq.km)
Sakthikulangara	0.027
Thrikkadavoor	0.080
Kilikolloor	0.193
Vadakkevila	0.644
Eravipuram	0.204
Kollam	0.018
Total	**1.166**

Source: Deduced from Land-use Survey 2019

Table 10.2 Zone-wise area of paddy cultivation

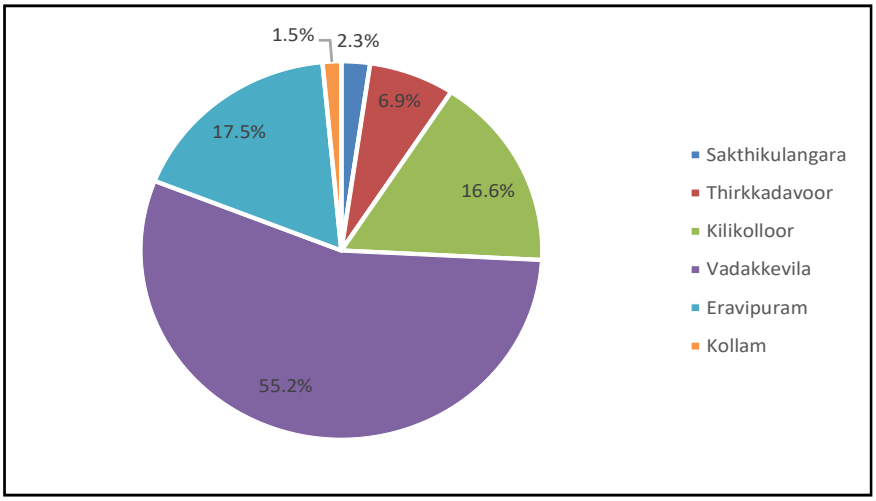


Figure 10.2 Zone-wise breakup of paddy cultivation area in KLMC (Landuse)

the productivity of rice in planning area is found as 2244kg/ha which is slightly higher than district average of 2237 kg/ha. However, area and production are very low in planning area compared to district. Eventhough area under paddy cultivation is very small in most of the zones in the planning area, conservation of paddy area is required for ground water recharging and to act as a collection basin at the time of flood in addition to contributing towards food security. The paddy and low lying land are the key elements in maintaining the city as a sponge city.

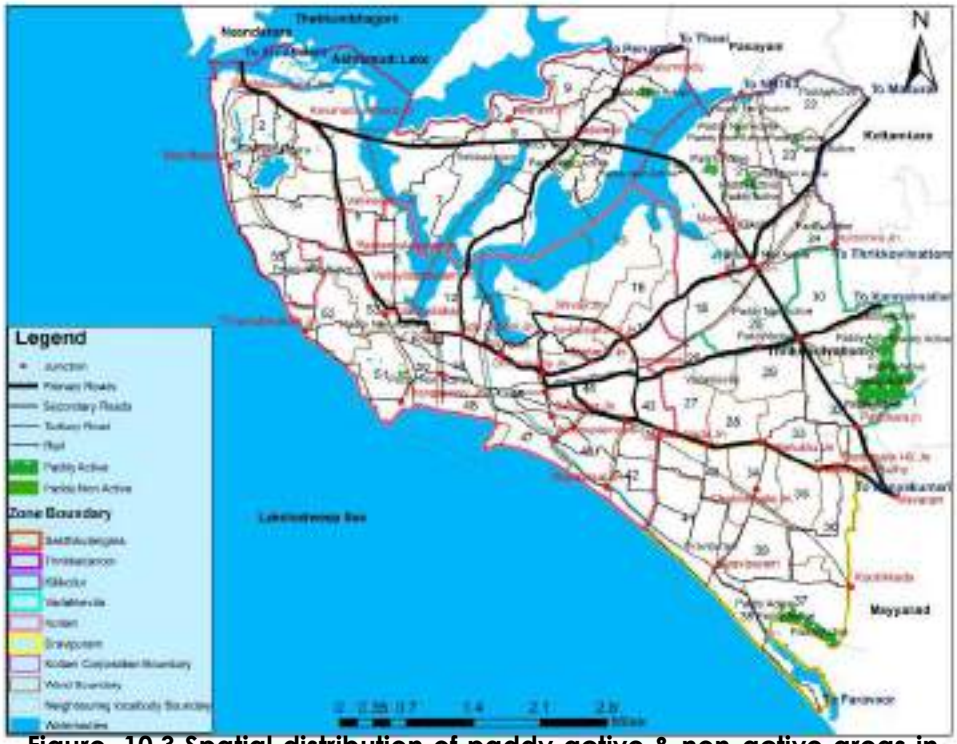


Figure. 10.3 Spatial distribution of paddy active & non-active areas in planning area

Corporation Zones	Area(ha)	Production (MT)	Productivity (Kg/ha)
Sakthikulangara	0	0	0
Thrikkadavoor	6	15.6	2600
Kollam	0	0	0
Kilikollor	0.35	1.062	3034
Vadekkevila	14	28	2000
Eravipuram	4	10	2500
KLMC	**24.35**	**54.662**	**2244 (MT/year)**
Kollam District	**243**	**4302**	**2237 (MT/year)**

(Source: Krish bhavan Survey, 2018-2019)

Table 10.3 Zone-wise area production & productivity of paddy

10.1.2 Dry Agriculture

From the landuse survey almost 11.5% i.e. 8.249 sq.km of total KLMC area is put under dry agriculture. Table 10.4 shows the area under dry agriculture in different zones of KLMC area and figure 10.4 shows the zone-wise share of dry agriculture area and spatial distribution of dry agricultural cultivation in various zones is depicted in figure 10.5.

Maximum share of area under dry agriculture is in Kilikolloor zone (22%) and least in Vadakkevila zone (13%).

Corporation Zones	Area(sq.km)
Sakthikulangara	1.557
Thrikadavoor	1.322
Kilikolloor	1.842
Vadekkevila	1.05
Eravipuram	1.34
Kollam	1.138
Total	**8.249**

(Source: Deduced from Landuse survey, 2019)

Table 10.4 Zone wise distribution of dry agricultural

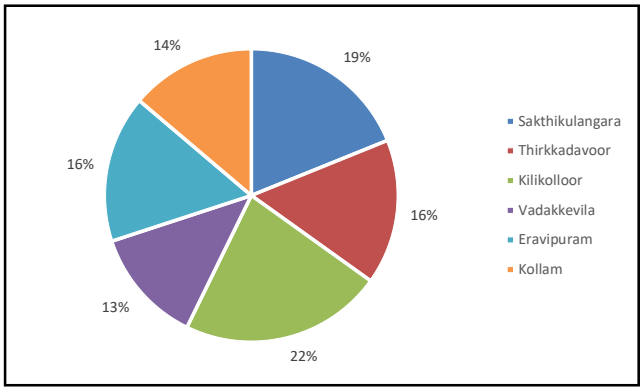


Figure 10.4 Zone-wise breakup of dry agriculture area in KLMC

Dry agriculture crops like Coconut, Banana, Vegetables, Pepper, and Tapioca are the most important crops grown in KLMC area. As per the data from Krishibhavan 2018-2019, the total dry agricultural area is 4217 ha i.e. 42.175 km^2 of the total KLMC area is occupied as listed in table 10.5.

Coconut Cultivation

As per the data from Krishibhavan 2018-2019, about 91.7% (3786 ha or 37.86 km^2) of dry agriculture consists of coconut cultivation, only 8.3% of dry agricultural area is used for cultivating any other crops. The area, production and productivity of coconut cultivation in different zones of KLMC is listed in table 10.6. Total production of coconut is 30 million nuts/year with a productivity of 7920 nuts/year/hectare which is higher than district average of 7016 nuts/year/ha. Sakthikulangara zone has maximum

Type of Crops	Area(sq.km)
Coconut	37.86
Banana	2.15
Pepper	0.385
Vegetables	0.63
Tapioca	1.15
Total	**42.175**

(Source: Krish bhavan Report 2018-2019)

Table 10.5 Area share of dry agricultural crops in KLMC

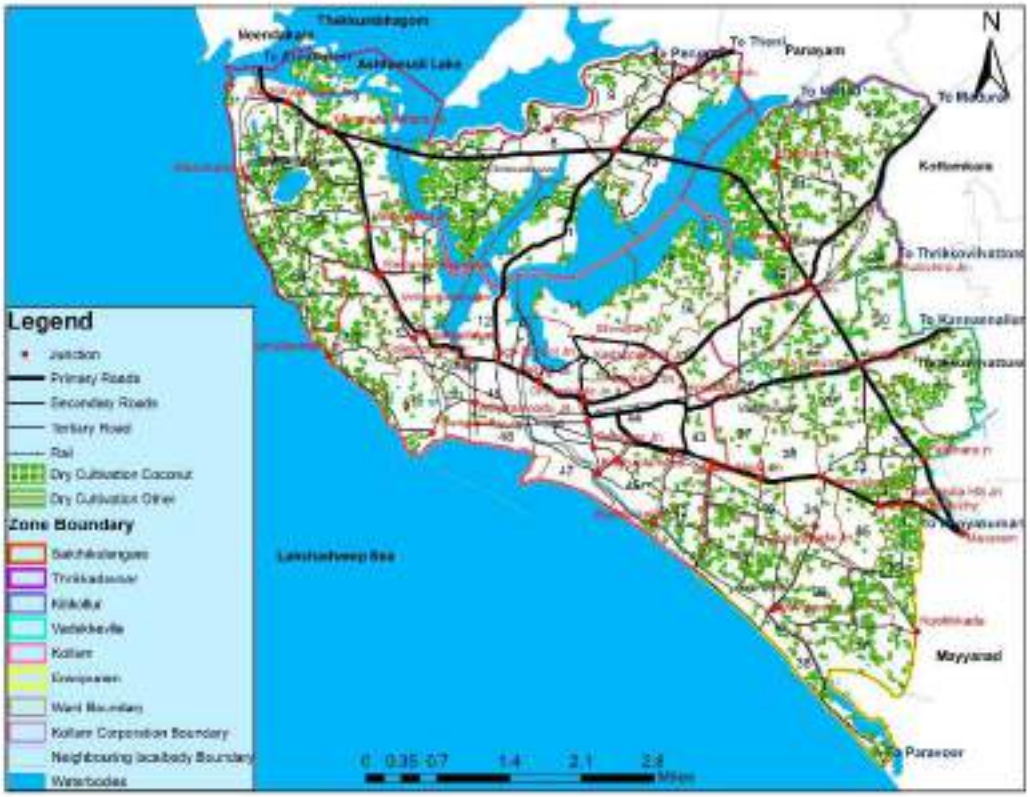


Figure. 10.5 Spatial distribution of dry agricultural area in KLMC

Corporation Zones	Coconut		
	Area(ha)	Production (nuts/year)	Productivity (nuts/year/ha)
Sakthikulangara	900	9900000	11000
Thrikkadavoor	850	9775000	11500
Kilikollur	16	106500	6660
Vadakkevila	400	1600000	4000
Eravipuram	750	5250000	7000
Kollam	870	5502750	6325
KLMC	**3786**	**32134250**	**7920 (MT/year)**
Kollam District	**46342**	**319000000**	**7016 (MT/year)**

Source: Krish bhavan Report 2018-2019

Table 10.6 Zonewise distribution of area, production and productivity of coconut cultivation

share of land (24%) under coconut cultivation among other zones as depicted in figure 10.6, However production and productivity of Kollam main zone is higher than other Zones. As KLMC is situated in the coastal belt of the district, the soil is suitable for coconut cultivation. Also coconut trees give a cool and pleasing atmosphere to the beaches and other areas. Hence coconut cultivation has enough potential in KLMC.

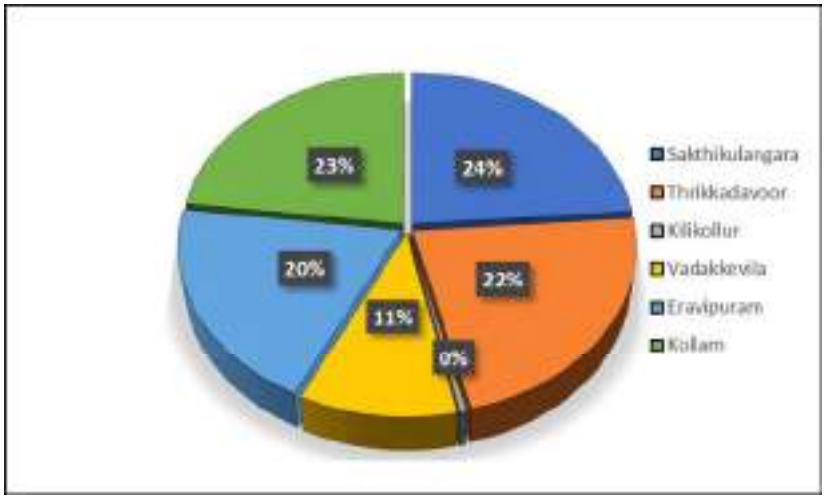


Figure 10.6 Zone-wise share of land in coconut cultivation in KLMC

hectare which is higher than district average of 7516 kg/ha/year. It is observed that Eravipuram zone has maximum share of land (65%) under Banana cultivation and highest productivity among other zones as indicated in figure 10.7. From the above data it can be assumed that banana cultivation also has potential in the planning area.

Banana Cultivation

As per the data from Krishibhavan 2018-2019, about 2 % (215 ha or 2.15 km^2) of dry agriculture area is used for banana cultivation. The area, production and productivity of banana cultivation in different zones of KLMC is given in table 10.7. Total production of banana is 2765 MT/year with a productivity of 12860 kg/year /

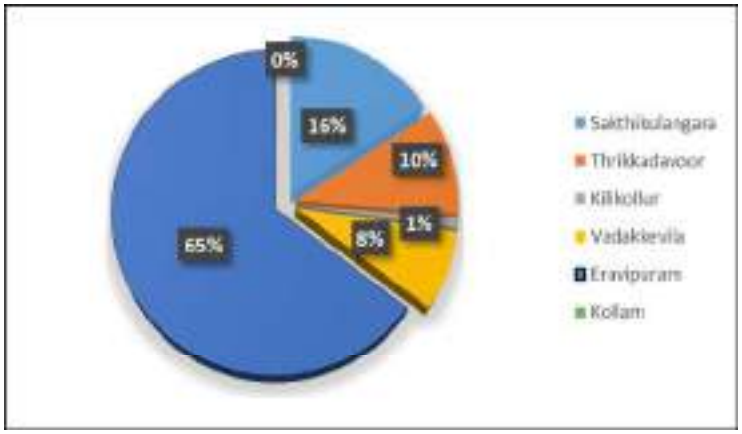


Figure 10.7 Zone-wise breakup of banana cultivation area in KLMC

Corporation Zones	Banana		
	Area (ha)	Production (MT)	Productivity (kg/ha)
Sakthikulangara	30	850	25500
Thrikkadavoor	20	425	21250
Kilikollur	2	34	17000
Vadakkevila	15	250	18900
Eravipuram	123	738	60000
Kollam	25	468	11700
KLMC	**215**	**2765**	**12860 (MT/year)**
District	**3455**	**25970.883**	**7516 (MT/year)**

Source: Krish bhavan Survey 2018-2019

Table 10.7 Zonewise distribution of area, production and productivity of banana cultivation

Pepper Cultivation

About 1 % (38.5 ha) of dry agriculture area is used for pepper cultivation as per the data from Krishibhavan 2018-2019. The area, production and productivity of pepper cultivation of KLMC is compared in different zones with that of district as given in table 10.8. The area under cultivation is 38.5 ha and total production is 83.219 T/year with a productivity of 2161 kg//ha/year which is higher than district average of 300 kg/ha/year. Eravipuram zone has maximum share of land under pepper cultivation among other zones, however production and productivity of Kollam main zone is higher than other zones. Figure 10.8 shows the zone-wise share of area under pepper cultivation.

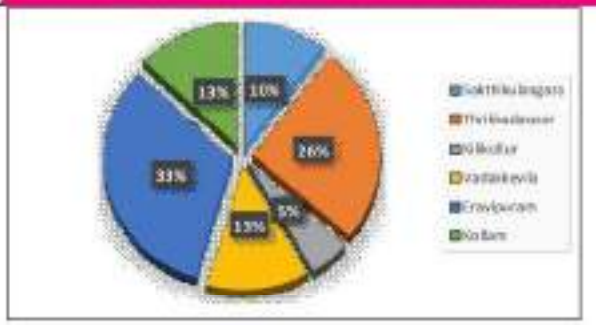


Figure 10.8 Zone-wise breakup of pepper cultivation area in KLMC

Vegetable Cultivation

About 0.9 % (63 ha or 0.63 km^2) of dry agriculture area is utilized for vegetable cultivation. The area, production and productivity of vegetable cultivation of KLMC is compared in different zones with that of district as given in table 10.9. Total production of vegetable is 368.25 T/year with a productivity of 5845 kg/ha/year which is lower than district average of 7016 Kg/ha/year. Thrikkadavoor and Kollam zone has maximum share of land (24%) under vegetable cultivation among other zones as shown in figure 10.9, however production and productivity of

Corporation Zones	Vegetable		
	Area (ha)	Production (T/ha)	Productivity (kg/ha)
Sakthikulangara	12	72	6000
Thrikkadavoor	15	131.25	8750
Kilikolloor	2	6	3000
Vadakkevila	7	21	3000
Eravipuram	12	96	8000
Kollam	15	42	2800
KLMC	**63**	**368.25**	**5845 (MT/year)**
Kollam District	**2815.76**	**4341.51**	**7016 (MT/year)**

Source: Krish bhavan Survey 2018-2019

Table 10.9 Zone-wise distribution of area, production and productivity of vegetable cultivation

Corporation Zones	Pepper		
	Area (ha)	Production (MT)	Productivity (kg/ha)
Sakthikulangara	4	2.992	748
Thrikkadavoor	10	18.7	1870
Kilikollur	2	2	1000
Vadakkevila	5	1	200
Eravipuram	12.5	25	2000
Kollam	5	33.527	6705
KLMC	**38.5**	**83.219**	**2161 (MT/year)**
Kollam District	**2870**	**860.837**	**300 (MT/year)**

Source: Krish bhavan Report 2018-2019

Table 10.8 Zone-wise distribution of area, production and productivity of pepper cultivation

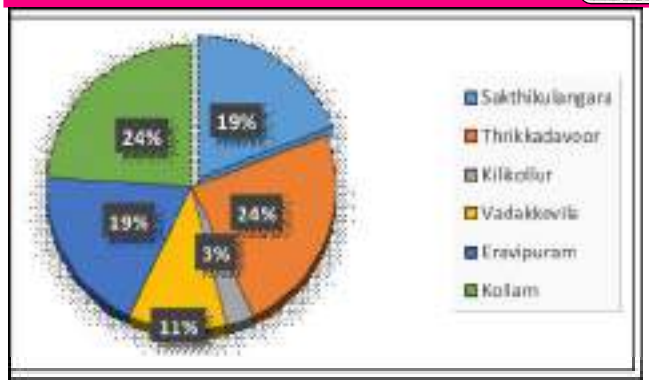


Figure 10.9 Zone-wise breakup of vegetable cultivation area in KLMC

Thrikkadavoor zone is higher than other Zones. Usually natural fertilizers are used for growing vegetable. As the productivity of vegetable is less than the district average, vegetable cultivation may not be profitable in KLMC. However, vegetable cultivation as a homestead cultivation need to be continued for contributing towards food security.

Tapioca Cultivation

The area, production and productivity of tapioca cultivation of KLMC with that of district is given in table 10.10. It is observed that area under cultivation of tapioca is 115.99 ha and production is 3049.69 MT/year with a productivity of 26313 kg/ hectare/year which is lower than district average of 34915 kg/ha/year.

10.1.3 Infrastructure Facilities

The various agricultural infrastructure facilities available in the KLMC area are shown in table 10.11. Seeds, seedlings, planting materials and other inputs are provided through Krishibhavans. There are 6 Krishibhavans located in KLMC area. Fertilizers from Fertilizer depot and bio-pesticides from Insecticide depot is distributed through 3 Fertilizer depots and one Insecticide depot. In addition to this, almost all Krishibhavans supply 1000 to 2000 kg of organic manure monthly. The various agro-based private industries located in KLMC area are: Raidco Kerala Ltd., Perfect Agri-Management Company, Kayes Industry, FCMC Agro-Bazar etc. Table 10.11 and figure 10.10 shows the distribution of Infrastructure facilities in KLMC area.

Tapioca Cultivation	Area (ha)	Production (MT)	Productivity (kg/ha)
KLMC	115.99	3049.69	26313
Kollam District	12909.36	450759.45	34915

Source: Agricultural Statistics 2018-2019

Table 10.10 Details of area, production and productivity of tapioca cultivation in KLMC and district

Sl no	Agricultural infrastructre	Location	Total number
1	Krishibhavans	Eravipuram	6
		Vadakkevila	
		Sakthikulangara	
		Thrikkadavoor	
		Kilikolloor	
		Kollam	
2	Fertilizer Depot	Sakthikulangara	3
		Kilikolloor	
		Kollam	
3	Insecticide Depot	Kilikolloor	1

(Source: Primary Survey, 2019)

Table 10.11 Agricultural infrastructural facilities in KLMC area

10.1.4 Irrigation Facilities

Irrigation facilities available in KLMC is very limited even though 3 west flowing rivers and a fresh water lake (Vattakayal) are available within the area. The main source of irrigation is ponds. Table 10.12 shows ponds in the study area& Figure 10.11 shows the spatial distribution of ponds in KLMC area. It is observed that more area of

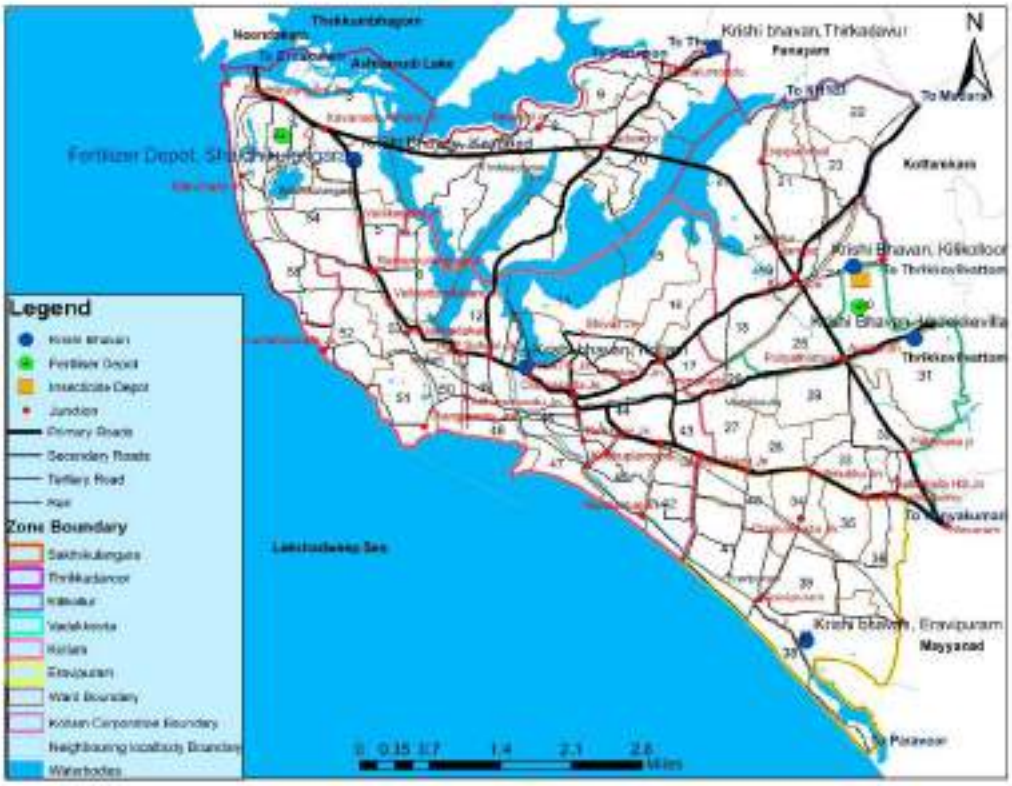


Figure. 10.10 Spatial distribution of infrastructure facilities in KLMC area

Sl. No	Name of ward	Area of pond-sq.m.	Sl. No	Name of ward	Area of pond-sq.m.
1	Akkolil	2381.67	15	Kureepuzha North	190.60
2	Ammannada	937.68	16	Kureepuzha South	3920.26
3	Arunoottimangalam	656.97	17	Mangadu	1109.15
4	Asramam South	184.89	18	Mulangadakom	1643.68
5	Ayathil	1935.79	19	Mulluvila	827.45
6	Bharanikavu	311.52	20	Palathara	1665.97
7	College Division	472.94	21	Pallimukku	373.46
8	Cutchery	429.67	22	Sakthikulangara Middle	188.31
9	Kaikulangara	7660.15	23	Sakthikulangara North	984.51
10	Kannimel East	5443.38	24	Thangassery	99.00
11	Kannimel West	17722.29	25	Thevally	569.98
12	Karicode	351.62	26	Thirumullavaram	5425.36
13	Kilikolloor	12.44	27	Uliyacovil East	435.44
14	Kolloorvila	150.11	28	Valathungal	542.11

Source: Primary Survey, 2019 from KLMC

Table 10.12 Ponds in KLMC area

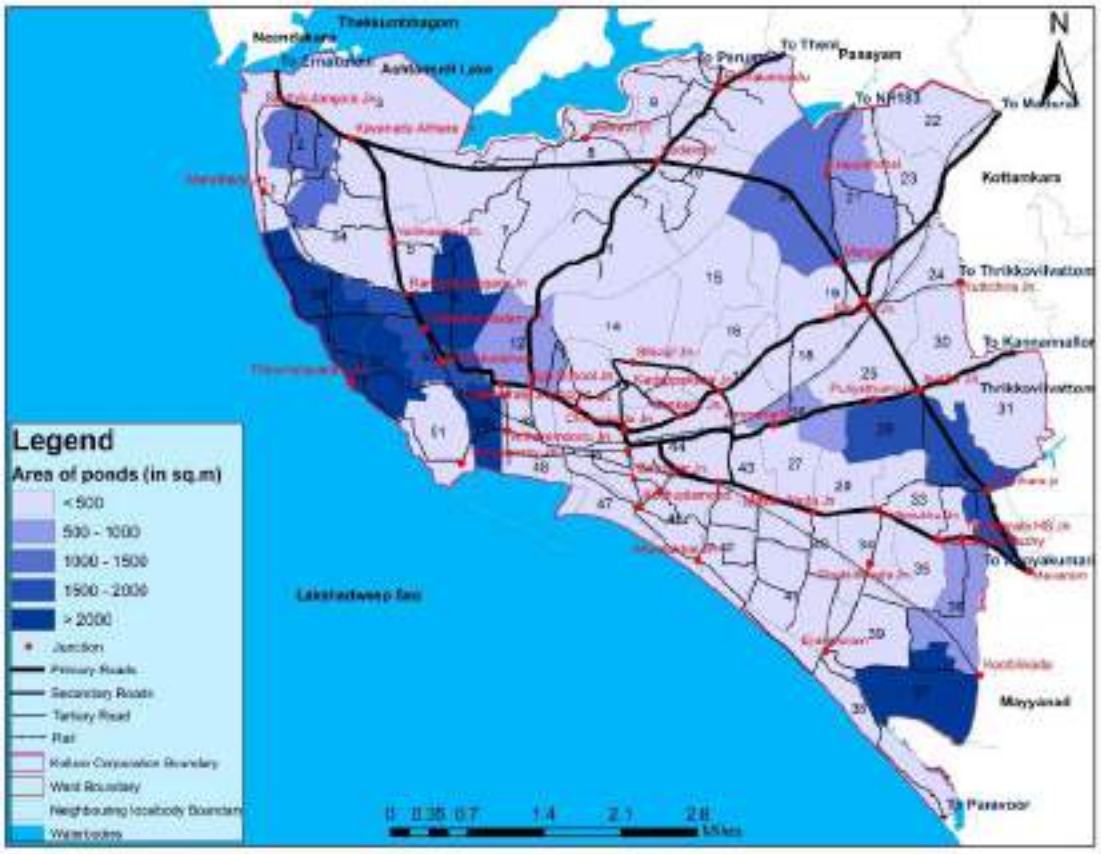


Figure. 10.11 Spatial distribution of ponds in KLMC area

ponds are available in Sakthikulangara zone. In addition to ponds Kollam Thodu and local streams are also used for irrigation. All Krishibhavans supply about 5 to 10 pump sets, 5 to 10 brush cutters yearly for facilitating irrigation.

10.1.5 Agriculture labour force

As a large number of people changed their occupation to non-agricultural activities, workforce employed in agriculture has started declining in large numbers. The size of the workforce in agriculture sector declined by around 1111 between 2018-2020. As per table 10.13, total workforce involved in the agriculture sector in KLMC area is 5269. Thrikkadavoor zone has maximum number of agricultural workers (1307)

Corporation Zones	Agricultural Labourers & Cultivators
Sakthikulangara	1000
Thrikkadavoor	1307
Kilikolloor	716
Vadakkevila	786
Eravipuram	540
Kollam	920
Total	**5269**

Source: Krish bhavan Survey 2019

Table 10.13 Zone wise distribution of agricultural labourers in KLMC

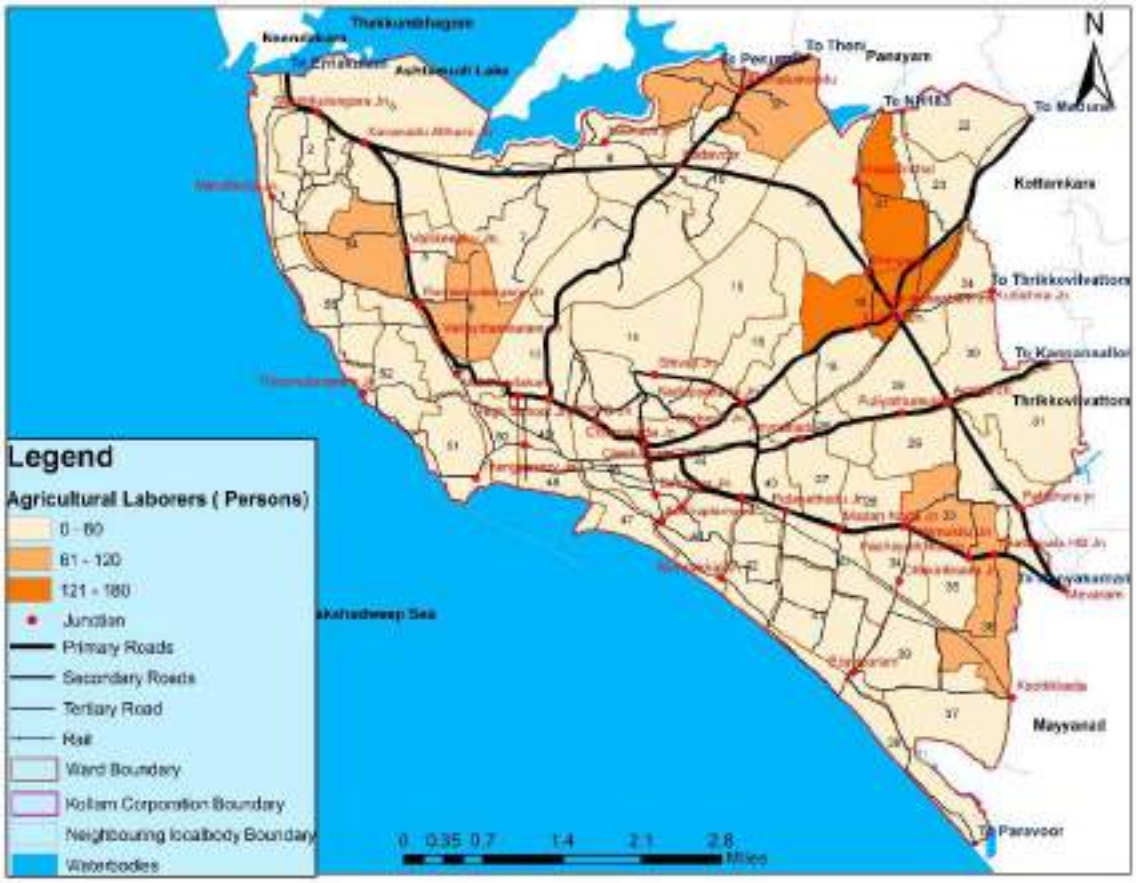


Figure. 10.12 Spatial distribution of agricultural labourers in planning area

followed by Sakthikulangara with 1000 labours as shown in figure 10.12.

About 13 numbers of farmers in Vadekkevila krishibhavan, 800 numbers in Sakthikulangara, 521 numbers in Thrikkadavoor, 21 numbers in Killikolloor have registered in State Agriculture Insurance scheme.

10.1.6 Development Issues

From the analysis of agricultural sector main issues observed may be concluded as follows:

- Large amount of area is available for coconut production and its productivity is also increased, supply of fertilizers and manures are found inadequate.
- Resource depletion i.e. labourers involved in agricultural sector is decreasing day by day.
- Shortage of agricultural labourers in paddy cultivation.
- Number of vegetables and fruit plants nurseries in the KLMC area is less.
- Absence of time bound soil testing.
- There is no proper education related to agricultural loan facilities and insurance to crops and field for farmers.
- Land management is very poor even cultivated areas get converted to non-cultivated areas for meeting other urban demand.
- Absence of education to farmers related to sowing, harvesting of crops and new methods to be adopted for farming
- Areas like Sakthikulangara, Port area, Ashtamudi area are prone to salt water intrusions, thereby affecting crop production.
- Lack of effort from authorities in cultivating fallow land.

10.2 ANIMAL HUSBANDRY

Animal husbandry sector plays an important role in providing livelihood to many families even in urban area, though this sector is considered as a rural sector with more potential in rural areas. This sector other than providing employment to large number of women, caters to the food security of the people. Meat, milk and egg are the most commonly used products. The existing status and developmental issues of animal husbandry sector in the planning area is explained as follows.

10.2.1 Livestock Population

Total number of domestic animals and birds in the planning area based on 20th Quinquennial census is 88461. Zone-wise distribution of total

number of cattle, buffalo, poultry (which includes Fowls, Turkey, and Duck), goat, dog and others (include elephant, pigs, and other poultry birds) in KLMC area is given in table 10.14.

Neeravil and Thekkumbhagam divisions of KLMC has the highest livestock population as indicated in figure 10.13.

Total number of cattle within planning area is 3717 which is 3.3% of

Corporation Zones	Animal Status						Livestock Population
	Cattle	**Buffalo**	**Goat**	**Poultry**	**Dog**	**Others**	
Sakthikulangara	591	9	356	9512	868	1093	**12429**
Thrikadavoor	507	14	403	11437	671	735	**13767**
Kollam	704	11	601	11523	2313	3425	**18577**
Kilikolloor	837	59	825	12792	1409	1675	**17597**
Vadekkevila	504	31	565	8228	880	1943	**12151**
Eravipuram	574	47	552	9607	1058	2102	**13940**
KLMC	**3717**	**171**	**3302**	**63099**	**7199**	**10973**	**88461**

(Source: 20th Quinquennial census, Provisional Report of AHD, Kollam)

Table 10.14 Zone-wise livestock population of planning area

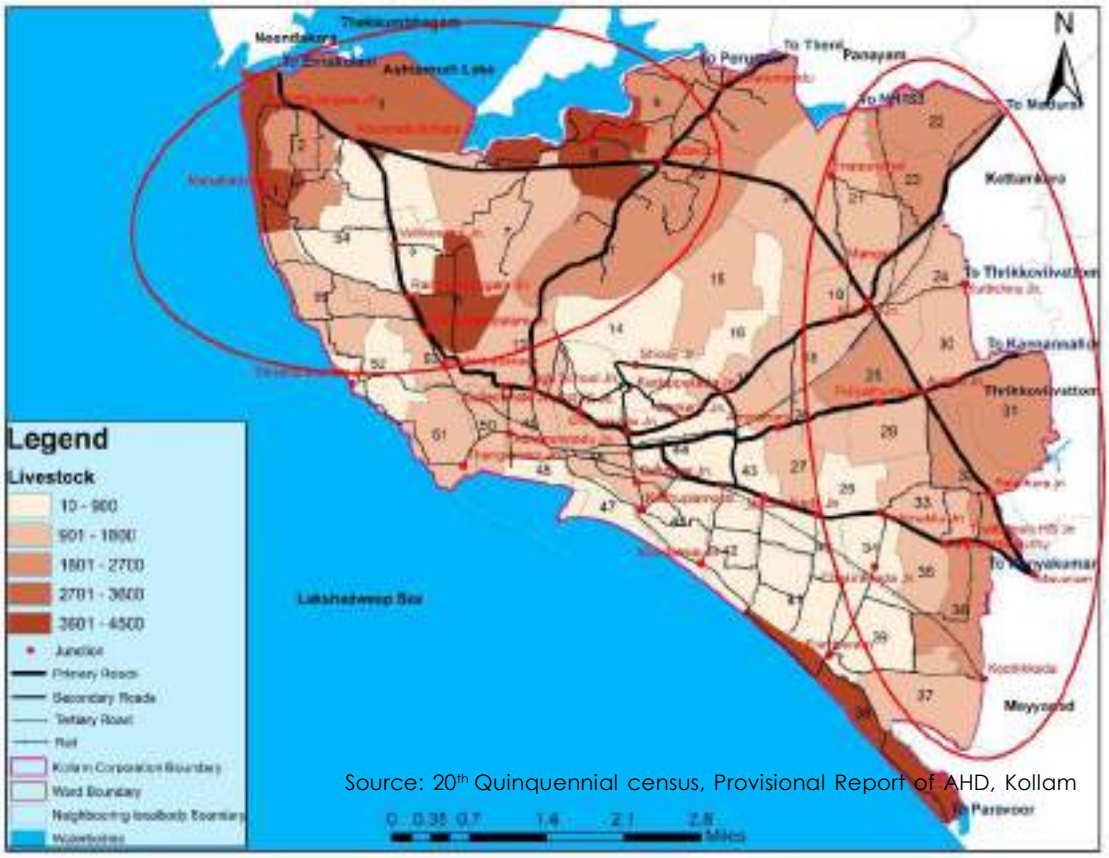


Figure 10.13 Livestock population distribution in KLMC area

20th Quinquennial status	Cattle	Buffalo	Goat	Poultry	Dog	Others	Total
Kollam District	110524	8658	124326	702888	108852	100615	**1155863**

Source: 20th Quinquennial census, Provisional Report of AHD, Kollam

Table 10.15 Livestock population in Kollam District

total number of cattle in Kollam District as in table 10.15. Also, 8.9% of poultry, 2.65% of goat in the district is existing in KLMC area. Kollam Zone followed by Kilikolloor zone have highest number of livestock population (21% and 20% respectively) as shown in figure 10.14. Highest number of cattle, goat, buffalo and poultry is found in Kilikolloor zone whereas highest dog population is seen in Kollam main zone.

Cattle per 1000 Population

Kilikolloor has the highest number of cattles per 1000 population due to availability of large extent of agriculture area and availability of farmers. Generally cattle density and number of cattle per 1000 population is found as high in the outskirts of KLMC as per table 10.16 and figure 10.15.

Poultry per 1000 population

Poultry consists of fowls, duck and turkeys. Total number of poultry in KLMC as per 20th Quinquennial status is 63099 which is 6% of total poultry population in the district. Poultry consists of 74% of fowls, 12% of ducks, 1% of turkey and other poultry birds 13%. Table 10.17 shows poultry density & poultry per 1000 population of different zones in KLMC. It is seen that poultry per 1000 population as well as poultry per sqkm. is concentrated in Kilikolloor zone followed by Eravipuram zone. Figure 10.16 shows the spatial distribution of poultry per 1000 population. From the figure it can be seen that poultry is also found concentrated in the outskirt of KLMC. In order to

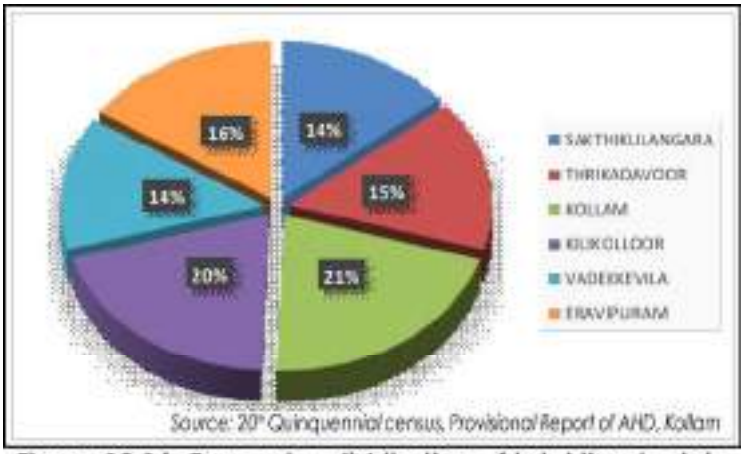


Figure 10.14 Zone-wise distribution of total livestock in KLMC area

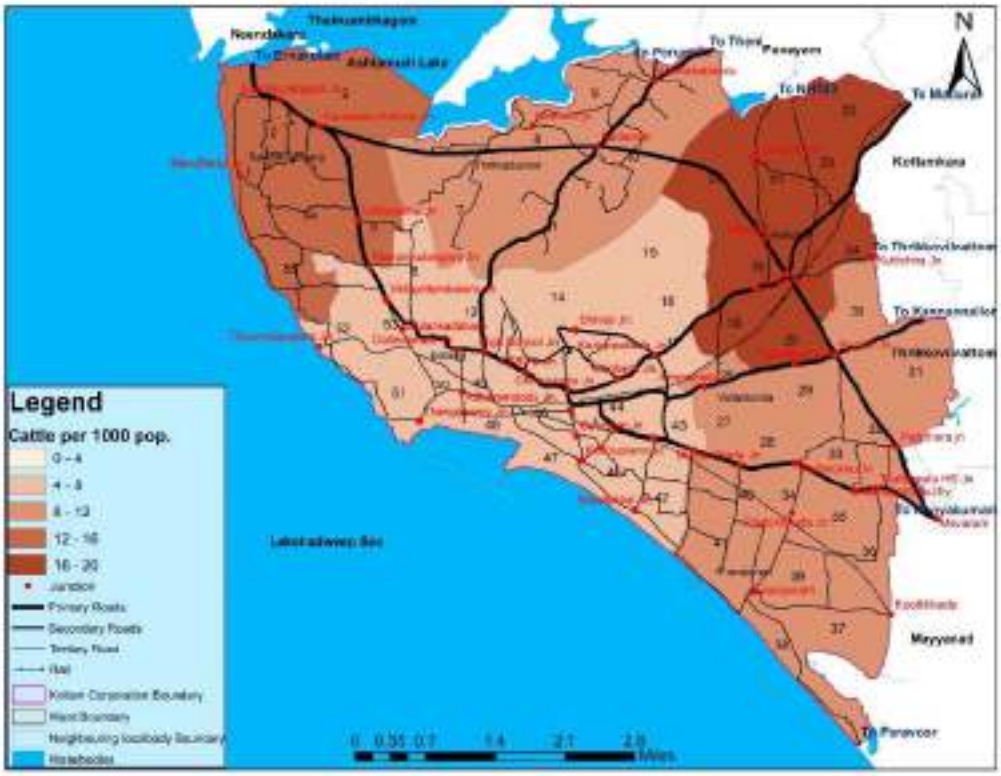


Figure 10.15 Spatial distribution of cattle per 1000 population

Corporation Zones	Total Population	Cattle Pop.	Cattle Density (No. of cattle's/ Sq. Km)	Cattle per 1000 Pop.
Sakthikulangara	46266	591	60	13
Thrikkadavoor	43270	507	43	12
Kilikolloor	50731	837	75	16
Vadakkevila	59959	504	57	8
Eravipuram	53966	574	62	11
Kollam	133750	704	27	4

(Source: 20th Quinquennial census, Provisional Report of AHD, Kollam)

Table 10.16 Zone-wise distribution of cattle density & cattle per 1000 population

attain self-sufficiency in egg & meat production, poultry farming should be widely promoted in KLMC area.

From the analysis of livestock and poultry population, it can be seen that animal husbandry sector has enough potential in the outskirts of KLMC.

Corporation Zones	Total Population	Poultry Pop.	Poultry Density (No. of Poultry/Km^2)	Poultry per 1000 Pop.
Sakthikulangara	46266	9512	636.2946	134.8939
Thrikkadavoor	43270	11437	688.4834	186.3647
Kilikolloor	50731	12792	1166.729	258.2839
Vadakkevila	59959	8228	897.9944	134.1583
Eravipuram	53966	9607	952.5037	165.8081
Kollam	133750	11523	364.6567	56.29907

(Source: 20th Quinquennial census, Provisional Report of AHD, Kollam)

Table 10.17 Zone-wise Distribution of poultry density& poultry per 1000 population

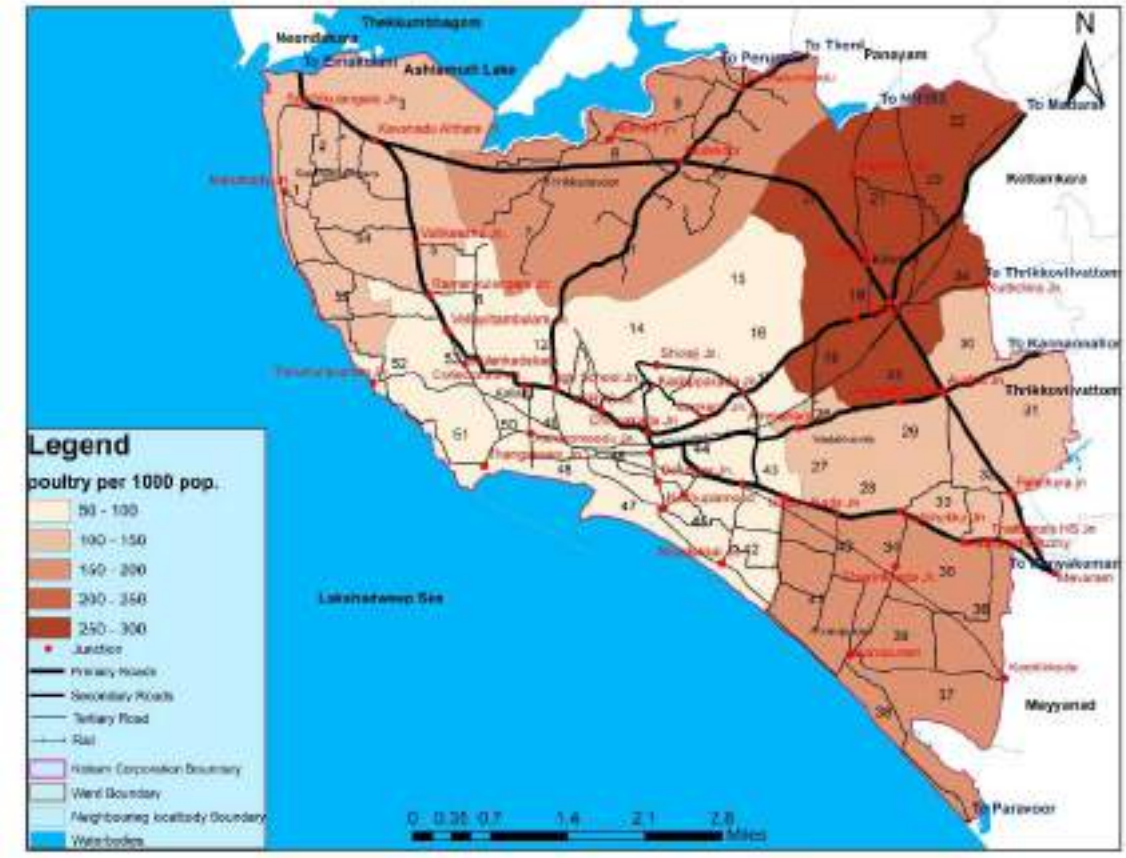


Figure 10.16 Spatial zone-wise distribution of poultry per 1000 population

10.2.2 Development Trend

Development trend of animal husbandry sector is assessed based on growth of livestock population as livestock is found as the most important component of the sector as far as economy, employment generation, cost of products etc. are concerned. Change in livestock population from 18th Quinquennial

Livestock Population	Cattle	Buffalo	Goat	Poultry	Dog	Others
20th Quinquennial	3717	171	3302	63099	7199	10973
19th Quinquennial	3304	118	3563	41760	5050	9435

Source: Animal Husbandry Department, Kollam

Table 10.18 Livestock comparison of 19th & 20th Quinquennial status

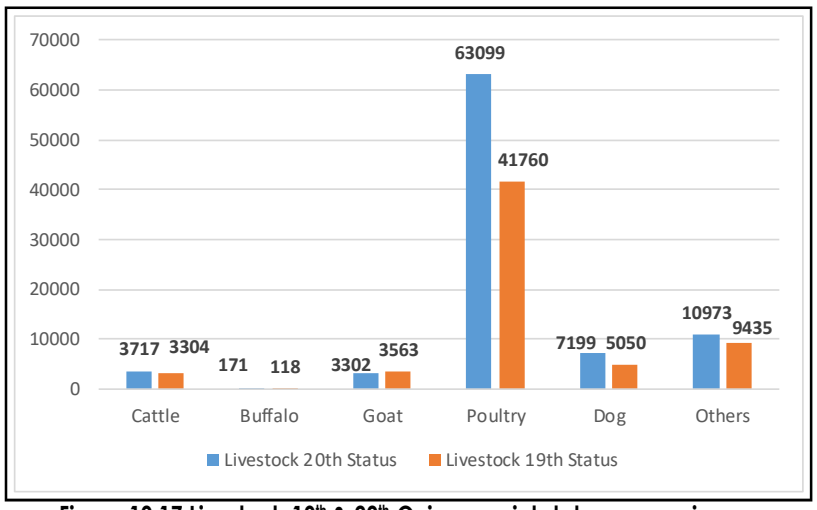


Figure 10.17 Livestock 19th & 20th Quinquennial status comparison

status to 20th Quinquennial status is shown in table 10.18 and the growth is shown in figure 10.17.

From the analysis of growth trend about 12.5% increase in cattle population, 45% increase in buffalo, 51% increase in poultry and 3% increase in dog population were observed. However goat population is decreased to about 7.3%.

10.2.3 Production Status

The status of most important products from animal husbandry sector like milk, meat and egg are analysed and reported below.

Milk Production

About 18 milk producers' co-operative societies (APCOS) and 5 major farms are functioning in the KLMC area. There are two ways of selling milk by direct sale and through societies. It is estimated that milk producers co-operative societies together with private farms handle about **6,599,976 litres of milk per annum**. Table 10.19 shows zone-wise milk production and the dairy farm details in KLMCarea.

Total of 440 dairy farms (including households & groups of households & non-households) with total population of 3717 cattle are available in the planning area.

Egg & Meat Production

Backyard poultry rearing is followed in Kerala and it is the major source of egg production as well as meat production. Currently, egg

Zones	DIARY FARMS			Milk Production (L)
	2 to 5 animals	6 to 10 animals	Above 10 animals	Total
Sakthikulangara	95	5	1	6599976L/year
Thrikkadavoor	76	20	1	
Kollam	37	3	0	
Kilikolloor	38	6	1	
Vadekkevila	71	7	1	
Eravipuram	72	5	1	
Total	**389**	**46**	**5**	**440 farms**

(Source: 20th Quinquennial census, Provisional Report of AHD, Kollam)

Table 10.19 Zone-wise milk production and the dairy farm details in KLMC area.

production is not sufficient to meet the requirements of people within the planning area. The total egg production in KLMC is estimated as 4.42 lakhs eggs/year from 10 farms under KLMC and 15 private broiler farms functioning within KLMC area. The total amount of meat production (includes chicken,beef, mutton,pork) estimated within KLMC as per the 20th Quinquennial Status is 141 tonnes/ year. The details of the poultry farms in corporation area and the total broiler farm details is given in table 10.20. More number of broiler farms are seen in Thrikkadavoor Zone and high rearing capacity broiler farm is available in Eravipuram Zone.

10.2.4 Infrastructure Facilities

Various institutions supporting the activities of animal husbandry & dairy development are listed in table

Zones	FARMS			
	POULTRY FARM			
	EGGER FARM		BROILER FARM	
	No. of Farms	No. of birds which can be reared at a time	No. of Farms	No. of birds which can be reared at a time
Sakthikulangara	2	3000	1	1025
Thrikkadavoor	2	1930	8	1400
Kollam	2	1450	1	70
Kilikollor	1	600	0	0
Vadekkevila	2	2500	1	80
Eravipuram	1	200	4	1440
Total	**10**	**9680**	**15**	**3015**

(Source: Animal Husbandry Department, Kollam)

Table 10.20 Details of egger & broiler farms in KLMC area

	Veterinary Hospitals	VD	ICDP	No. Of Milk Society	Registered Slaughter House	Pvt. AI Centre	RPF(Dist. Turkey Farm)	Dist. AHO	SPCA
Corporation	4	2	8	18	1 (Not Working)	1	1	1	1
Kollam District	31	45	144	325	1	62	1	1	1

Source: Animal Husbandry Dept., Kollam

Table 10.21 Infrastructure facilities of animal husbandry in KLMC area

10.21. There is no organized marketing system for meat and egg in KLMC as well as in the district. Hence unauthorized slaughter houses are selling low quality and disease bearing livestock products.

The only turkey breeding farm in Kerala is located in Kureepuzha ward of KLMC. There is a Milma Dairy in KLMC with pasteurization and chilling facilities. The capacity of dairy is 102500 LPD. Veterinary institutions of animal husbandry department comprise of lower level breeding centers namely ICDP subcentres, 2 Veterinary dispensaries and 4 Veterinary hospitals extending health care facilities to livestock and poultry. 1 SPCA (Society for prevention of cruelty to animals) in KLMC area is carrying out functions like awareness against cruelty to animals, animal birth control programmes, etc. There was one registered slaughterhouse near Iron Bridge which is permanently closed due to dumping of waste into Ashtamudi Lake by the authorities. Distribution of infrastructural facilities in KLMC area is shown in figure 10.18. From the figure it is observed that the infrastructure is concentrated in KLMC area.

10.2.5 DEVELOPMENT PROBLEMS

- Livestock population concentration is very less in the core area compared to other parts of the planning area.
- Improving productivity of farm animals is one of the major challenges, even though there is adequate milk production in the planning area, meat production is not meeting the requirements of KLMC area.
- Slaughtering facilities are too inadequate in the planning area. About half of the total meat production comes from un-registered slaughterhouses.
- The declining trend of goat population leads to reduction in

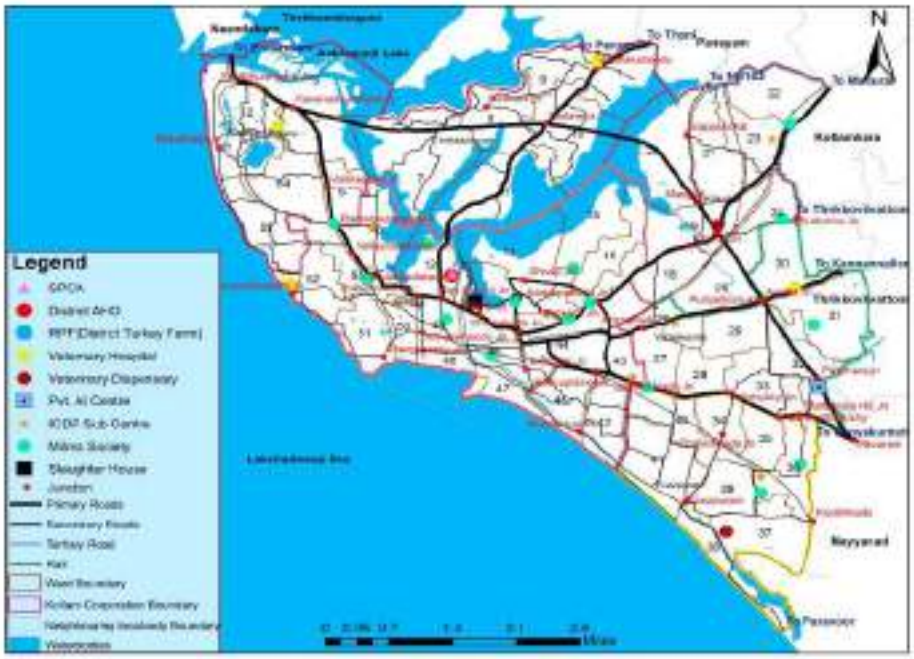


Figure 10.18 Distribution of infrastructure facilities of animal husbandry sector in KLMC area

availability of mutton in the planning area.

- Quality consciousness among the public regarding meat and milk products has improved nowadays, so modern meat processing plants are to be established and broiler production has to be promoted to attain self-sufficiency in meat production.
- Reduction in agricultural activities has affected animal husbandry sector also, availability of straw and hay at a reasonable price is reduced as people are transforming their lives from rural culture to urban culture.

10.2.6 Development Potentials

- The outskirts of KLMC is found as a potential area for promoting animal husbandry activities.
- Infrastructure facilities except the slaughterhouses are available in the planning area to promote animal husbandry activities.
- Excellent marketing networks of milk societies are there throughout the area
- People have got affinity to use brown shelled eggs leading to promotion of backyard poultry system
- Demand for pet dogs, birds are high leading to more employment opportunities in this sector

CHAPTER - 11
TRANSPORTATION

Transportation is considered as the back born for promoting sustainable economic growth and development of any area. Transportation system consists of many aspects based on which the level of easiness,economy, time consumption, safety etc. of the journey depends. Road, rail and water are the common modes of transport available in the planning area. In this chapter Transportation sector is analysed by evaluating the existing transportation system as well as various proposals in the anvil for future transportation developments in Kollam Municipal Corporation area. It also covers the evaluation of existing transportation plans and various issues associated with transportation sector.

11.1 ROAD NETWORK

Inorder to carry out analysisof road network various primary surveys were carried out and secondary data were collected from PWD, NHAI and other state holders. In this regard National Transportation Planning and Research Centre (M/s. NATPAC) was awarded the work of conducting transportation study within the planning area and they have completed the study. Analysis of roadways in Kollam Municipal Corporation area consists of;

- Details of existing roads
- Daily link volume on major road sections
- Volume-capacity ratio for major road sections in the base year
- List of traffic zones adopted for the study
- Sample size of vehicles interviewed at various survey stations
- Origin-Destination of daily passenger trips by different modes through each survey station
- Origin-Destination matrix of passenger trips through each survey station
- Distribution of passengers according to purpose and mode of travel
- Commodity-wise distribution of goods traffic at the survey stations
- Parking accumulation of vehicles on major roads
- Projected traffic volume on the existing network in 2039.

Existing road network is shown in figure 11.1. The city road network is found as fairly extensive, however, there is no apparent road hierarchy withlack of access control. The regional roads converging in the city centrealso serve as the major transport (arterials) and development (commercial) corridors. These roads carry a mix of local, and regional traffic and suffer major congestion. Other major roads in the city provide direct access to private properties and carry mixed traffic. Inadequate width of right of way and poor road geometrics are also found as major limitations of most of the roads within the planning area. The pattern of the road network in the central area is Grid-Iron and for other portions it is a radial pattern. Classification of roads as per IRC as Arterial, Sub-arterial etc is not possible in the case of planning area as width of roads are not at par with that specified in IRC. However depending on the relative importance of the road, the entire roads in the planning area may be classified as follows:

1. Primary Roads
2. Secondary Roads
3. Tertiary Roads
4. Local Roads

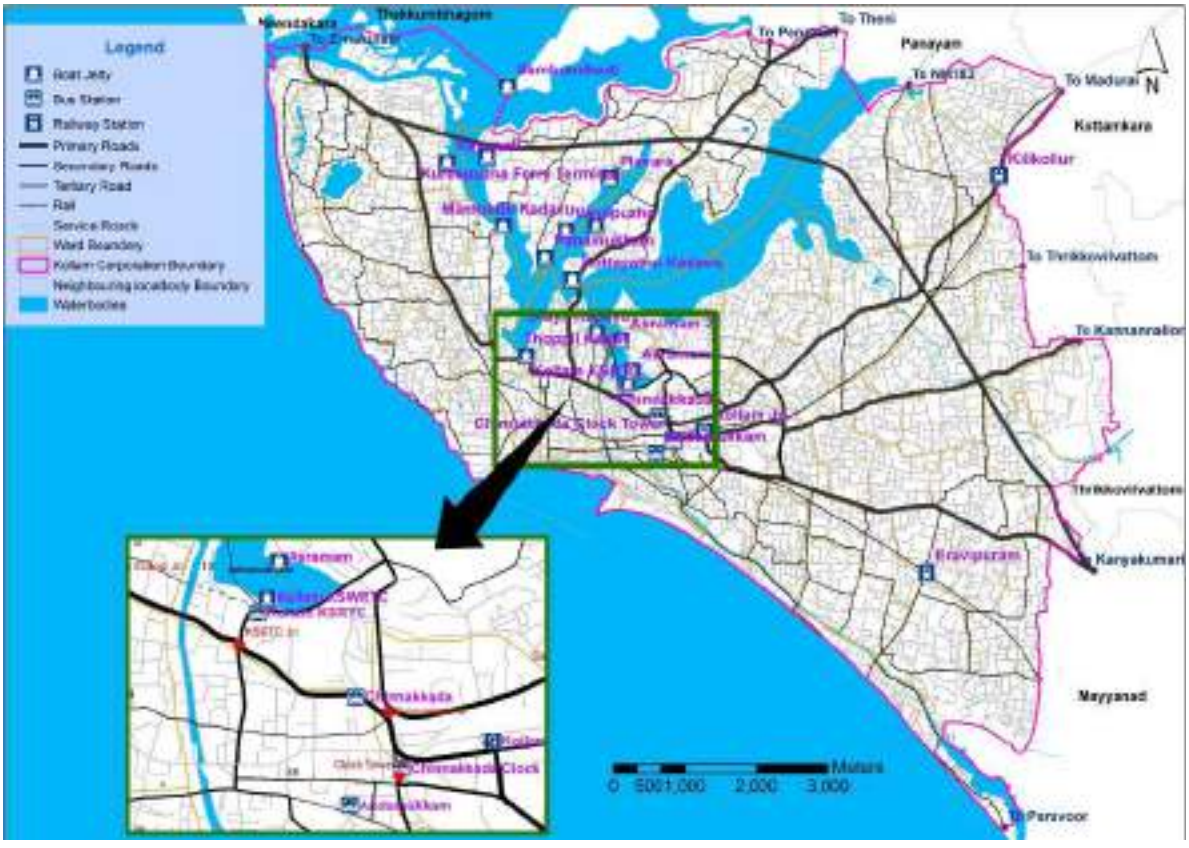


Figure 11.1 Existing road network map of KLMC

11.1.1Primary Roads

Primary roads consist of NH 66, NH 66 Bypass, NH 744, NH 183, Kollam – Kannanalloor –Ayoor Road, and proposed Coastal Highway. Characteristics of each of these roads are explained below.

1. National Highway 66 (Kanyakumari- Panvel)

NH 66 previously notified as NH47 is the most important road passing through KLMCand has a length of 15.4 km. It passesthrough the CBD area of the city. It connects the planning area with neighbouring districts viz Alappuzha on the north and Thiruvananthapuram on the south. Boundary nodes of NH 66 are Mevaram Bypass junction on south and Neendakara Bridge on north. Mevaram - Kavanad stretch of this road is characterised by intense ribbon development especially with several commercial establishments. This road consists of two lane traffic except Kappalandimukku to Chinnakadawhere four lane traffic is available. Carriageway width of Mevaram-Chinnakada stretch of NH 66 varies from 10 to 15 metres. Footpath is provided from Kappalandimukku - SBI junction for a length of 1.25km. NH 66 alignment passes through Mevaram-Chinnakada - KacheriJn - Collecterate Jn-Vellayittambalam. Ramankulangara Junction is a bottleneck in the highwaydue to encroachment. Collectorate- Vellayittambalam road via Anchalummood with a length of 3.7 km runs parallel to the above described NH alignment. Part of this road from Civil Station to Ammachiveed belongs to King's way constructed by Venad Dynasty. Many heritage buildings are located by the side of this road. Hence further development of this road can be taken up only after giving due construction measures to theseheritage precincts. This road has a width of 8-15 m through which most of the private buses commute towards Neendakara, Chavara, Thangassery etc. and back.

2. National Highway 66 Bypass

NH 66 bypass of length 13.4 Km connects Mevaram and Kavanad junction on NH 66, thereby bypassing the CBD area. The road intersects the radial roads at Ayathil, Kallumthazham and Kadavoor junction. Traffic signals are in place at these intersections for controlling the vehicle movement. The road has 7m carriageway & 1.5m paved shoulders in general except at

signalised intersections where the road has channelized into divided carriageway. Right of Way of this road is 45m.Construction of additional bridges for increasing the number of lanes is already started.

3.National Highway 744
(Kollam - Thirumangalam)

It is the second important National Highway in Kollam and was previously notified as NH 208. NH 744 provides connectivity of the planning area to eastern side of the district thereby connecting urban centres like Kottarakara and Punalur. NH 744 also connects Kollam Municipal corporation area with Madurai via Shenkottai, Tenkasi, Rajapalayam, Srivilliputtur and Tirumangalam. The length of road stretch within Kollam Municipal Corporation area is 8km from Chinnakada to Chandanathope with 7m carriageway and two-lane traffic. The road is devoid of paved shoulders and footpaths. Absence of bus bay leads to stoppage of buses on main carriageway itself leading to excessive congestion on raod and causesdelay. The road is characterised by intense commercial activities along the sidesfrom Chinnakada to Chadanathoppe. Major junctions in the stretch are Kadappakkada, 2nd mile Stone, Kallumthazham, 3rd mile stone and Karicode. The average RoW is 13m.

4. National Highway 183 (Kollam - Theni)

It connects Kollam with Tamil Nadu via Adoor, Kottayam, Mundakayam, Kumily and Cumbum. NH 183 runs northwards and turns east at Kottayam and runs along the northern border of Periyar Wildlife Sanctuary before crossing the border into Tamil Nadu and ending near Dindigul, where it joins NH 83(Coimbatore - Nagapattinam). Total length of road from High School Junction to Pavuvayalin the planning area is 7 km. This is a two-lane road with 6m carriageway. The road is devoid of paved shoulders and footpaths. Delay is observed in this road also due to absence of dedicated bus bay. The road is characterised by residential and commercial activities. Major junctions in the stretch are High School Junction, Thevally, Kadavoor and Anchalumoodu. The highway has an average RoW of 11m.

5.Kollam-Kannanalloor - Ayoor Road

It is a major district road which connects Kollam city with south-eastern parts of the district. This two-lane road originates from Railway

station Junction and connects MC road near Ayoor junction. It has an average carriageway width of 11m from Railway station to Chemmamukku and is characterised by intense parking on either side. However Chemmamukku to Ayathil section is a narrow road having average carriage way width of about6.5mwithright of way varies from 8m-10m. Ayathil- Decent Junction is comparatively wider with paved shoulder of 1.5m on either side thus having a paved width of 10m withRoWof about13m. This road is characterised by residential, Institutional and commercial activities. The road has nearly 6 km length in Kollam Municipal Corporation area from Chemmanmukku Junction to Decent Junction.

6. Proposed Coastal Highway

The proposed 657Km coastal highway traverse through the planning area from Thanni to Shakthikulangara for a distance of about 17.88 km. The alignment was prepared by National Transportation Planning and Research Chennai (Natpac). Average ROW of the proposed road is 14 m with a carriage-width of 7 m. As per the available detailsexisting coastal roads from Thanni to Thangassery forms part of the proposal. However from Thangasseryto Thirumullavaram is proposed as bridge for a length of about 2 km adjacent to sea coast. Thereafter road is proposed on land utilizing existing road stretch. Portion of road above sea is designed to accommodate cycle track and footpath forfacilitating the public to enjoy the scenic beauty of Lakshadweep sea. The proposed road alignment almost follows the coastal road proposal inthe sanctioned Master Plan except for the proposed bridge from Thangassery to Thirumullavaram. However the proposed width of coastal road in the Master Plan is 15m instead of 14m proposed in the new alignment. Proposed coastal highway connects Kollam with Paravur to the South and Neendakara to the North.

11.1.2 Secondary Roads

1. Beach road

It is another major district road which connects Chinnakada with Kochuplammoodu Junction. The road is characterised by residential and commercial activities, intense commercial activities present on both sides of the road. The road has nearly 3 km length in KLMC. The average RoW is 9.7 m. This road is the most important

road in the planning area as far as tourism development is considered. Most of the domestic and foreign tourists commute to Beach area through this road.

2. Kappalandimukku – Kadappakada-Asramam-TalukKacheri Junction

This 4 lane road has nearly 4.3 km length with a carriage width of 7.5m. andaverage RoW15.1 m.This road connects Asramam Bio Diversity Heritage site, Asramam ground, KSRTC bus stand, Boat jetty etc. This road can be considered as a bypass to NH66 from Kappalandimukku to Taluk Office Jn.

3. Chinnakada- Asramam- Sankers Junction

The road has nearly 1.9 km length with a carriageway of 9m wide. The average ROW is 12 m.It connects Chinnakada to Asramam area and a number of multi-specialty hospitals.

4. Anchalumoodu-Perumon Road

This road originates from Anchalumoodu junctionand provide connectivity to Perumon Engineering College. However only a short stretch of this road (0.3km) passes through KLMC.

5. Proposed Asramam-Mangad Link Road

This road is proposed along the relatively undeveloped areaadjacent toAstamudi lake with a view to develop tourism activities and also to provide an alternate link between the city and NH66 Bypass. It originates from Asramam near AYK auditorium and ends inNH Bypass nearMangadu Police Station.This road was proposed in this first masterplan and retained in the subsequent master plans. However the road is not yet taken up for implementation thereby creating issuesto the public. Recently KLMC decided to implement the proposal as part of a new DTP scheme for tourism development.

6. Proposed KSRTC-Thoppilkadavu road

This road connects Kollam city and KSRTC bus stand with Thoppilkadavu. As per the proposed alignment by PWD this 2.98 km long road is completely constructed as bridge adjacent to the bank of Ashtamudi. It crosses beneath the existing Thevally bridge. Also this road is proposed to be connected to Thevally area near Jaladarshini auditorium. Bridge construction near Olayilkadavu is completed. Though

the proposed road alignment gives hassle free movement of vehicle between Thoppilkadav to KSRTC bus stand it affects the natural beauty of Ashtamudi lake. Also the water entrapped between the bank and bridge is susceptible to natural and man made reclamations.

11.1.3 Tertiary Roads

Roads connecting primary to secondary roads and also to collect and distribute traffic from and to local roads are included under tertiary roads. Total length of tertiary roads in planning area is approximately 96.353 k m and the ROW varies from 5m to 22 m.

11.1.4 Local Roads

Roads which collect and distribute traffic from and to neighbourhood areas and also to provide access to tertiary roads are grouped as local roads. Total length of local roads in the planningarea is approximately 746.93 Km and the width of local roads varies from 3m to 5m.

From the analysis of existing landuse and road network, as given in figure 11.2, 11.3 it is found that along the sides of NH and major roads except for the central part mixed land is predominant where the central part is developed with Commercial, Public



Figure 11.2 Road network and landuse

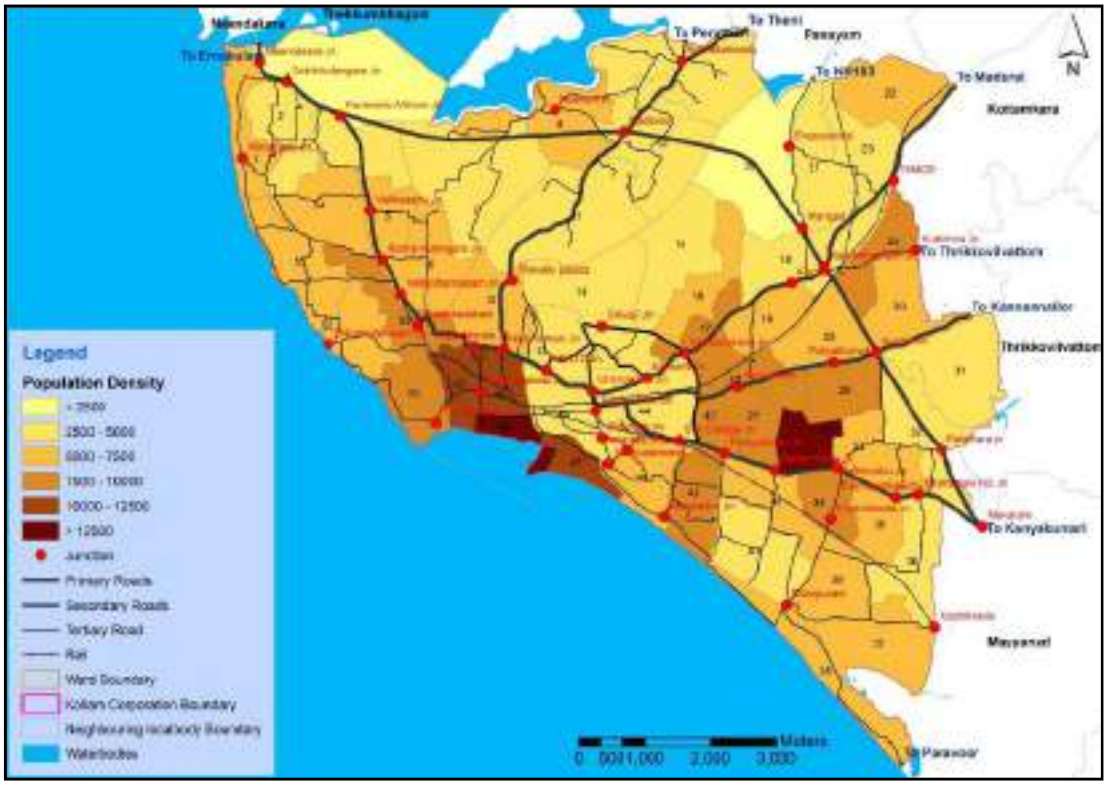


Figure 11.3 Road network and population density

and Semi- public activities. Land use for transportation sector is found as 3.71km² only which is 5.17% of the total geographicalarea which is very low compared to the recommended share of area under transportation use (12-14%) as per URDPFI guidelines,2014.

11.1.5 Road Density

Category wise length of road in Kollam Corporation is shown in table 11.1.

The total length of road available in the corporation area is 947.76 km as shown in table11.1and road density of the KLMC area is 2.44

Sl. No.	Type of Road	Length of Road(km)	Percentage (%)
1	Primary Road	52.16	6
2	Secondary Road	10.44	1
3	Tertiary Road	96.353	11
4	Local Road	746.93	82
Total Length		**947.76**	100

Source: Deduced from land use survey, 2019

Table 11.1 Road length and road density of roads in KLMC area

km/1000 population which is more than that of the Kochi Corporation area of 1.03 km/1000 population. From the table it is clear that 82% of road length available belongs to local roads of majority width less than 5m.

11.1.6 Homogenous sections

To study the traffic characteristics, major roads in the study area were divided into 105 homogeneous sections considering the similarity in traffic characteristics, future development potential and available road width by M/s NATPAC. The details of homogeneous sections on major roads in KLMC are as shown in figure 11.4.

11.1.7 Traffic Analysis

Traffic analysis includes growth of vehicles, speed and delay characteristics, traffic volume and pedestrian volume.

11.1.7.1 Growth of Vehicles

For the last two decades compounded annual growth rate of vehicles in the planning area is found as more than 10 per cent as shown in table 11.2. The number of vehicles per 1,000 population for Kerala as on March 2018 is 361. It can be seen that the vehicle population in Kollam District has grown by more than four times during 2000 to 2011 and 1.7 times during the last five years. The number



Source: Deduced from traffic & transportation study, 2019 by NATPAC

Figure 11.4 Homogenous section selected for study in KLMC

Year	No. of vehicles	Growth Index
1990	57694	100
2001-2002	137020	237.49
2002-2003	168907	292.76
2003-2004	189346	328.19
2004-2005	212249	367.89
2005-2006	239511	415.14
2006-2007	270438	468.75
2007-2008	304649	528.04
2008-2009	335400	581.34
2009-2010	363447	629.96
2011-2012	523739	310
2012-2013	600042	355
2013-2014	600398	355
2014-2015	661896	-
2015-2016	776314	545
2016-2017	778218	148
2017-2018	868077	166

Source: Deduced from traffic & transportation study, 2019 by NATPAC

Table 11.2 Year-wise growth of vehicle population in Kollam District

of motor vehicles having valid registration in Kollam district in 2018 is 8,68,077. This trend in increased growth rate of vehicle population is seen all over the state which is demanding increased capacity of the road network to accommodate more vehicles.

Out of the 7,78,218 vehicles in 2017 nearly 65% of vehicles are two-wheelers as shown in figure11.5.

11.1.8 Speed and delay characteristics

For determining the journey speed, running speed and delay of traffic flow on the road network, speed and delay survey was conducted by M/s NATPAC on major roads in KLMC area. The survey was carried out by moving car observer method during

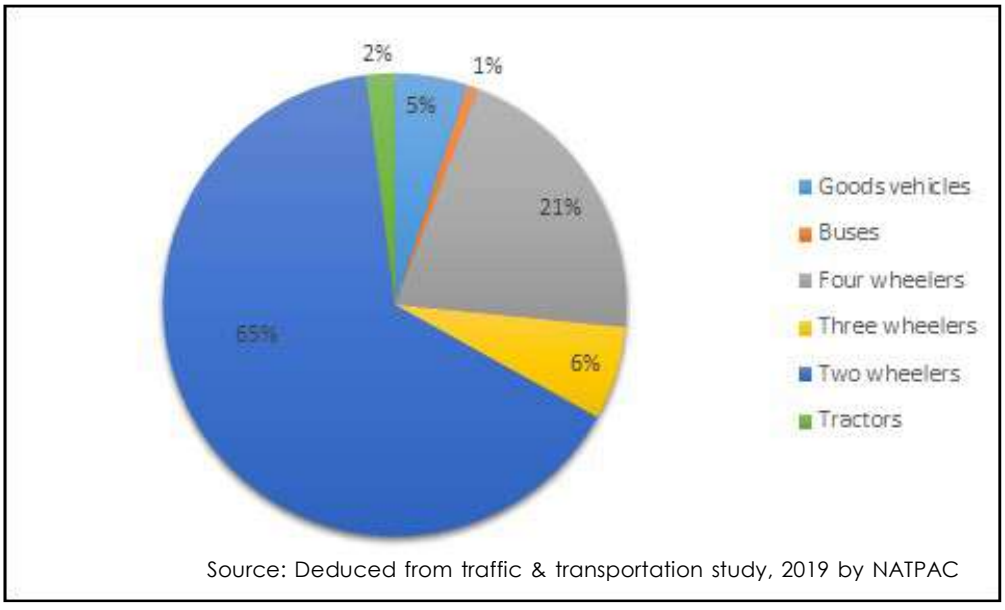


Figure 11.5 Vehicle population in Kollam District

peak and off-peak hours of the day. The results of speed and delay surveys on the major roads are given in annexure-I.

From the table, it is observed that the maximum average journey speed during peak hour is 41 kmph between Kallumthazham to Kadavoor stretch on NH66 bypass whereas during off peak hour it is 51Kmph between Kappalandimukku and SN College ROB Jn. Minimum average journey speed during peak hour and off-peak hour was observed in Kallupalam to Chinnakada (3kmph and 12kmph respectively). The major reason for low speed is haphazard parking along the side of narrow roads and high commercial activities spill covered on both sides of roads. As per GKDP report 2012 also, Chinnakada to Kallupalam is the one operating at lower journey speed among other roads. Among NH 744 and NH 183 more traffic flow is through NH 744, thus the 3rd mile and 2nd mile stretch of Kallumthazham haslowest speed during peak as well as off-peak hours. Similarly, Thevally and CKP stretch of Kadavoor Junction has least peak and off-peak hour value compared to national highways in planning area.

It is found that all major roads including national highways experienced delay due to improper design of intersections. The most delayed road section is Kallupalam to Chinnakada (698 sec) due to the presence of market and non-organised parking. Other causes of delay are right turn traffic, bus stops on roads, uncontrolled pedestrian crossing etc.

11.1.9 Traffic Volume on Road Sections

Traffic volume survey was conducted at identified mid-block sections by manual traffic volume count by vehicle moving in opposite direction. Roads carrying very low traffic were not considered for this survey. Data collected from the field has been scrutinised and was converted to Passenger Car Units (PCU) by adopting equivalent PCUs. The PCUs recommended as per IRC: 64-1990 are used for calculating traffic volume. The data on traffic volume from the survey is tabulated and presented as annexure-II.

From the recorded data it is seen that various sections of NH 66 show high traffic volume. The section between Chinnakada and St. Joseph link shows the highest traffic volume of 6340 PCU with a vehicle count of 5284.

The lowest traffic volume in NH-66 is between YMCA Junction to Railway Station Junction with a traffic volume of 2423 PCU. Pazhayattinkuzhi – Pallimukku (5601PCU), Pallimukku – Madannada (5075 PCU), Madannada - KappaIndimukku (5857 PCU) and TalukKachery - High school Junction (5791 PCU) sections were showing high PCU values.

In the case of secondary road fromKappalandimukku to TalukKacheri Jn. peak hour traffic volume increases from 1811 PCUin Kappalandimukku to Chemmamukku Jn. stretch to 4303 PCU in Chemmamukku - Kadappa kkada junction. Traffic volume in the KSRTC link road is found as 2313PCU.Comparatively high traffic volume was observed in CKP Jn to Anchalumoodu Jn.1535 PCU to 3487 PCU.

On Major Intersections

Major intersections in the study area and its immediate surroundings were identified and a classified traffic volume count survey was conducted for all movements at these junctions. The data helps in identifying the traffic issues at the intersections, critical movement's etc. 32 locations were selected for intersection turning volume count and the data is presented in table11.3.

The maximum traffic flow through Chinnakada intersection was 9521 PCU observed between 11:00 AM and 12:00 PM. Heavy traffic flow is observed in Alappuzha arm (3695PCU) of this intersection. Table11.3 and figure 11.6 gives peak hour and Peak hour traffic flow through the junction. Among the other junctions, Taluk office junction witnessed the maximum peak hour flow of 7652 PCU (followed by Kadappakada junction with 7470 PCU. In the GKDP report, the peak hour traffic volume at Chinnakada round was 6660 PCU only which has now increased to 9521 PCU, for TalukKacheri it was 6366 PCU which has increased to 7652 PCU.

11.1.10 Capacity Utilisation

Capacity utilisation of the road stretches is measured by volume-to-capacity ratio (V/C Ratio) as per IRC-106-1990. It is the ratio of volume of peak hour traffic plying on the road stretch to thecapacity of the road stretch. The volume capacity ratios of major road stretchesare given in annexure-III and the road stretches with different V/C ratioare depicted on figure 11.7.

Sl.No	Name of Intersection	No of arms	Peak time (hours)	Peak Traffic (PCU)
1	MevaramJn	3	17:15-18:15	4774
2(a)	PallimukkuJn (Eravipuram Road)	3	10:00-11:00	6849
2(b)	PallimukkuJn (Koonambaikulam Road)	3	09:00-10:00	5390
3	KappalandimukkuJn	4	17:00-18:00	6374
4	SN College ROB Jn	3	18:00-19:00	5101
5	SBI YMCA Jn	3	16:45-17.:45	3175
6	Railway Station Jn	3	10:45-11:45	3041
7	ChinnakadaJn	6	11:00-12:00	9521
8	TalukKacheriJn	4	11:00-12:00	7652
9	High School Jn	4	11:15-12:15	5461
10	Civil Station Jn	4	17:00-18:00	3601
11	VellayittambalamJn	3	11:15-12:15	4502
12	RamankulangaraJn	3	17:00-18:00	3324
13	Kavanad Bypass Jn	3	09:15-10:15	4227
14	AmmachiveeduJn	4	09:45-10:45	3171
15	AnchukallumooduJn	3	08:15-09:15	2730
16	MundallummooduJn	4	08:30-09:30	3441
17	Sankar'sJn	3	09:15-10:15	3636
18	KadappakkadaJn	3	09:15-10:15	7470
19	KallumthazhamJn	4	08:30-09:30	5407
20	KaricodeJn	3	16:45-17:45	3405
21	KadavoorJn	4	17:00-18:00	3384
22	AnchalummooduJn	**5**	17.45-18.45	3719
23 (a)	ChemmamukkuJn (Ayathil Road)	3	16:15-17:15	3358
23 (b)	ChemmamukkuJn (Railway Station)	3	16:15-17:15	4312
24	AyathilJn	4	10:00-11:00	5868
25	Mangad	4	09:00-10:00	2382
26 (a)	Kochuplamoodu 1	4	08:45-09:45	2680
26 (b)	Kochuplamoodu 2	4	18:00-19:00	2500
27	EravipuramJn	4	08:30-09:30	728
28	ThangasseryJn	3	08:00-09:00	886
29	AltharamooduJn	4	15:15-16:15	2291
30	KavalJn	4	15:00-16:00	1753
31	Nair's Hospital Jn	3	09:15-10:15	2725
32	Traffic Police Station Jn	4	10:15-11:15	3441

Source: Deduced from traffic & transportation study, 2019 by NATPAC

Table 11.3 Peak hour traffic flow and No. of arms at major intersections



Figure 11.6 Link volume at major intersections



Figure 11.7 V/C ratio of different stretches in planning area

From the annexure-3 and figure 11.7, it is clear that the road section from Madannada- Kappalandimukku section is over utilised to the extent of 490% of its capacity. Even though the traffic volume of Chinnakada to St.Joseph link is the highest, the capacity utilisation is 220% not that critical as Madanada-Kappalandimukku Section because the road width available is comparatively more for this section. The next critical section is PazhayattinkuzhiJn - Pallimukku Jn. where the capacity utilisation is 470% of its capacity. From the analysis 84 % of road sections are found as V/C ratio greater than 100. However, 5 % of road stretches show a V/C ratio greater than 300%.

11.1.11 Parking Characteristics

Parking survey was conducted to assess the extent of on-street parking on the basis of different zones in the Corporation area where a significant amount of parking accumulation is observed. A total of 4 zones (Commercial, Recreational, Terminal and special concern zones) have been selected for the survey and are given in table 11.4, 11.5, 11.6, and 11.7. Parking accumulation and parking duration were observed for all the Zones.

Presently a high parking demand for the terminal zone in KLMC is observed at the Kollam Junction Railway station in Kollam Municipal Corporation with a very high parking load of 6773 veh-hrs. It is observedthat the peak hour demand in Kollam Junction Railway station is seen at 1.00 P.M noon with a peak hour demand of 949 PCU.

While analysing parking duration for the terminal zones about 70% of cars and 68% of two-wheelers parked in Railway station Kollam is more than 2 hours as shown in table 11.6.Two-wheelersconstitute 66% of total vehicles parked followed by car 23% and auto rickshaw 7% as depicted in figure 11.8. Goodsvehicle parking share is only about 2 %.

Sl No.	Recreational Zones	Total vehicle/ day	Peak Hour(s)	Peak Hour Demand (PCU)	Parking load (veh-hrs)	Parking Type
1	Asramam Ground	8018	11.30 am	381	3330	Free parking
2	Kollam Beach	5572	06.30 pm	337	1410	Pay & Park, Free parking

Source: Parking policy of Kollam Municipal Corporation, 2019

Table 11.4 Parking demand in selected Recreational Zones in KLMC

Sl No.	Commercial Zones	Total vehicle/day	Peak Hour(s)	Peak Hour Demand (PCU)	Parking load (Veh-hours)
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Chinnakada Circle- Sanker's Jn Road (QS Road)	4157	06.30pm	155	981
6	Pallimukku	4507	11.00am	87	845.5
7	Vadayattukotta Road	3546	12.00pm to 01.00pm	89	785
8	Thamarakulam Road (Jn to Benziger Jn)	1492	12.30pm	81	724
9	Residency road	2140	12.00pm	91	706
10	Clock Tower Junction	2597	10.30am	70	610
11	Beach Road	2484	07.30pm	72	572
12	Kadapakada- Asramam Road	1770	9.00 am	80	571
13	YMCA Road	2649	02.30pm	58	488.5
14	Kavanadu	2472	11.00am	54	438.5
15	Anchalumoodu Jn-PNN Memorial Hospital Road	2356	05.00pm	51	389
16	Kadapakada- Sanker's Jn road	1482	3.00 pm	53	363
17	Kadapakada- Randamkutty Road	1428	1.00 pm	46	341
18	Pazhayatinkuzhi Jn-Pallimukku Jn Road	1725	03.30pm	46	331
19	Thamarakulam Road (jn to Andamukkam)	1357	02.00pm	34	316.5
20	Kadapakada-Manorama Jn Road	1006	10.00 am	56	315
21	Ramankulangara Vellaytambalam Road	1160	12.00pm	39	297
22	Pazhayatinkuzhi Jn-Thattamala Jn Road	980	07.00pm	43	260
23	Anchalumoodu Jn-Thannukalmukku Road	1532	06.00pm	32	246
24	Thamarakulam Road (Jn to Chamakkada)	1210	11.00am	30	241.5
25	Kadavoor-Anchalumoodu Route	1109	06.00pm	28	237.5
26	Anchalumoodu Jn-CKP Jn Road	1508	02.30pm	30	232
27	Kadavoor Temple - Bhoothakavu Temple Route	1000	11.00am	22	216
28	Maruthadi Irattkadavu Route	1458	12.00pm	31	204
29	Ramankulangara Sakthikulangara Route	1316	09.30am	23	203

Source: Parking policy of KLMC, 2019

Table 11.5: Parking demand in selected areas of commercial zones in KLMC

Sl No.	Terminal	Total veh/day	Peak Hour(s)	Peak Hour Demand (PCU)	Parking load (veh-hrs)	Parking Duration
1	Kollam Junction Railway Station	37248	01.00pm	949	6773	70% of cars and 68% of Two-wheelers parked for more than 2 hrs
2	Civil Station	10536	11.00am	363	2695.5	45% of cars and 43% of Two-wheelers parked for more than 2 hrs
3	KSRTC - Link Road	6700	04.00pm	177	1845	
4	Bishop Jerome Nagar	5187	11.30am	208	1126.5	40% of cars and 45% of Two-wheelers parked for 30 mins to 1 hour
5	District Hospital	4997	11.00am	118	1060	
6	AndamukkamPvt Bus Terminal	2174	10.30am	59	513	

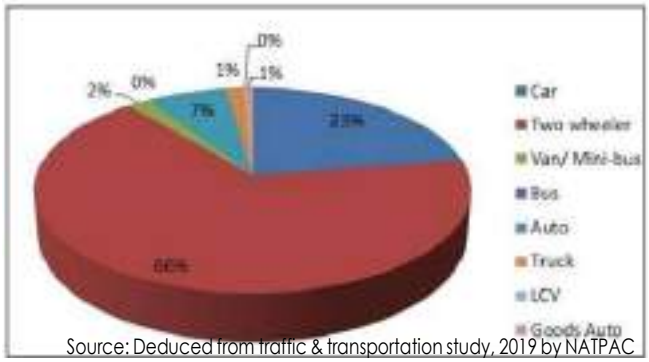
Source: Parking policy of Kollam Municipal Corporation, 2019

Table 11.6 Parking demand in selected terminal zones in KLMC

Sl No.	School Zones	Total veh/day	Peak Hour(s)	Peak Hour Demand (PCU)	Parking load (veh-hrs)
1	Infant Jesus School Zone (Thangassery)	994	08.30 AM	223	530
2	Mount Carmel School (Thangassery)	1413	03.00 PM	196	461.5
3	St Aloysius & Trinity Lyceum Schools (Altharamoodu)	997	03.30 PM	61	302
4	VimalaHridayam School Zone (Chemmamukku)	237	03.30 PM	30	55.5
5	St. Mary's Residential Central (Maruthady)	83	09.00 AM	9	26

Source: Parking policy of Kollam Municipal Corporation, 2019

Table 11.7 Parking demand in selected special concern zones in KLMC



Source: Deduced from traffic & transportation study, 2019 by NATPAC

Figure11.8 Composition of parked vehicles in KLMC area

On-street Parking Facility

Marked On-street facilities parking are available in:

Main Road – 92 parking bays

Payikkada Road – 100 parking bays

Vadayattukotta Road – 14 parking bays

For all other road stretches including 'no parking area' designated by police, vehicles are parked causing delay in many roads.

11.1.12 Pedestrian Characteristics

Facilities like foot path,zebra crossing, foot over bridge etc. are very important to ensure safety of pedestrians who are the most vulnerable among the road users. Data on pedestrian crossings and lateral movements were taken at major locations in Kollam Corporation. Locations selected for pedestrian survey are shown in figure 11.9.

The intensity of pedestrian-vehicle conflicts represented by PV^2 value (where P is the number of pedestrians crossing a link during peak hour and V is the number of vehicles passing through the link during peak hour) were analysed. For a road section with central median refuge, value of PV^2 greater than 2x108 and for a road section without central median refuge, PV^2 value greater than 108 indicates a higher level of conflict and warrants controlled pedestrian crossing facility. It implies that a divided carriageway canreduce the pedestrian - vehicle conflicts by 50% for a given number of pedestrian and vehicles crossing a link. Based on the above criterion, the critical locations where pedestrians are

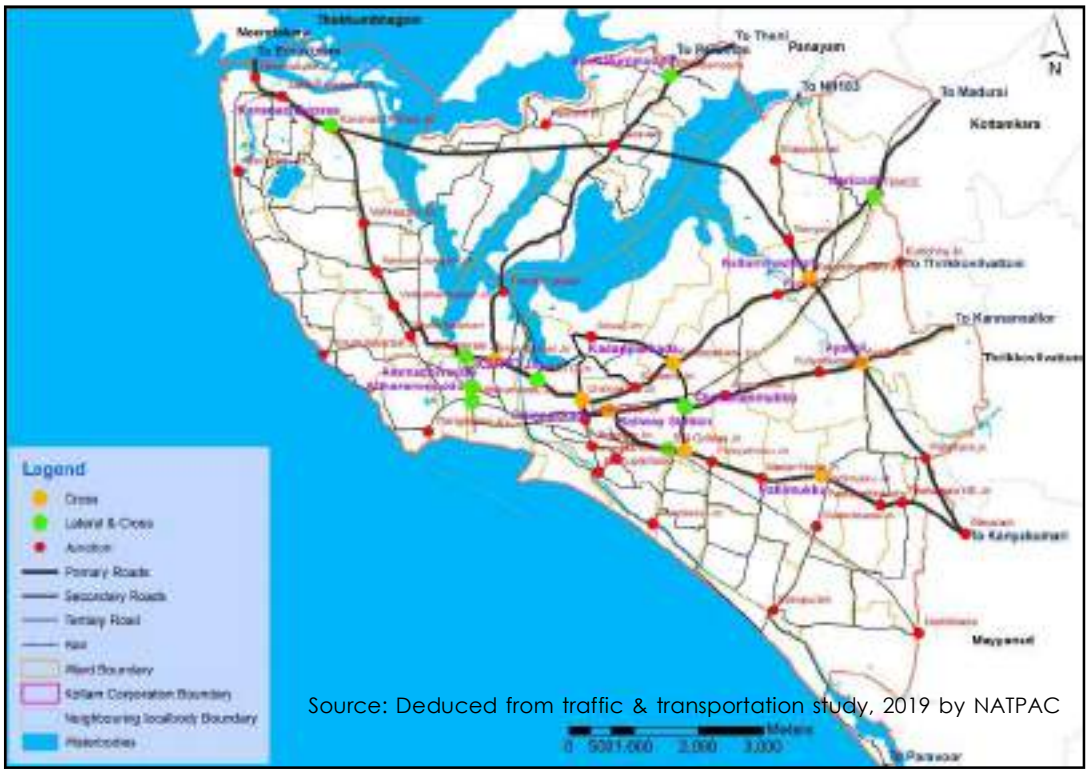


Figure 11.9: Locations identified for Pedestrian Survey

in sharp conflict with vehicular traffic have been identified. Locations selected for pedestrian crossing and lateral movements in Kollam Municipal Corporation area are shown in Annexure -IV.

Out of the 18 locations selected for the pedestrian cross survey as indicated in table 11.8, 99% of locations have high PV 2 value. Ernakulam arm of Chinnakada intersection had high PV2 value 231.69x108. This cross movement was due to the presence of bus bay on Ernakulam arm. The second and third highest values were observed between Kappalandimukku and SN College due to the students to and fro movement to SN College and Fathima Matha College.

The highest lateral movement of 3295 pedestrian was observed in the Peroor arm of Kilikolloor intersection due to the presence of TKM College of Engineering and Kilikollur Railway station. Second highest value 1841 was at CKP arm of Anchukallummoodu junction and third value of 1128 was at Kadappakada arm of Chemmamukku intersection. Pedestrian movement of 1065 and 1012 were observed at SN College ROB to Railway Station side and Kottarakkaraarm of Kilikollur intersection respectively. Pedestrian value of 1065 and 1012 respectively.

Sl No.	Name of Location	Peak Time	Up	Down	Total
1	**MevaramJn**				
1-a	Meevaram to Trivandrum	9.15-10.15	136	108	244
2	**SN College Jn**				
2-a	SN College to Kollam Side (Right)	16.30-17.30	543	0	543
2-b	SN College to Kollam Side (Left)	16.45-17.45	633	379	1012
3	**KaricodeJn**				
3-a	Peroor Arm	16.15-17.15	360	2935	3295
3-b	Kottarakkara Arm	16.00-17.00	200	865	1065
4	**ChemmamukkuJn**				
4-a	Chinnakada Arm	15.45-16.45	89	25	114
4-b	ChemmamukkumidsectionJn	15.30-16.30	227	99	326
4-c	Ayathil Arm	16.30-17.30	315	180	495
4-d	Kadappakkada Arm	15.30-16.30	596	532	1128
4-e	Kadappakkada Arm	16.30-17.30	211	90	301
5	**Anchalummoodu**				
5-a	Panayam Arm	18.00-19.00	169	201	370
5-b	CKP Arm	15.30-16.30	1050	791	1841
5-c	Pavuvayal Arm	15.15-16.15	133	204	337

Source: Deduced from traffic & transportation study, 2019 by NATPAC

Table 11.8 Peak hour pedestrian lateral movements at Major locations

Sl. No.	Name of Location	Sum of Fatal & Grievous InjuryCrashes	Number of Fatalities	Accident Severity Index	Priority Order
1	Ayathil Junction	65	4	211	High-Risk
2	Prathibha Junction	58	4	190	High-Risk
3	Thattamala	46	4	154	High-Risk
4	Asramam	43	5	149	High-Risk
5	Kacheri Junction	38	7	142	High-Risk
6	Mullakal Krishna Temple, Kureepuzha	35	9	141	High-Risk
7	Kavanad	37	5	131	High-Risk
8	Moonamkutti	36	3	120	High-Risk
9	Kilikollur Junction	34	4	118	High-Risk
10	Ramankulangara	33	4	115	High-Risk
11	ChemmanMukku	32	5	112	High-Risk
12	Railway Station Junction	32	2	104	Moderate-Risk
13	High School Junction	32	1	100	Moderate-Risk
14	Kallumthazham Junction	29	3	99	Moderate-Risk
15	Sakthikulangara Junction	25	6	99	Moderate-Risk
16	Thevally	26	5	98	Moderate-Risk
17	Polayathode Junction	27	4	97	Moderate-Risk
18	Mevaram Bypass Junction	28	3	96	Moderate-Risk

Source: Deduced from traffic & transportation study, 2019 by NATPAC

Table 11.9 Location of accident spots Kollam Town

11.1.13 Accidents

Every year KLMC witnesses numerous accidents. After detailed study major accident-prone locations within the corporation wereprioritised based on accident severity index and given in table 11.9. Ayathil junction in NH bypass has a high accident severity index followed by Prathibha junction in NH 744. Total 11 locations are prioritised under high risk condition (figure 11.10)and 7 locations under moderate risk.

11.1.14 Inter City Travel Characteristics

Intercity travel patterns of passenger and commercial traffic were assessed from the Origin Destination survey(O-D survey) conducted at the cordon points on the major roads of KLMC. Roadside interview method was adopted for this and it involves collection of travel



Figure 11.10 Prioritised accident black spot locations in KLMC area

particulars of sample vehicles on a normal working day. Five locations were identified for conducting O-D survey and the details are given in Table 11.10 and Table 11.11 and map showing the location of cordon points is given in Figure 11.11.

The maximum daily traffic volume of 59, 548 PCU was observed at Mevaram on NH 66 on Thiruvananthapuram side. This includes 28,694 PCU of inbound traffic with 11% of LCV and 30,854 PCU of outbound traffic with 18% of MAT Vehicles.

Towards Alappuzha side of NH 66, Sakthikulangara has second maximum daily traffic of 45,445 PCU withinbound of 22020 PCU and outbound of 23425 PCU. NH 744 on Chandanathope side has a daily traffic of 37,885 PCU with in bound of 18,905 PCU and outbound of 18,980 PCU.

Sl. No	Name of Road Section	Name of Location
OC- 1	NH-66-NeendakarapalamSide	Sakthikulangara
OC- 2	NH-66-Thiruvananthapuram Side	Mevaram
OC- 3	NH 183-Kundara side	Pavuvayal
OC- 4	NH 744-Kottarakara Side	Chandanathope
OC- 5	Ayoor Road	Decent Mukku

Table 10.10: Locations Identified for Conducting O-D Survey in KLMC area

Vehicle Type	Sakthikulangara			Mevaram			Pavuvayal			Chandanathope			Decent Mukku		
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
KSRTC	441	492	933	430	373	802	49	48	97	284	258	541	46	45	91
Private Bus	244	297	541	290	274	564	152	127	280	246	232	478	197	200	397
Educational/ Institutional Buses	45	48	93	52	75	127	36	36	72	61	30	91	45	16	61
Other	122	116	238	290	142	432	32	37	68	76	56	132	14	12	26
Minibus/ Tempo (Edct.)	25	63	88	66	121	187	131	2	133	27	88	116	65	52	117
Minibus/Tempo	131	144	275	208	104	312	34	7	41	54	427	481	51	66	117
Car	5308	6399	11707	9046	9750	18796	1415	1605	3020	5061	4384	9445	3176	2956	6133
Two Wheeler	11021	10818	21839	12649	13354	26002	6674	6409	13083	10577	10997	21574	8759	11560	20319
Auto Rickshaw	1374	1646	3020	2236	3223	5459	948	1166	2114	1786	1493	3279	1708	1906	3614
LCV	1097	1068	2165	702	1223	1925	68	220	288	525	548	1073	468	552	1020
Goods Auto	278	338	616	574	256	830	108	241	348	188	390	578	157	202	359
Trucks-2 Axles	688	683	1371	837	1038	1875	11	114	124	378	403	781	251	361	612
Trucks-3 Axles	338	163	501	187	127	314	0	5	5	80	72	152	44	39	83
MAV	115	166	281	183	93	276	8	1	9	37	77	114	5	5	9
Cycles	169	190	359	124	48	172	93	97	190	114	113	227	120	163	283
JCB, Road Roller	9	7	16	7	3	10	2	3	5	4	1	5	0	0	0
Total Traffic	21405	22638	44043	27879	30202	58081	9761	10117	19878	19499	19568	39067	15108	18134	33242
Total PCU	22020	23425	45445	28694	30854	59548	9481	10215	19696	18905	19098	38002	15563	18193	33756

Source: Deduced from traffic & transportation study, 2019 by NATPAC

Table 11.11 Distribution of inbound and outbound traffic at outer cordon points survey



Figure 11.11 Map showing the location of cordon points in KLMC area

Total daily traffic of 33,756 PCU was found at Decentmukku on Ayoor road which include inbound traffic of 15,563 PCU and outbound traffic of 18,193 PCU. Among the five outer cordon points Pavuvayal has low daily traffic of 19,696 PCU which was contributed by 9481 PCU of inbound and 10,215 PCU of outbound traffic.

In order to conduct a detailed analysis of O-D Survey the entire planning area is divided into 21 traffic zones and the outside area of the planning area is divided into 4 zones as shown in figure 11.12. Various aspects of the survey are analysed as shown below.

The inter-city passenger transport is mainly through roads. An analysis of the O-D survey data collected from outer cordon survey locations revealed that about 1,63,378 inter-city vehicle trips were performed in the study region on a reference day. The total trip consists of 96,198 two wheelers (59 %), followed by car trips 44,403 (27%) and 15,999 auto rickshaw trips (10 %). The trip share for bus is only 5474 (3%) and for mini bus is further low as 1,305 (1%). Figure.11.13 gives the modal split of intercity passenger vehicle traffic in Kollam

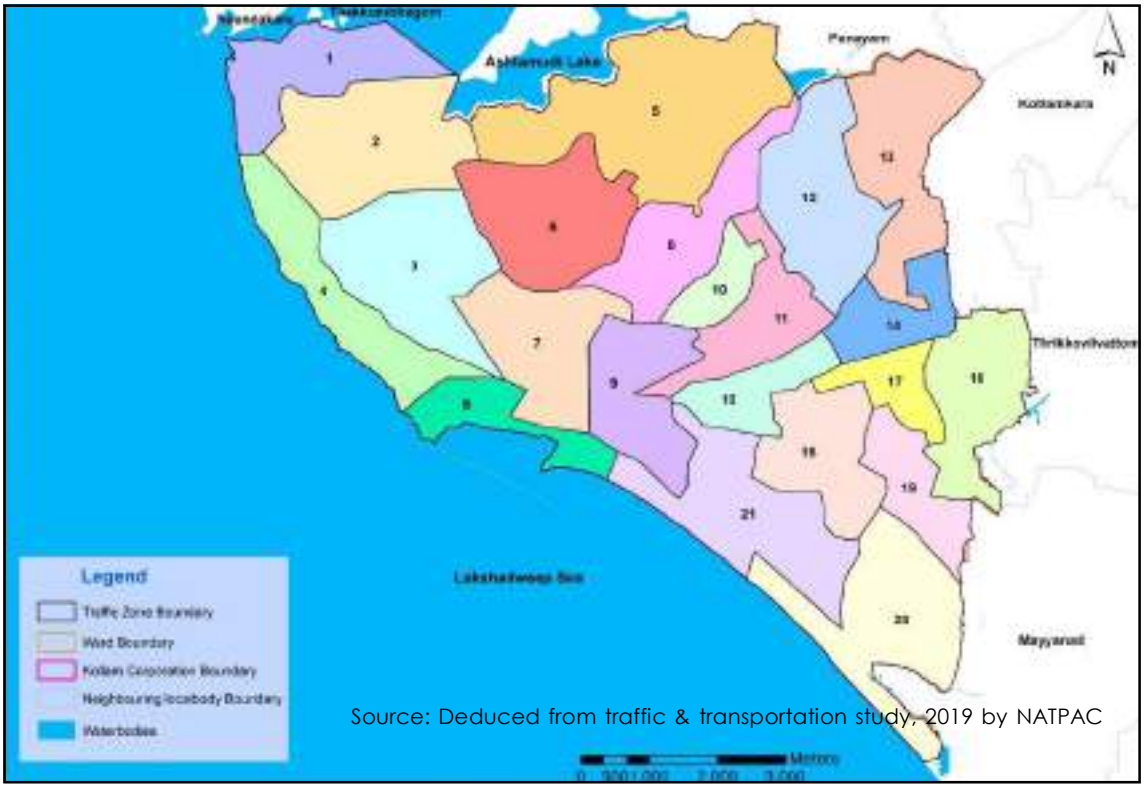


Figure 11.12 Inter-city travel characteristics- Traffic zones in KLMC area
Passenger vehicular trips

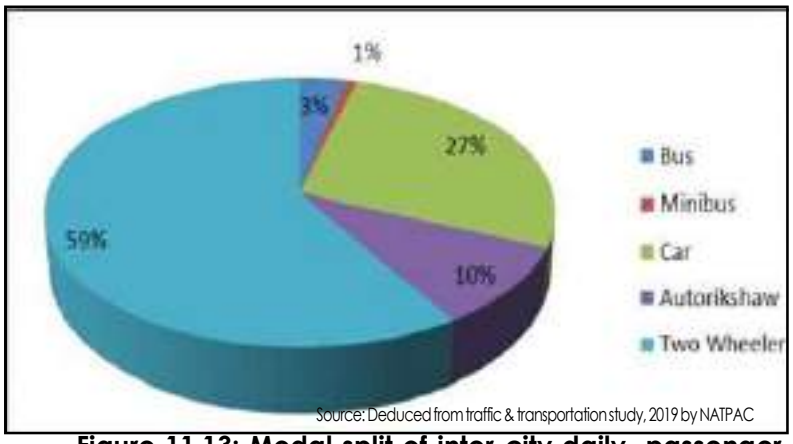


Figure 11.13: Modal split of inter-city daily passenger vehicle traffic in KLMC area

intercity passenger trips is tabulated in table11.12 and the desire lines are shown in figure 11.14.

Purpose of tripIn KLMC, about 48% of intercity passenger trips are performed for work purposes.

Pattern of passenger trips

The O-D pattern of inter-city passenger traffic revealed that out of 5,04,048 passenger trips, internal - external trips were 2,29,837 which constitutes 46 per cent of total trips. Similar pattern was observed in external - internal trips, forming 43 per cent of the total trips. External-external trips to the tune of 35,977 were performed through the study region which accounted for about 7 per cent of the total trips. Pattern of

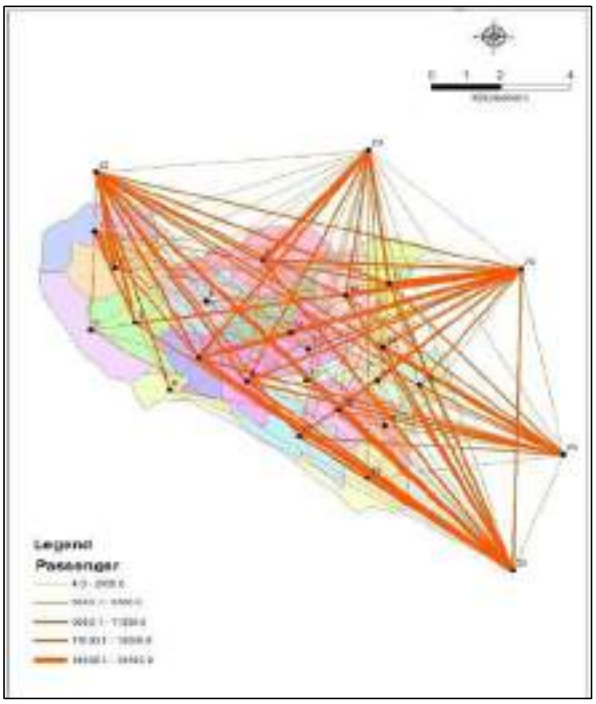


Figure 11.14: Desire lines showing pattern of passenger trips

Sl. No	Mode	Internal - Internal	Internal - External	External - Internal	External - External	Total	Total vehicle trips (%)
1	Bus	9026	109,849	104,896	6,136	229,906	46%
2	Minibus	531	4563	4076	4050	13,220	3%
3	Car	2082	41,123	40,539	14,379	98,123	19%
4	Auto rickshaw	5619	58,917	57,044	8526	130,106	26%
5	Two Wheeler	1784	15,386	12,638	2,885	32,693	6%
Total passenger trips		**19041**	**229837**	**219192**	**35977**	**504048**	**100%**
In percentage		**4%**	**46%**	**43%**	**7%**	**100%**	

Source: Deduced from traffic & transportation study, 2019 by NATPAC

Table 11.12: Modal split of inter-city daily passenger trips inKLMC area

Nearly 22% of the total trips were performed for other trips such as banking, visits to offices and ATMs etc. Passenger trips for medical and social trips are about 7%. Education and Shopping contributes 6 % of total trips. Least value of the 4% trip is formed for recreation. Figure11.15 represents distribution of intercity passenger trips for different purposes

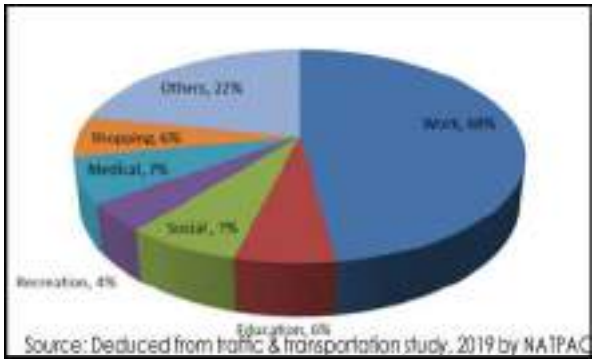


Figure 11.15: Inter -City Passenger Trips for Different Purpose

Occupation of passengers

The occupational characteristics of passengers were ascertained from the O-D survey. It could be seen that persons working in the private sector constitute the major segment (25%) followed by casuallabourers (18%). 17% are business persons and 12% are in government service. Other occupations such as NRI contribute 8% of total share and professionals and students contribute 5 % each. Retired employees' share is 4 %. Unemployed and house makers each contribute 3% of total share. Distribution of intercity daily passenger trips according occupation of trip maker is given in figure11.16.

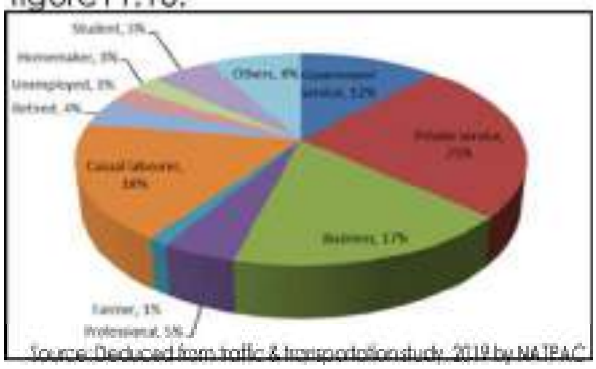


Figure 11.16: Distribution of Inter-City Passenger Trips According to Occupational Status

11.1.15 Intercity Goods Transportation

Intercity goods transportation was analysedby conducting classified volume counts and road side interview of goods vehicles at outer cordon points. From the analysis it is found that an estimated inter–city goods vehicle trips of 14064 were performed in the KLMC area. Table 11.13 gives the modal split of intercity goods vehicular traffic in the planning area.

Pattern of goods traffic

The O-D pattern of inter-city goods traffic revealed that about 45,718 tons of goods were transported through the town on a reference day. Trucks carried the maximum goods (52%), followed by LCV carrying 28% of goods and the remaining 21% by MAT and Goods Auto. Figure 11.17 showing

Sl. No.	Mode	Internal - Internal	Internal - External	External - Internal	External - External	Total	Total vehicle trips (%)
1	MAT	45	151	157	279	632	4%
2	Truck	250	1782	1891	1247	5171	37%
3	LCV	414	2393	1890	1088	5785	41%
4	Goods Auto	189	992	958	337	2476	18%
Total Vehicles		**898**	**5319**	**4897**	**2951**	**14064**	**100%**
In percentage		**6%**	**38%**	**35%**	**21%**	**100%**	

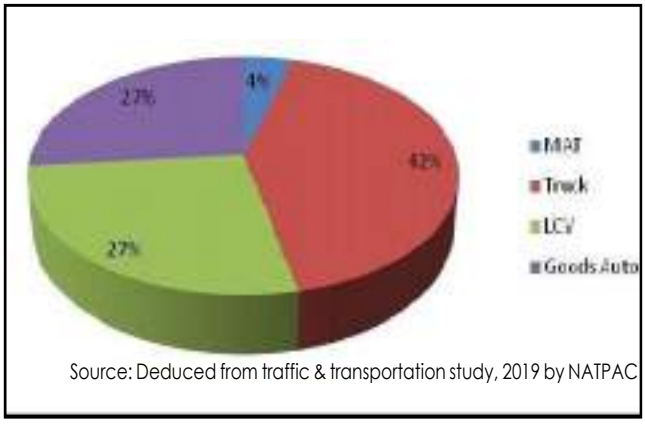
Source: Deduced from traffic & transportation study, 2019 by NATPAC

Table 11.13: Modal split of Inter-city goods vehicular traffic in KLMCarea

the intercity goods pattern (in tons) in KLMC.

Composition of goods traffic

Out of the Goods transported in KLMC, nearly 33% was agricultural products, followed by 32% of construction materials. Remaining goods composition was 18 % of industrial goods, 8% of miscellaneous items, 7% of petroleum products and 2% percent of food grains. Commodity wise distribution of goods traffic is presented in figure11.18 given below.

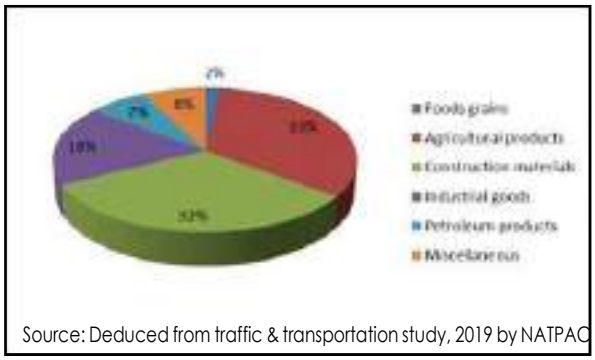


Source: Deduced from traffic & transportation study, 2019 by NATPAC

Figure 11.17 Modal split of intercity goods pattern (in tons) in KLMC area

11.1.16 Traffic Projection

The fundamental aim of urban transportation planning is to formulate a long-term transportation plan to cater to the needs of the community



Source: Deduced from traffic & transportation study, 2019 by NATPAC

Figure 11.18: Modal split of intercity goods pattern (in tons) in KKLMC area

in future. Thus, it becomes necessary to forecast the future travel demand for the horizon year. Traffic projections help in evaluating the shortfall in the road network and accordingly augment the facilities and plan the road network such as road widening,

developing new roads, for missing links, bypass roads etc.

Methods of traffic projection

Various methods of traffic projection employed in the transport planning include;

- Growth factor method
- Regression analysis method based on economic indicators like population, per-capita vehicle ownership, income growth, growth rate in industrial sector and land use pattern
- Interpolation method based on past trend in traffic growth rates.
- In the case of KLMC, traffic projections were carried out according to the growth rates worked out on the following basis:
- Rates arrived based on studies conducted by NATPAC in different towns of similar size in Kerala in the past.
- Growth rate of vehicle population in Kollam District over the years.

The growth rates estimated as per the above basis are given in table11.14.

On the basis of a critical evaluation of the above growth rates and also factors such as moderation in traffic growth over the years due to development of Information Technology in the transportation sector, the following growth rates on table11.15 were adopted for Kollam Corporation for different categories of roads.

11.1.17 Major Issues in Transportation Sector

The major issues in transportation sector identified from analysis are:

- Narrow roads in central part of the city
- High traffic volume and low capacity of roads
- Unorganised on-street parking in

Methods	Annual growth rate (%)
Studies conducted by NATPAC in similar towns in Kerala in the past (traffic growth)	3 to 6
Growth rate of motor vehicles registration in Kollam district during 2010-2019	10.58

Table 11.14: Growth rates estimated for trafficprojection

Hierarchy of road	Annual traffic growth rate (%)	
	Up to 2030	Beyond 2040
Primary roads	5	4
Secondary roads	4	3
Tertiary roads	4	3
Local roads	3	2

Table 11.15: Growth rate adopted for Horizon years

the absence of parking lots
- Encroachment of right of way
- Uncontrolled pedestrian traffic
- Underutilization of foot over-bridges already completed
- Delay due to level crossings in CBD area
- Location of intercity – Bus stand attracts more trafficto the city
- centre thereby creating traffic congestion.
- Unorganised goods traffic through trucks and their loading/unloading problems within the Central area
- Absence of NMT facilities and full-fledged public transportation system.

11.2 RAILWAYS

Kollam junction is an important Railway Station in the Rail Map of the state. The rail transport system in the city is administered by the Southern Railway zone of the Indian Railways. Kollam is the terminal junction of Kollam-Punalur-Shenkottai Broad Gauge line. The Trivandrum-Ernakulam (via Kottayam and Alappuzha) line passes through Kollam. Kilikolloor, Chandnathope and Eravipuram are the minor railway stations in the planning area. Kollam being an important railway station, daily trains from Thiruvananthapuram to Bangalore, Mumbai, Delhi and Chennai etc. have their stops at Kollam. Although road transport dominates the transportation scenario in the city, people depend on railways for their long distance at low cost transport needs. Rail network map of Kollam District is shown in figure 11.19.From the figure it can be observed that the railway line divide the CBD area into different segments causing development constraints to the city centre.

A total of 142 trains are running through Kollam Junction railway station and are operating 565 services in a week. Train operation through Kollam junction railway station is summarised and shown in Table 11.16 Number of passengers travelling with unreserved tickets in Kollam is 7,26,692 and the Passenger reservation system is 19,492 during the month of February 2020. Thus, number of passengers from Kollamrailway station in a day will be around 25,730. However this data is not reflecting the normal travel demand through rail as during Corona time work at home for the employees and social distancing and lock down affected the travel demand



Figure 11.19: Rail network map of Kollam District

	Kollam-Thiruvananthapuram		Kollam-Alappuzha/Kottayam		Kollam- Punalur	
Class of train	No. of Trains	No. of Services in a Week	No. of Trains	No. of Services in a Week	No. of Trains	No. of Services in a Week
Superfast	23	49	23	49		
Mail /Exp	29	133	30	134	2	14
Holiday spl	1	1	2	2	1	1
Rajdhani	1	3	1	3		
Passenger	4	28	5	35	7	49
MEMU	1	6	4	24		
Garibrath	2	5	2	5		
Janshatabdi	2	12	2	12		
Total	**63**	**237**	**69**	**264**	**10**	**64**

Source: Deduced from traffic & transportation study, 2019 by NATPAC

Table 11.16: Summary of train operation through Kollam railway station

considerably. As the origin- destination pair of season tickets of passengers are not available, the number of passengers carried by Kollam Railway station per day can be estimated to be 52,000.

11.2.1 Railway Crossings

Two railway lines viz. Ernakulam-Kanyakumari line and Shenkottai - Kollam line pass through city limits. There are about 15 railway crossings in Corporation limit and is given in Table 10.17 out of whichfour of them are in the central part of the district.

Maximum Train Vehicle Unit (TVU i.e. product of average number of vehicles and trains passing a crossing) of 2,34,640 is observed at Kavalapura Railway cross in Pallimukku-Eravipuram road. The Peak hour volume on this link is observed as 2267 PCU.

11.2.2 Alignment of Semi High Speed Proposed Silver Line

While analysing the alignment of the proposed semi high speed rail (Silver line) available from the website of Silver line project, the Kollam station is located outside the corporation limit (figure 11.20) even though the planning area acts as the district centre.

11.2.3 Issues

Due to the peculiar alignment, Thiruvananthapuram-Ernakulam line creates traffic problems due to the large number of railway crossings in the planning area. As the railway goods yard is also located in the citycentre it increases traffic congestion in the core area.

- Block signalling system is followed there by causing excessive delay.
- Capacity of railway station building

Sl No	Name of the Level Cross	Railway Chainage	TVU	Date	Observed Peak Hour Traffic
1	Koottikkada	162/0-1	1,53,300	18-11-2016	823
2	Puthenchantha	160/7-8	78,960	18-11-2016	414
3	Kavalpura	159/8-9	2,34,640	02-11-2016	2227
4	Madannada-Bharanikavu	158/8-9	95,340	02-11-2016	466
5	Polayathodu	157/9-158/0	1,69,925	17-04-2019	883
6	Kappalandimukku	157/4-5	89,010	07-03-2019	282
7	College Jn	157/2-3	1,04,363	07-02-2019	327
8	YMCAChinnakada	155/8-9	2,44,650	26-10-2016	896
9	Palkulangara	151/7-8	12,054	09-01-2019	99
10	Kallumthazham	151/3-4	1,23,431	08-01-2019	425
11	Old Bus stand Karicode	755/2-3	87,766	27-01-2019	546
12	Chandanathope	754/2-3	1,33,308	28-01-2019	679
13	Kandachira, -Chathinamkulam	148/3-4	32,424	13-03-2019	90
14	Cheppethadam	149/7-8	59,989	20-03-2019	151
15	Gurumandiram	150/0-1	11,921	30-01-2019	39

Source: Deduced from traffic & transportation study, 2019 by NATPAC

Table 11.17: Railway crossing in KLMC limit



Figure 11.20 Location of Kollam station in proposed silver line alignment

has already exceeded. Hence railway station is over crowded at peak hours and many of the facilities required for passengers are absent.

- The land available to the railway is kept underutilised in many places like the one which is available near the traffic island at Chinnakada and is damaging the city aesthetics.
- Adequate basic facilities such as toilets and drinking water are not provided on all platforms. Other facilities such as rest rooms, waiting areas are not maintained properly.
- In the case of other railway stations, absence of basic facilities and parking space are the main problems.

11.3 INLAND WATER TRANSPORT

Kollam city is well-connected through waterways with other parts of Kerala. The Inland Waterway Authority of India (IWAI) has declared Kollam-Kottapuram stretch of West Coast Canal as National Waterway No III (NWIII).

Kollam districthas a fairly good network of waterways. The State Water Transport Department and District Toursim Promotion Council (DTPC) operates boat services to West Kallada, Munroe Island and Alappuzha. Double decker luxury boats run between Kollam and Alleppey daily. Luxury boats, operated by Government and private owners,

operate from the main boat jetty near KSRTC bus stand during the tourist season. Journey through waterways facilitate to visit scenic tourist destinations in and around planning area. DTPC is operating house boats for tourists in Ashtamudi lake.

SWTD operates four schedules daily as follows:

1. Boat 1 – Starts from Kollam Terminal at 10:00 AM and operates to SambraniKodi. This boat does the ferry services in Sambranikodi – Kavanad - Vallakadavu stretch and returns to Kollam the next day at 8:40 AM. Normally the boat will have 25 passengers from Kollam to Sambranikodi and Sambranikodi-Kollam service will have 15 passengers to Kavanad and 10 passengers to Kollam.
2. Boat-2 operates from Kollam terminal and provides services in Kollam- Sambranikodi and Kollam-Plavarakadavu sector. Schedule and details of passengers carried in this boat is furnished in table 11.18.
3. Boat-3 operates from Kollam to Alappuzha at 10:30 AM via Chavara, Amruthapuri. This trip is mainly aimed at tourists and number of passengers vary across the year depending upon the tourist season. During tourist season number of passengers will be in the range 25-30.

Name of the kadath	No of boats	Trip per day	People travelled per day
Mangad - Kaavanath	1	50	60 -70
Uliyakovil - Kadavur, Muttathumoola	1	10 to 12	10 to 12
Ashramam - Olayil kadave	1	10 to 15	40
Ashramam - Venkekara	2	20 to 25	60
Thevally-Panamukham	1	50+	100
Kaniyamkadave-St.George island-Thomas island	4 boat day 1 boat night	25-30 per boat	250
Mukkade - Fathima island	2 boat day 1 boat night	50+ per boat	300
Mukkade -Thomas island	1	10 to 15	50
Kinatinmootil- Kanakan thuruth	2 boat day 1 boat night	50+ per boat	250
Kallumpuram	2 boat day 1 boat night	50+ per boat	250
Kachikadave	1	40 to 50	150

Source: Deduced from traffic & transportation study, 2019 by NATPAC

Table 11.18: Details of ferry (Kadath) operation in Kollam

4. Boat-4 starts from Kollam terminal at 12:30 PM and operates to Pezhumthuruthu near Mundrothuruthu. Then local service will be carried out in Pezhumthuruthu, Koivila and Ashtamudi and return to Kollam Terminal the nextday at 9:00 AM only. Number of passengers in Pezhumthuruthu-Kollam sector at 9:00 AM is approximately 20 and Kollam- Pezhumthuruthu sector at 12:30 PM is nearly 15.

Once Kollam thodu in the planning area is developed, along with Paravur Kayal-Maniyamkulamthodu-Nadayara Kayal route, this will become an important IWT route for tourists, connecting Paravurkayal, Ashtamudi and Varkala. The IWT in corporation has very good potential for development due to the presence of Kollam port. At present there is no connection between Kollam port and Kollam thodu, if connected we can reduce the traffic load of the road network for goods transportation, thereby reducing conveyance cost.

11.3.1 Issues

The issues identified from the analysis of IWT are given below:

- Pollution and encroachment of waterways
- Under-utilisation of Inland waterways
- Lack of connection between Kollam Thodu and port
- Lack of integration with other modes of transportation.
- If the IWT is developed and properly linked with other modes of transport, this can act as a potential link in passenger and goods traffic.
- It also has got very good potential in promoting tourism development of the planning area.

Airways

The nearest airport is Trivandrum International airport at Thiruvananthapuram which is only about 70km from the planning area. Another nearest airport is Cochin International airport at Kochi which is about 180 km from the planning area. India's first seaplane service, promoted by Kerala Tourism Development Corporation was launched on 2 June 2013 in the backwaters of the Ashtamudi Lake using a six seater Cessna 206H amphibian aircraft. But unfortunately not a single trip has taken place due to opposition from the fishermen commodity as it affect their livelihood.

11.4 EVALUATION OF EXISTING CIRCULATION PLAN

1. Sanctioned master plan 2011

As per the sanctioned master plan, many roads were suggested for widening (table 11.19). However most of the proposals are not taken up for implementation so far except for the Kadappakada - Kappalandimukku and portion of NH bypass, Taluk office-Asramam link roads etc. Control on building lines was not effectively done due to the absence of effective checking while confusing buildings abuttingpublic road. Hence plots along the road sides have become heavily built up especially in the case of roads in the eastern portion of the planning area, Vadayattukotta road etc.

2. Integrated District Development Plan -Road network in planning area:

Portions of all existing national highways and proposed national highways in the regional road network pass through the planning area. The

Sl No	Name of Road	Proposed width (Meter)	Sl. No	Name of Road	Proposed width (Meter)
1	Kollam (Chinnakkada) - Ernakulam	25	32	Palathara - Thattamala H.S. junction	15
2	Kollam (Railway Station) Thiruvananthapuram		33	Mulluvila - Pazhayattinkuzhy	
3	Kollam-Shencotta		34	Karicode - Mangalathu junction via Kuttichira	
4	Kollam (Chinnakkada)- Kannanalloor	20	35	Anchukallumoodu - Kaval junction	
5	High School junction-Thrikkadavoor		36	Ottakkalmoodu -Sarpakuzhy	
6	Chinnakkada- Beach (Beach road)		37	Vishnathukavu - Cheemaramukku	
7	Taluk office- Kadappakkada via Asramam		38	Ramankulangara - Konnelmukku	
8	Kadappakkada - Kappalandimukku		39	Elangathu junction -Ozhukkuthodu	
9	S.N. College- Karbala		40	Konnelmukku - Kolleri junction	
10	D.S.P Office- Mulankadakom via Thekkecutchery	18	41	Gopikkada -Cheppallimukku	
11	Pallimukku - Eravipuram		42	Vallikkeezhu - Vasupilla junction	
12	Thekkecutchery - Civil Station		43	Maniyathu junction - Sooranthodu	
13	D.S.P Office - Kochuplamoodu		44	Karangiya junction - Mariyalayam	
14	Eravipuram - Sakthikulangara (Coastal Road)	15	45	S.N. College - Mundakkal	12
15	Ayathil - Pallimukku via Mulluvila		46	Congress Bhavan - Mundakkal	
16	Polayathodu - Kachikadavu		47	Kochuplamoodu -Thumbara	
17	Altharamoodu - Thankasseri		48	Thumbara -Amruthakulam	
18	Mundalumoodu - Thirumullavaram		49	Pulimoodu - Puthennada via Chayakkada junction	
19	Ramankulangara - Maruthady		50	Amruthakulam - Veliyilkulangara	
20	Chinnakkada - Sharma junction via Asramam		51	Madannada - Attukalkadavu	
21	Kallumthazham - Kuttichira		52	Bharanikavu - Pazhayattinkuzhy via Chakirikada	
22	Mangadu - Erappanchal		53	Veliyilkulangara - Alumoodu	
23	Vallikkeezhu - Mammoottillkadavu		54	Puthennada- Eravipuram Vadakkumbhagom	
24	Ramankulangara - Erattukadavu		55	Sivaji junction - Mangad via Uliyakovil	
25	Mamoottilkadavu - Kangathumukku		56	Nair's Hospital - Uliyakovil	
26	Chinnakkada -Thekkecutchery (Vadayattucotta road)		57	Randamkutty - Uliyakovil	
27	Chinnakkada- Maharani Market (payikkada road)		58	Randamkutty- Kadappal	
28	High School junction - Kotamukku		59	Ammannada - Polayathodu	
29	Taluk Office - Sudhi theatre (Dist. Hospital road)		60	Kallumthazham - Puliyathumukku	
30	Ammannada - Medayilmukku via N.S. Junction		61	Puliyathumukku - Pallimukku	
31	Madannada - Kalavedi junction				

Table 11.19 List of Roads in planning area proposed for road widening as per sanctioned Master Plan (2011)

road width suggested in the master plan differs from that in the district plan in the case of Coastal road and this needs to be rectified.

From the evaluation of the circulation plans, it is clear that the development proposals need to be reworked based on the regional level vision and the policies of State and Central government in such a way that the plan acts as a clear guideline for the various implementation agencies and to solve the issues identified in the transportation sector.

3.Greater Kollam Development Plan

Greater Kollam Development Plan published in 2012 follows the road proposals included in the sanctioned Master Plan. Since the development concept of transportation sector of KLMC area is not changed even after elapsing more than 3 decades.

11.5 INFERENCE

All the modes of transport in the planning area needs to be integrated with a view of decongesting the existing roads for boosting up the development of area and to provide easy movement to the public. Issues identified from the analysis of different modes of transport needs to be addressed and suitable proposals and time bound action plan for implementing various proposals are to be decided while finalising the Master Plan. Parking and pedestrian issues, absence of NMT and full-fledged public transportation system are to be separately tackled for better transportation in the planning area.

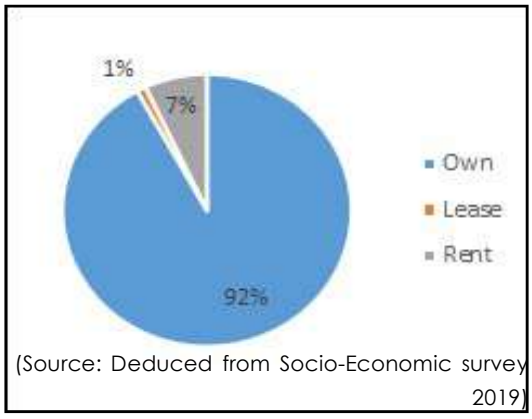
CHAPTER - 12
HOUSING

The basic needs of humans are food water and shelter. Protection of life and personal properties are also considered as fundamental rights as per Article 21 of the Constitution of India which encompasses right to shelter. Good housing shows the welfare of the community and vice versa. People belonging to economically weaker sections found it very difficult to build houses by themselves. Increased population and nuclear family formation require large number of housing stock. This chapter deals with an overview of housing sector in the planning area, substandard housing areas and the issues in housing.

12.1 AN OVERVIEW OF HOUSING SECTOR

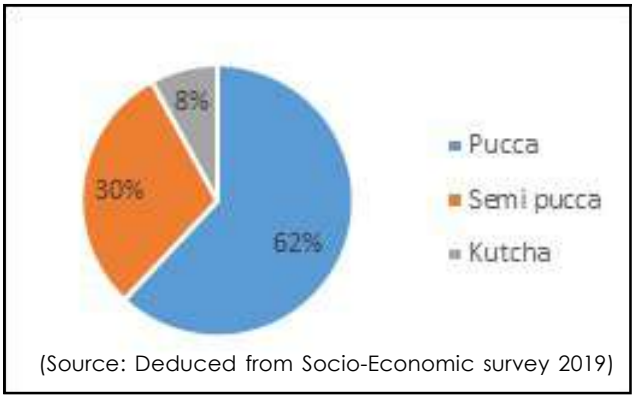
Total number of households in KLMC is 93,993 which constitutes 14.04% of total number of households of the district. The ownership and typology of houses in KLMC area are shown in figure12.1and 12.2 respectively.

From the above data, it can be seen that 92% of households live in owned houses and remaining 8% live either in lease or rental houses. The typology of houses in KLMC area shows that pucca houses constitute 62% of total houses whereas 30% of houses are semi pucca and kutcha houses are only 8%. People living in kutcha houses encounter major issues which include



(Source: Deduced from Socio-Economic survey 2019)

Figure 12.1 Details of ownership of house



(Source: Deduced from Socio-Economic survey 2019)

Figure 12.2 Typology of houses

deterioration of health, rain, life threatening incidences like snake bite, stray dog bite etc. Since they are not provided with adequate shelter, immediate priority is to build houses for them.

The ward-wise distribution of typology of houses is shown in figure 12.3. From the figure it is observed that the kutcha and semi-pucca houses are more concentrated along the coastal belt where fishermen reside and in Thrikkadavoor zone.

12.2 SUBSTANDARD HOUSING AREAS

Within the KLMC area 113 housing colonies with lack of basic amenities are identified from survey report of the SC/ST Department of KLMC. Total number of households in these colonies are 1839. The spatial distribution of these colonies are shown in figure12.4. Maximum number of colonies are concentrated in ward 2 and 7.

12.3 CATEGORIZATION OF SUBSTANDARD HOUSING AREAS

Housing areas are categorized as substandard housing colonies based on lack of facilities like sanitation, drainage facility, and access to road and water supply, street light, density of population, SC/ST population and housing conditions as adopted in the



Figure 12.3 Ward-wise distribution of building typology

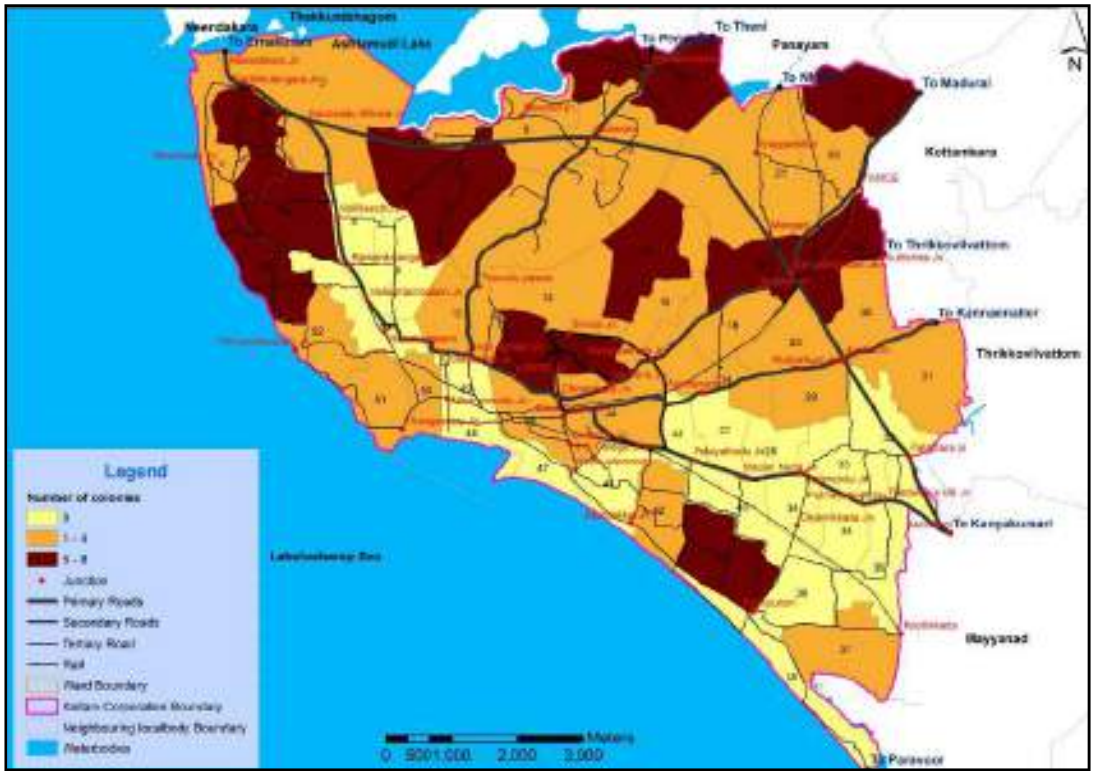


Fig.12.4 Ward-wise distribution of substandard housing colonies in KLMC area

study of Urban Slums in Kerala undertakes by Town and Country Planning Department in 1985. Weightage is assigned to the absence of each amenity and other parameters as given in table 12.1. Colonies obtaining combined weightage of 40 or above in table 12.2 are considered as slums. The data analyzed is presented below:

Grade-D (Slums)

In KLMC area combined weightage above 40 is categorized as Grade D or slum. However in KLMC area there are no colonies categorized as slum.

Grade- C

Colonies with combined weightage varying from 30-39 are categorized as grade C. Following 7 colonies are identified as grade C.

1. Elamapallur Kaavu Colony
2. Thekkechira Colony
3. Muttara Pulikkal Colony
4. Pullikkada Cheri
5. Polayathodu Municipal Colony
6. Moonu Theginthara Colony
7. Vadakkechira Colony

Grade - B

Colonies with weightage varying from 20-29 are categorized under grade B. The colonies identified grade B are

Sl. no	Indicators of Backwardness	Minimum Standard/Benchmark	Maximum weightage when amenities are completely absent
A	Adequate basic amenities :		
1	Inadequacy of latrine facilities	One seated latrine for every 20 person	10
2	Inadequacy of drainage system and exit for sullage and rain water		10
3	Inadequacy of access road		8
4	Inadequacy of access water supply		5
5	Inadequacy of street light		5
B	Density of population	100p/acre(250/Hectare) gets 5 point and one point each every additional 20 persons	20 max weightage when density reaches 400 person/acre
C	SC/ST Population	30% above	10
D	Structural conditions of dwelling unit	50%or more huts or dilapidated structures	5

Table 12.1 Indicators of backwardness, their minimum standards and Weightage Assigned

listed (table 12.3). In KLMC area most of the colonies (85 nos) are under Grade B category.

Grade- A

Grade A colonies are colonies having basic amenities with required minimum standards. 21 colonies are identified as Grade A colonies. The details of Grade A colonies are listed in table 12.4.

As per the previous survey carried out for the planning area in 2010 as listed in table 12.5, the total number of colonies was 108 against 113 colonies found in 2019.

From the table it is observed that even though the substandard housing colonies have increased slightly over a period of time, the

Ward Number	Sl No.	Name of Colonies	Sanitation	Drainage	Access to road	Water supply	Street light	Density	SC population	Housing condition	Combined Weightage
1	1	Chadayanthara Colony	2.5	1	1	1	0	5	10	1	21.5
2	2	MalayilJayanthi Colony	1	1	0	1	0	5	10	1	19
	3	Aayithari Colony	2	2	2	1	0	5	10	1	23
	4	VazhikkavuJayanthi Colony	2	3	0	2	0	5	10	2	24
	5	MuttaraPulikkal Colony	2.5	5	4	2	0	6	10	3	32.5
	6	ThottinteKizhakkathil Colony	1	2	6	1	0	5	10	1	26
	7	AshramathinuKizhakku Colony	1	0	0	1	0	5	10	2	19
	8	Elamapallur Kaavu Colony	1	5	8	2	0	5	10	2	33
	9	MoonuTheginthara Colony	1	3	6	2	0	5	10	3	30
3	10	Vilayilkaavu Colony	2.5	5	4	1	0	5	10	1	28.5
4	11	Vaiyakkal Colony	1	1	3	1	0	5	10	1	22
7	12	Vadakkechira Colony	2	5	5	2	0	5	10	1	30
	13	Thekkechira Colony	3	5	5	2	0	5	10	3	33
	14	AakkalThekkethil Colony	2	3	3	2	0	5	10	2	27
	15	MeleMangadu Colony	2	1	2	1	0	5	10	1	22
	16	IdathundilJayanthi Colony	1	1	1	1	0	5	10	1	20
	17	VilayilKizhakkathilJayanthiColony	1	2	2	1	0	5	10	1	22
	18	AaluvilaThekkethil Colony	1	2	2	2	0	5	10	1	23
	19	NeelaVeetil Colony	1	1	1	1	0	5	10	1	20
8	20	Thoppuvila Colony	1	1	1	1	0	5	10	1	20
	21	ElaPattikajaathiSanketham	1	1	1	2	0	5	10	2	22
9	22	VettuvilaJayanthi Colony	2	2	2	2	0	5	10	2	25
	23	ThamarappillyVadakkathil Colony	2	1	1	1	0	5	10	1	21
	24	Thadathil Colony	2	1	1	1	0	5	10	2	22
	25	Aanikkulam Colony	1	1	2	2	0	5	10	2	23
	26	KaavinteThekkathil Colony	2	2	2	2	0	5	10	2	25
	27	Thattuvila Colony	2	3	3	1	0	5	10	1	25
10	28	Kunnadi Colony	1	1	1	1	0	5	10	2	21
	29	Sivodayam Colony	2	2	1	1	0	5	10	2	23

11	30	Thekkedath Colony	2	1	1	1	0	5	10	2	22
	31	Chirakkara Colony	2	1	1	1	0	5	10	2	22
12	32	Pound Purayidam Colony	2	1	1	1	0	5	5	1	16
	33	PuthuvalPurayidam Colony	1	1	1	1	0	5	5	2	16
13	34	Pullikkada Cheri	2.5	1	1	1	0	15	10	2	32.5
	35	Kotheswaram Cheri	2.5	1	1	1	0	5	1	2	13.5
	36	Mission Compound	1	1	1	1	0	5	10	1	20
	37	PolachiraVannan Colony	1	1	1	1	0	5	10	1	20
	38	Municipal Colony	1	1	1	1	0	5	10	1	20
14	39	Kambikkakam Colony	1	1	1	1	0	5	10	1	20
15	40	CheeramcheriAalayila Colony	1	1	1	1	0	5	10	1	20
	41	M.G Colony	1	1	1	1	0	5	10	1	20
	42	Sreerangath Municipal Colony	1	1	1	1	0	5	10	1	20
	43	Njaaravila Colony	1	1	1	1	0	5	10	2	21
	44	Keleth Colony	1	1	1	1	0	5	10	1	20
	45	Kuruveli Colony	1	1	1	1	0	5	10	1	20
16	46	KadavanaThekkethil Colony	1	1	1	1	0	5	10	1	20
	47	Kaippullithodiyil Colony	1	1	1	1	0	5	10	1	20
17	48	Municipal Colony	1	1	1	1	0	7	10	1	22
18	49	Cherikshetram	1	1	1	1	0	5	10	1	20
	50	Cheprapillathodi	1	1	1	2	0	5	10	2	22
19	51	Vettolil Colony	1	1	2	1	0	5	5	1	16
	52	Mannamala Colony	1	1	1	1	0	5	10	1	20
	53	Mankuzhi Colony	1	1	1	1	0	5	5	1	15
	54	Mantrikappuram	1	1	1	1	0	5	1	1	11
	55	KaippalliThodiyil	1	1	1	1	0	5	10	1	20
20	56	Punnamoodu Colony	1	1	1	2	0	5	10	1	21
	57	Chamundi Colony	2	2	2	1	0	5	10	1	23
21	58	Arunootimangalam Settlement Colony	1	1	1	1	0	5	10	1	20
	59	Koippullithodi Colony	1	1	1	1	0	5	10	1	20
	60	Keeraluvila Colony	1	1	1	1	0	5	10	1	20
22	61	Ambedkar Colony	1	1	1	1	0	5	5	1	15
	62	Pattanichira Colony	1	1	1	1	0	5	10	1	20
	63	KP Nagar Colony	1	1	1	1	0	5	10	1	20
	64	Kaanjithara Colony	1	1	2	1	0	5	10	1	21
	65	Kuzhikkara Colony	1	1	1	1	0	5	10	1	20

23	66	Pallivila Colony	1	1	2	1	0	5	10	1	21
	67	Pulari Colony	1	1	1	1	0	8	10	1	23
24	68	KuttichiraLakshamveedu Colony	1	1	1	1	0	5	10	1	20
	69	PunnatheVayal	1	3	2	1	0	5	10	1	23
	70	Parankimaamvila	1	1	1	1	0	5	10	1	20
	71	Vayalirakkath	1	1	1	1	0	5	10	1	20
	72	Vellachaluvila	1	2	2	1	0	5	10	1	22
25	73	Vyalil Cheri	1	2	2	1	0	5	10	1	22
	74	Kuzhikkandam Cheri	1	2	1	1	0	7	10	1	23
	75	Valiyamaadam	1	2	2	1	0	9	10	2	27
26	76	Priyadarshini Colony	1	1	1	1	0	6	10	1	21
29	77	Kailatra Colony	1	2	1	1	0	5	10	1	21
30	78	Varuvilachira	2	2	1	1	0	5	10	1	22
	79	MangalathLakshamveedu	1	1	1	1	0	5	5	1	15
	80	Chembranteyath Colony	1	1	1	1	0	5	5	1	15
	81	Aatturpana Colony	1	1	1	1	0	5	5	1	15
31	82	Jayanthi Colony	1	1	1	1	0	5	10	1	20
	83	PandranduVeedu Colony	1	1	1	1	0	5	10	1	20
	84	KailatraPerumkulam Colony	1	1	1	1	0	5	5	1	15
37	85	Akkolil Cheri Colony	1	1	1	1	0	8	10	1	23
	86	Idakkunnam	1	1	1	1	0	9	10	1	24
	87	Nilamelthodi	1	1	1	1	0	5	10	1	20
	88	Uzvaamvathukkal	1	1	1	1	0	5	5	1	15
	89	KunnathukkavuLakshamveedu	1	1	1	1	0	5	10	1	20
	90	KattippanaVayal	2	2	2	1	0	8	10	1	26
	91	Melachaluvila Colony	1	1	2	1	0	5	10	2	22
42	92	Amruthukulam Municipal Colony	1	1	1	1	0	5	2	1	12
	93	Kalarikkavu Municipal Colony	1	1	1	1	0	5	5	1	15
44	94	DippoPurayidam	1	1	1	1	0	12	10	1	27
	95	KuravanPalam Cheri	1	1	1	1	0	5	10	1	20
	96	Polayathodu Municipal Colony	1	1	1	1	0	17	10	1	32
46	97	ThodiyilPulthottam Colony	1	1	1	1	0	5	1	1	11
50	98	Vadakkethodi Colony	1	1	1	1	0	5	1	1	11
	99	Thamarathottam Colony	1	1	1	1	0	5	1	1	11

51	100	CheemaraVayal Colony	1	1	1	1	0	5	1	1	11
52	101	Aandurthara Colony	2	2	2	2	0	5	10	2	25
54	102	TharamelVadakethil Colony	2	5	5	1	0	5	10	1	29
	103	Jayanthiyil Colony	1	1	1	1	0	5	10	1	20
	104	Payithala Colony	1	1	1	2	0	5	10	1	21
	105	PadiyanathKizhakkathil	2	1	1	1	0	5	10	2	22
	106	Kumbalath Colony	1	1	1	2	0	5	10	1	21
55	107	CherannasseriLakshamveedu Colony	2	1	2	2	0	5	10	1	23
	108	Ariyantikathjayanthi Colony	2	1	2	1	0	5	10	1	22
	109	Kunnumpuram Colony	1	1	2	1	0	5	10	1	21
	110	MulankaraLakshamveedu	2	1	1	1	0	5	10	1	21
	111	Paruvakkalthara Colony	2	1	1	1	0	5	10	1	21
	112	Idakkattu Colony	2	2	1	2	0	8	10	1	26
	113	Pulliyil Colony	1	1	1	1	0	5	1	1	11

Source: SC/ST Department, Kollam

Table 12.2 Combined weightage of colonies in KLMC area

1.	Tharamelvadakethil colony	2.	Punnamoodu colony
3.	Vilayilkaavu colony	4.	Kaanjithara colony
5.	Aakkalthekkethil colony	6.	Pallivila colony
7.	Valiyamaadam	8.	Priyadarshini colony
9.	Dippopurayidam	10.	Kailatra colony
11.	Thottintekizhakkathil colony	12.	Payithala colony
13.	Kattippanavayal	14.	Kumbalath colony
15.	Idakkattu colony	16.	Kunnumpuram colony
17.	Vettuvilajayanthi colony	18.	Mulankaralakshamveedu
19.	Kaavintethekkathil colony	20.	Paruvakkalthara colony
21.	Thattuvila colony	22.	Idathundiljayanthi colony
23.	Aandurthara colony	24.	Neelaveetil colony
25.	Vazhikkavujayanthi colony	26.	Thoppuvila colony
27.	Idakkunnam	28.	Mission compound
29.	Aayithari colony	30.	Polachiravannan colony
31.	Aaluvilathekkethil colony	32.	Municipal colony

33.	Aanikkulam colony	34.	Kambikkakam colony
35.	Sivodayam colony	36.	Cheeramcheriaalayila colony
37.	Chamundi colony	38.	M.g colony
39.	Pulari colony	40.	Sreerangath municipal colony
41.	Punnathevayal	42.	Keleth colony
43.	Kuzhikkandamcheri	44.	Kuruveli colony
45.	Akkolilcheri colony	46	Kadavanathekkethil colony
47	Cherannasserilakshamveedu colony	48.	Kaippullithodiyil colony
49.	Vaiyakkal colony	50.	Cherikshetram
51.	Melemangadu colony	52.	Mannamala colony
53.	Vilayilkizhakkathiljayanthi colony	54.	Kaippallithodiyil
55.	Elapattikajaathisanketham	56.	Arunootimangalam settlement colony
57.	Thadathil colony	58.	Koippullithodi colony
59.	Thekkedath colony	60.	Keeraluvila colony
61.	Chirakkara colony	62.	Pattanichira colony
63.	Municipal colony	64.	Kpnagar colony
65.	Cheprapillathodi	66.	Kuzhikkara colony
67.	Vellachaluvila	68.	Kuttichiralakshamveedu colony
69.	Vyalilcheri	70.	Parankimaamvila
71.	Varuvilachira	72.	Vayalirakkath
73.	Melachaluvila colony	74.	Jayanthi colony
75.	Padiyanathkizhakkathil	76.	Pandranduveedu colony
77.	Ariyantikathjayanthi colony	78.	Nilamelthodi
79.	Chadayanthara colony	80.	Kunnathukkavulakshamveedu
81.	Thamarappillyvadakkathil colony	82.	Kuravanpalamcheri
83.	Kunnadi colony	84	Jayanthiyil colony
85.	Njaaravila colony		

Table 12.3 List of colonies under Grade B in KLMC

1. MalayilJayanthi Colony	2. Uzvaamvathukkal
3. AshramathinuKizhakku Colony	4. Kalarikkavu Municipal Colony
5. Pound Purayidam Colony	6. Kotheswaram Cheri
7. PuthuvalPurayidam Colony	8. Amruthukulam Municipal Colony
9. Vettolil Colony	9. Mantrikappuram
10. Mankuzhi Colony	11. ThodiyilPulthottam Colony
12. Ambedkar Colony	13. VadakkethodiColony
14. MangalathLakshamveedu	15. Thamarathottam Colony
16. Chembranteyath Colony	17. CheemaraVayal Colony
18. Aatturpana Colony	19. Pulliyil Colony
20.KailatraPerumkulam Colony	

Table 12.4 List of colonies under category Grade A in KLMC area

Grade of Colonies	Grade A	Grade B	Grade C	Grade D	Total
Number of Colonies in 2010	27	45	32	4	**108**
In 2019	21	85	7	0	**113**

Table 12.5 Colonies of KLMC area for the year 2010 & 2019

facilities available in the substandard colony areas were increased considerably. The slums which were identified during previous surveys have upgraded to higher categories and most of the group C colonies were upgraded to group B colonies.

12.4 HOUSELESS POPULATION

In KLMC area around 3957 applications were received under LIFE mission which gives an indication to the houseless population. Houseless population includes those who don't have pucca houses also and the total number of people without houses can be assumed as 16817. Considering the household size as 4.1people per household ward wise distribution of houseless households is shown in figure 12.5. From the figure, it is seen that more houseless families are concentrated in Kaikulangara,

Kureeppuzha West, Anchalumoodu, Chathinamkulam divisions of KLMC.

12.5 HOUSING ISSUES IN COASTAL AREA

During monsoon season large extent of coastal stretches of KLMC area is affected by sea erosion resulting irreparable damage to many houses. Lack of break waters and protection works are the main reasons for the destruction of houses. Hence rehabilitation of people from sea erosion prone areas or implementation of protection measures to prevent sea erosion need to be done for avoiding frequent destruction of houses in coastal areas.



Dilapidated house due to sea erosion at Eravipuram coastal area 2019-20

12.6 DEVELOPMENT ISSUES

- In most of substandard housing colonies lack of adequate supply of potable water and absence of well-maintained sanitation facilities and drainage are the main issues.

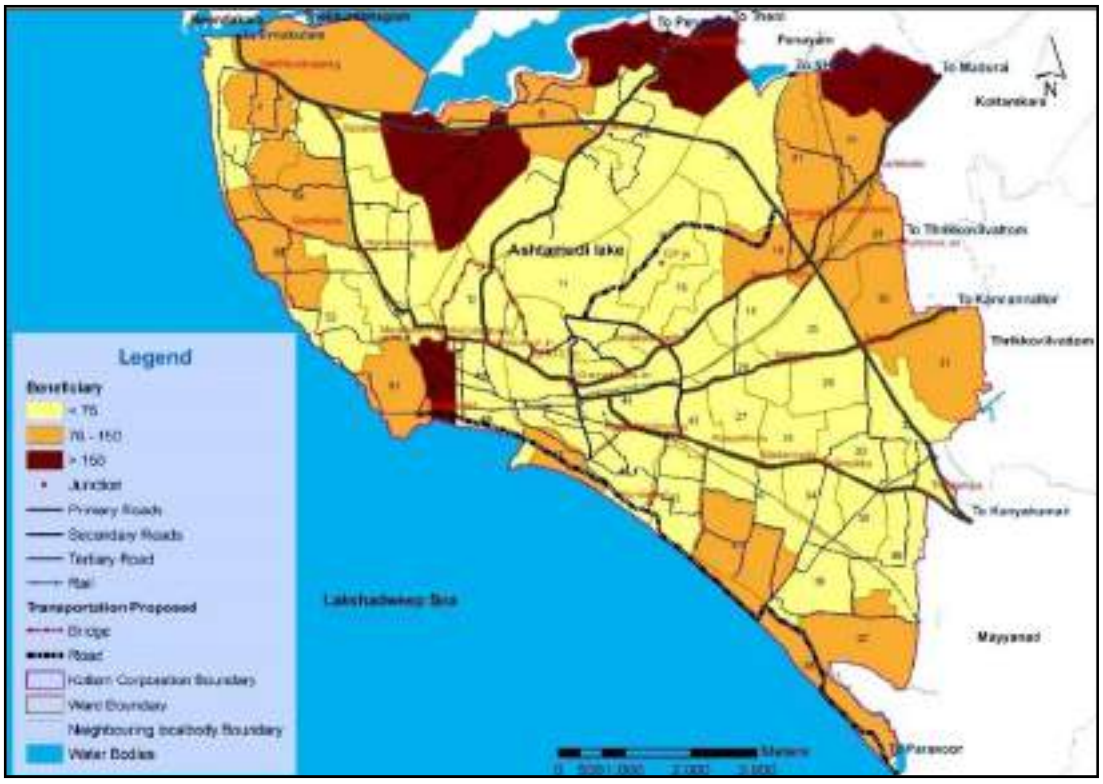


Figure 12.5 Spatial distribution of Ward - wise houseless population details

- Though houses are available to the families in substandard housing colonies, most of them are not fully finished. Hence during rainy seasons leakage issues are associated with these houses. Also water logging due to absence of drainage leads to water borne diseases to many dwellers in these colonies. Grade C & Grade B category areas need to be considered as priority housing areas for providing infrastructural facilities.
- Frequent destruction of houses along coastal area due to lack of protective measures to prevent sea erosion and absence of schemes for the rehabilitation.

CHAPTER - 13
EDUCATION

As knowledge economy is sidelining many other economic sectors role of education to complete the socialization process need to be revisited as foundation of knowledge economy. Education in its general sense is a form of learning in which knowledge, skills and habits of a group of people are transferred from one general and to the next. This chapter details the level of educational institutions and the issues associated with education sector in Kollam Municipal Corporation area.

13.1. LEVEL OF EDUCATION

According to census 2011, the literacy rate of KLMC is 94.2%. Figure 13.1shows the literacy rate of KLMC in comparison with other AMRUT cities. It is seen that KLMC has the lowest literacy rate of 94.2%, which has considerable difference with Kochi having high literacy rate of 97.36%. Comparing with other ULBs in Kollam District, (figure 13.2) KLMC's literacy rate is found at par with Karunagappilly Municipality (94.56%) and Punalur Municipality (94.31%) whereas Paravur Municipality shows lowest literacy rate of 92.51% and highest value is in Kottarakkara Municipality(96.37%). However on analyzing the past data (figure 13.3) a considerable increase in literacy rate is seen during 2001 to 2011.

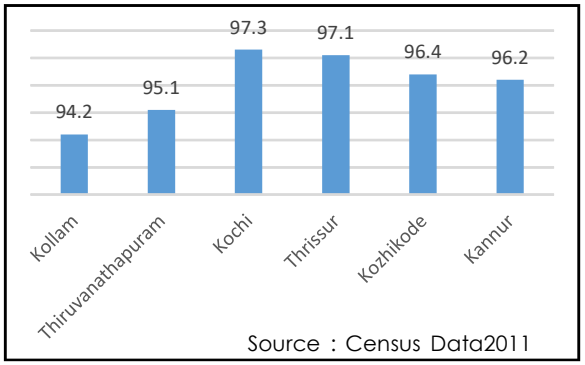


Figure 13.1 Comparison of literacy rate of KLMC with other AMRUT cities

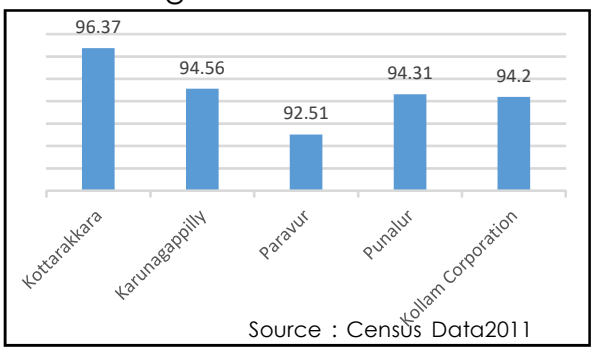


Figure 13.2 Comparison of literacy rate with adjacent local bodies in Kollam District

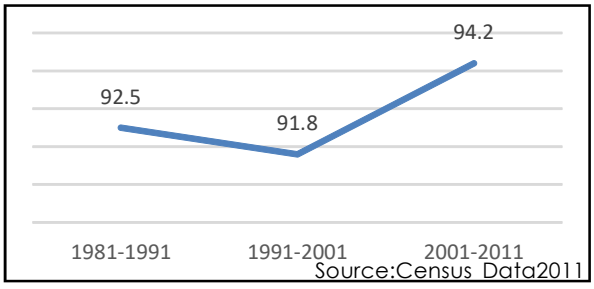
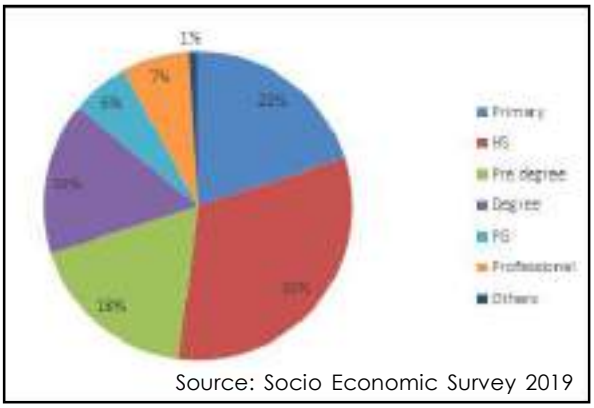


Figure 13.3 Decadal variation in literacy rate of KLMC area

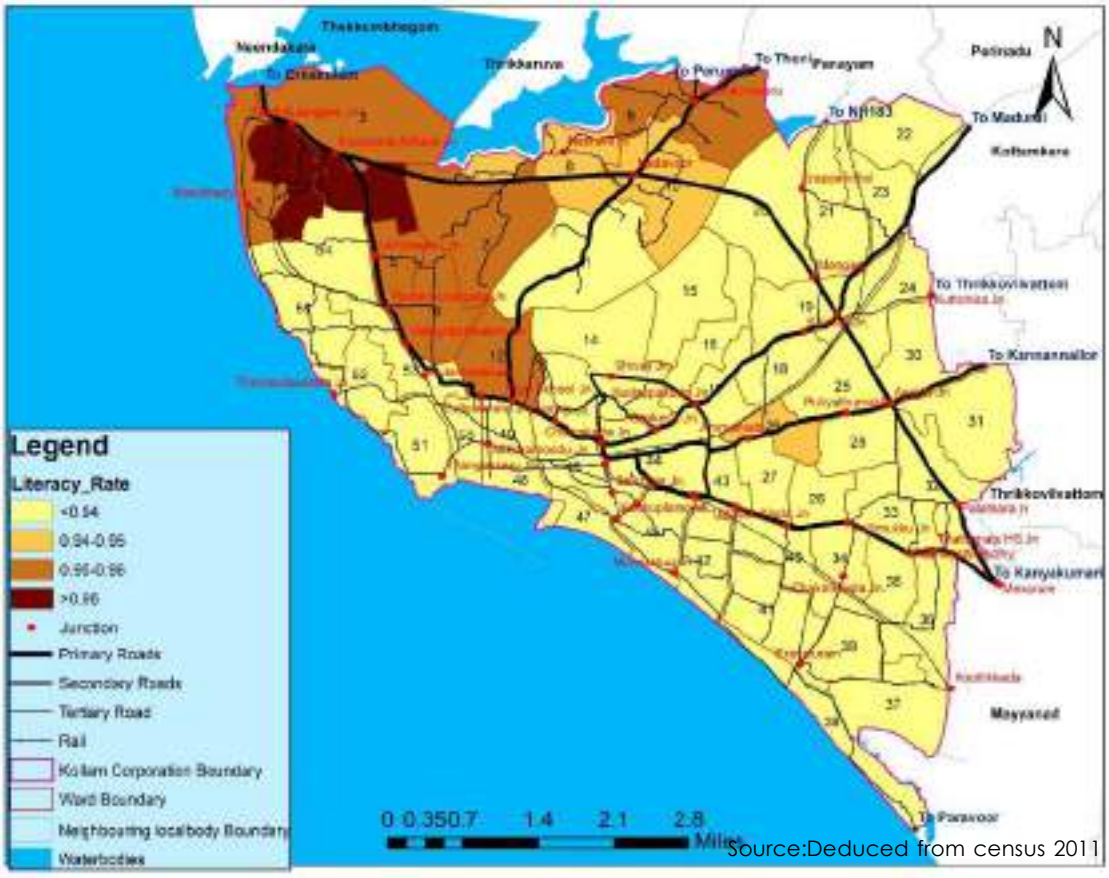
Now the literacy rate of planning area is slightly higher than that of the Kollam District (94.09%), and State (94%).The ward wise spatial distribution of literacy rate is shown in figure 13.4. From the figure it is found that literacy rate in all the wards is above 94%. This indicates that within the planning area even in fishing villages most of the people are literate.

The level of education in KLMC area is shown in figure 13.5. From the figure it is clear that about 32% people in the KLMC area got education up to high school level and 20% of people have attained primary education. About 18% of people got pre-degree and 16% go up to degree level. Only 7% of people are professional graduates and 6% achieved post-graduation.



Source: Socio Economic Survey 2019

Figure 13.5 Level of education in KLMC area



Source:Deduced from census 2011

Figure 13.4 Ward-wise spatial distribution of level of literacy in KLMC area

13.2. EDUCATIONAL INSTITUTIONS

The number of educational institutions in the KLMC area is depicted on table 13.1. From primary school level to higher secondary 148 educational institutions are functioning in KLMC area.The total number of colleges in KLMC area is 28 numbers in which 25 numbers are professional colleges and 3 belongs to arts and science. Other educational facilities such as 15 educational institutions conducting adult education programmes and only 1 school for differently abled students.

Primary School

There are 78 nos. of primary schools in KLMC area, the details of schools with number of students and teachers under each category is shown in table 13.2. From the table it is observed that about 48% of primary schools (37nos) are in aided, 28% (22nos) in government and 24% (19nos) are in private sector. Hence 76% of schools in KLMC area are directly or indirectly under control of Government of Kerala which shows the commitment of government in education sector in the planning area. 52% of students are studying in unaided schools. This may be due to miss concept in previous years that the standard of learning in government schools and the facilities in government and aided schools are

Schools				Higher Educational Facilities			Other Educational Facilities	
Primary	HS	HSS & VHSS	**Total**	Arts and Science	Professional	**Total**	Differently Abled School	Adult Education Programmes
78	37	33	148	3	25	28	1	15

Source:DEO Kollam

Table 13.1 Details of educational institutions in KLMC

Type Of Schools	Government			Aided			Private		
	School (Nos)	Student (Nos)	Teacher (Nos)	School (Nos)	Student (Nos)	Teacher (Nos)	School (Nos)	Student (Nos)	Teacher (Nos)
Primary	22	4158	179	37	5638	272	19	10581	309
HS	12	6786	270	8	12195	400	17	11596	407
HSS& VHSE	13	2422	176	6	2023	102	14	2538	170
TOTAL	**47**	**13366**	**625**	**51**	**19876**	**774**	**50**	**24715**	**886**

Source:DEO Kollam

Table 13.2 Details of Schools and teachers in KLMC

inferior comparing to private schools. As per the Kerala Education Rules recommended teachers- student ratio up to 5th standard,6th to 8th standard, 9th & 10th standard and HSS are 1:30, 1:35, 1:45, 1:50 respectively. While analyzing the teacher-student ratio in education institutions in the planning area, it is found that except for private primary schools, the ratio is higher. In the case of private primary schools, the ratio is 1:34 which is slightly lower than that of the recommended value.

While comparing with previous data 2012 (GKDP report) number of primary schools in the planning area in the government and aided together has increased from 56 to 59 (5.35%). During the same period, number of unaided schools increased from 5 to 19 (280%). Also the number of students in government & aided schools has reduced from 11647 to 9796 (18.9%).

The spatial distribution of primary schools are depicted on figure 13.6. For analyzing whether the available schools are sufficient, 1km is considered as convenient distance for a child to reach school daily without any physical issues. The service areas considering a distance of 1 km from each school are



Figure 13.6 Location of Primary schools in KLMC area

plotted and shown in figure 13.7. From the figure it can be seen that the uncovered areas of primary school in KLMC are Mathilil ,Akkolil and Puthalathazham. For achieving better basic level of education equally in planning area additional primary schools are required in Mathilil, Akkolil and Puthalathazham.

High School

Out of 37 schools in KLMC area 46% (17nos) schools are in unaided sector, 32% (12nos) are under government sector and 22 % (8nos) are in aided sector. Number of high schools as per planning standard developed by the Town and Country Planning Department is 700 seats for a population of 13,000. Hence for a population of 387942 around 30 schools are necessary. The total number of seats available in all the 37 schools comes to 30,577 which is higher than the seats expected for a population of 387952 (20889). Hence, it can be concluded that sufficient number of high schools are available in the planning area. The spatial distribution of high schools are depicted in figure 13.8.

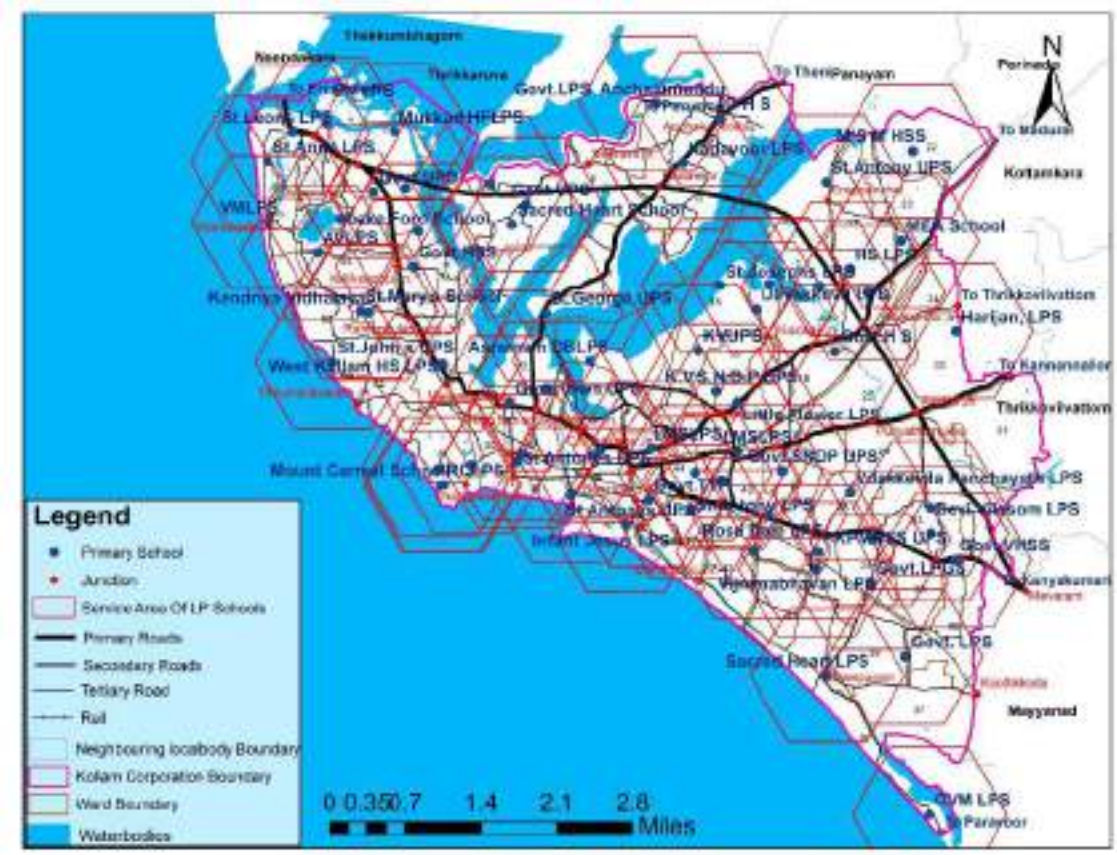


Figure 13.7 Service areas of primary schools in KLMC

While analysing high school in different institutions it is observed that 40% of students are studying in aided schools and 38% under unaided and 22% under government schools. The recommended teacher student ratio for high school is 1:45. In the case of planning area teacher- student ratio in all types of schools is high. Hence quality high school education can be possible in the planning area. Also more divisions if required can be started with available teacher strength in all types of schools in the planning area.

Higher Secondary Schools (HSS)& Vocational Higher Secondary Schools (VHSE)

Out of the total number of 33 HSS and VHSE schools in KLMC 43% (14nos) under unaided sector, 39% (13nos) are in government sector and 18% (6nos) are under aided sector. Total number of seats in both HSS and VHSE schools is 6983. As per planning standard total number of seats required for a population of 13000 is 400. Hence it can be concluded that sufficient number of HSS and VHSE are available in the



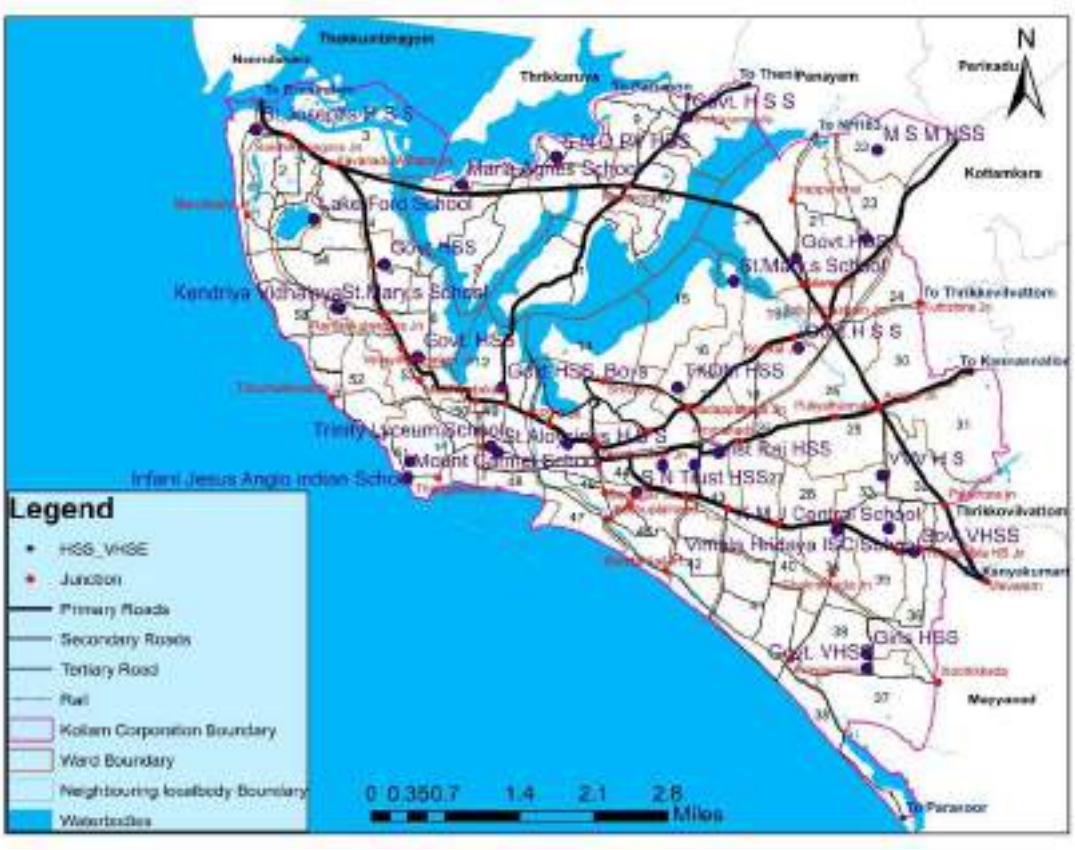
Figure 13.8 Location of High schools in the KLMC area

planning area. While analysing the number students in each category, it can be seen that maximum number (36%) of students are studying in unaided sector, 35% of students are studying in government schools and 29% in aided schools. The teacher student ratio is very high for government aided and unaided sectors. Hence in HSS and VHSE schools also enough number of teachers are available for ensuring quality education and also present teacher strength is found sufficient for accommodating more students in the HSS and VHSE schools in planning area. Spatial distribution of HSS & VHSE in KLMC area is shown in figure 13.9.

13.3 HIGHER EDUCATION FACILITIES

Arts and Science Colleges

There are 3 Arts and Science Colleges in KLMC area, of which the two colleges are aided and one college is self-financing. As per planning standards the requirement of Arts and Science College in KLMC is 1 for 80,000. As populationof KLMC is 387942 the number of Arts and Science colleges required is 4 nos. The


N
Legend
HSS_VHSE
Junction
Primary Roads
Secondary Roads
Tertiary Road
Rail
Kollam Corporation Boundary
Ward Boundary
Neighbouring localbody Boundary
Waterbodies
0 0.350.7 1.4 2.1 2.8
Miles
Govt. HSS
Govt. HSS, Boys
Govt. VHSS
Girls HSS
Govt. VHSS
Govt. HSS
Govt. HSS
Govt. H

newly started Sree Narayana Open University located in Kureepuzha can provide under graduate, post graduate and diploma programmes. Hence it can be assumed that if the University becomes fully operational, highereducation facility in the planning area is sufficient. The location of Arts and Science Colleges along with Sree Narayana Open University in KLMC area are shown in figure 13.10. In this map we can see that majority of colleges are located in the heart of the city.

Professional College

There are 25 professional colleges in the KLMC area including 3 Engineering colleges, 1 Law College, 3 B.Ed. colleges, 2 TTI and 1 Pharmacy college,4 Business Administration, 2 Architecture, 1 Computer Application,


SN College Kollam

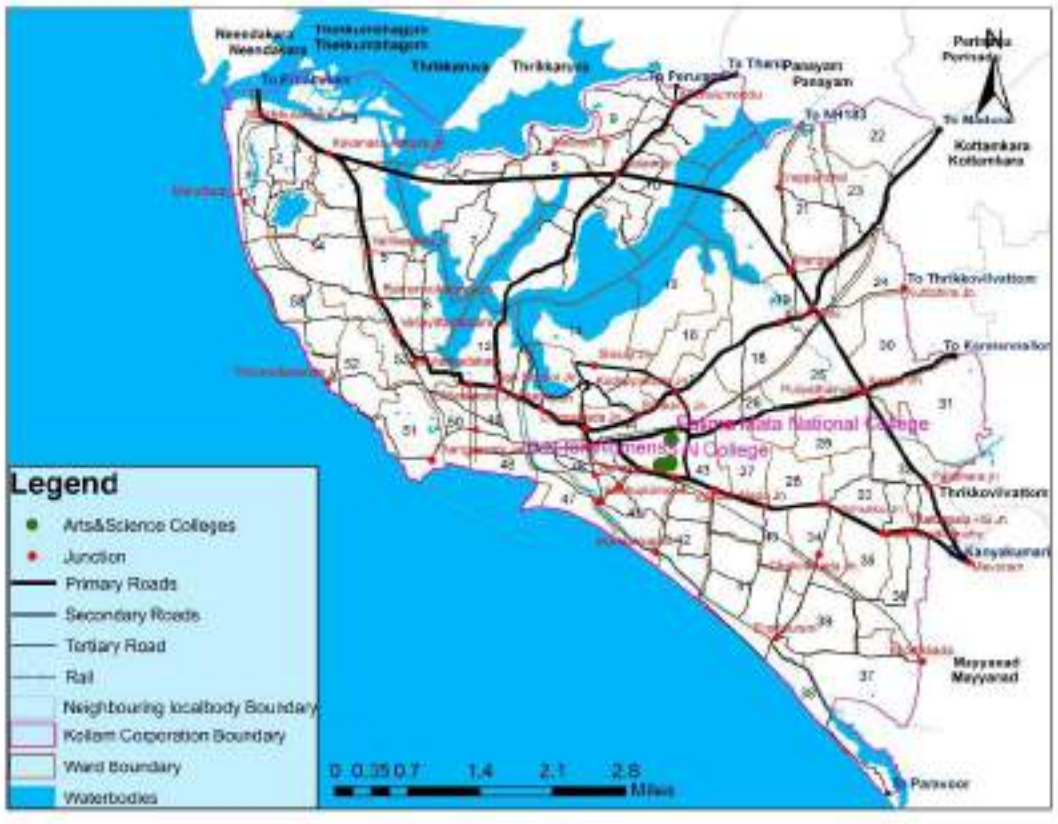


Figure 13.10 Location of Arts and Science Colleges in KLMC area

1 Fashion Technology,6 Nursing,1 ITI etc. As per planning standard one professional college is required for 2,50,000 population. Hence the number of professional colleges in the planning area is sufficient. However Medical College, and Polytechnic College are not present in the planning area, but they are available adjacent to the planning area. The spatial distribution of professional colleges are depicted in the figure 13.11. Inspite of large number of educational institutions including professional institutions available in the planning area, facilities for channelizing the potential of education towards economy generation is absent in the planning area.

Other Educational Institutions

Other education institution includes differently abled schools and


TKM College of engineering

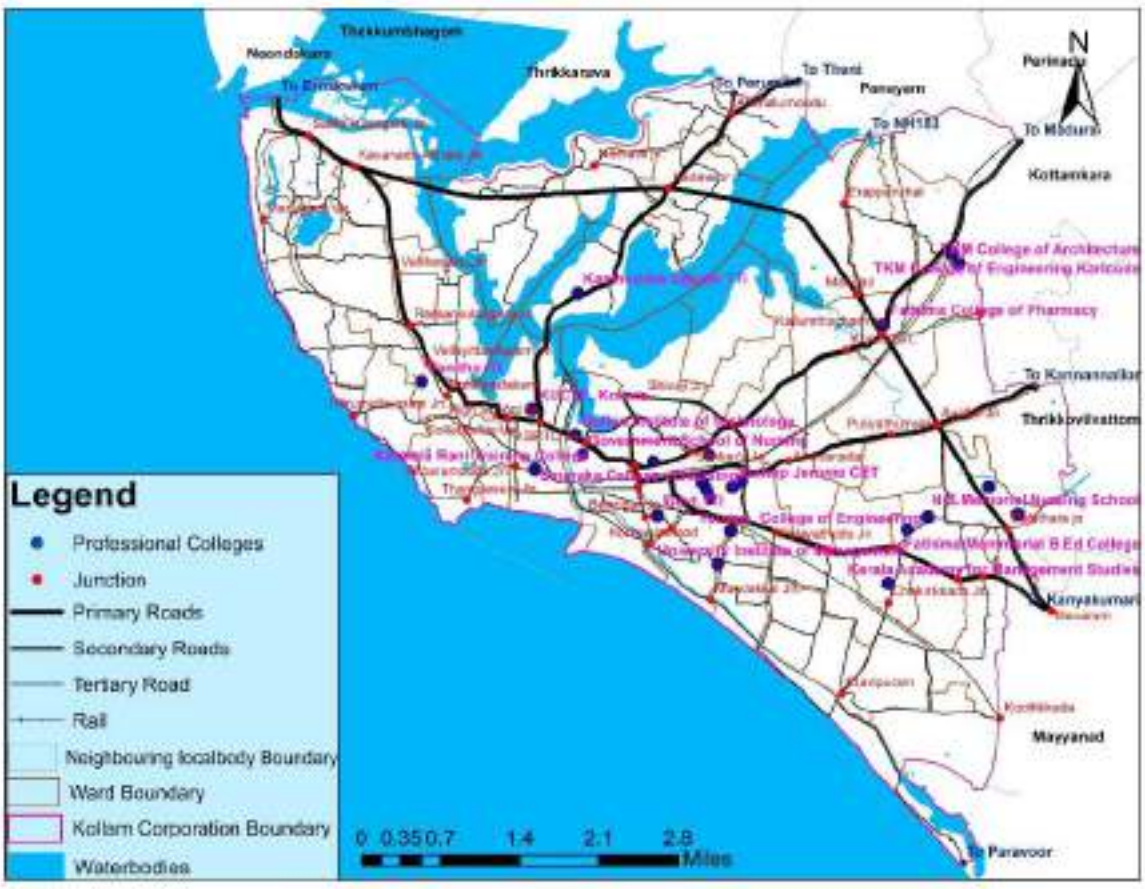


Figure 13.11 Location of Professional Colleges in KLMC Area

adult education programmes under various centers in KLMC area.

- Differently Abled Schools

There is one school under private ownership for differently abled children. There are 107 students in this school, details of the school are shown in table 13.3.

- Adult Education Programme

Adult education aims at extending educational options to those adults, who could not complete their education in due course of time and have crossed the age of formal education, but now for a need for learning of any type. KLMC has 15 centres for this programme. Details of this are shown in table 13.4. It is informed from the office of DEO Kollam that so far 127 persons have passed 4th equivalency exam from these institutions.

13.4 DEVELOPMENT ISSUE

After analysing the education sector, following issues are found necessary to be addressed while finalising the Master Plan.

- Uncovered service areas in primary school education sector and a low rate of literacy rate when compared with other AMRUT cities.
- Even though a sufficient number of educational institutions with teachers is available in the planning area except for some of the professional institutions, there is not much facility to convert education into knowledge economy within the planning area.
- Issues such as shortage of class rooms, lack of toilet facilities, drinking water facilities, dilapidated buildings, lack of public gathering places and play grounds were solved due to the intervention of government during the past 10 years. However lab with internet facilities are not available in 33 primary schools.

Sl. No	Name of the School	Details of Ownership	Location	No.of Students	No.of teachers	Specialised
1	VimalaHridaya Special School	Private	Pazhaya ttinkuzhi	107(Age limit from 4-18)	15	Specially abled

source:DEO Kollam

Table 13.3 School for differently abled

Sl.No	Name of the center	Courses	No. Students	No.of Teachers
1	VikasanaVidhyaKendram,Zonal office, Anchalumoodu	4 thEquivalancy Exam	41	12
2	C.E.C,Govt.TTI,Kollam			
3	C.E.C,Kalavedi,Mulankadakam			
4	AksharaC.E.C,Kavanadu			
5	Arya C.E.C,Maruthadi			
6	C.E.C Arunootimangalam			
	Vayanasala,Moonnamkutty			
7	C.E.C Kilikolloor,Kallumthazham			
8	C.E.C Pallithottam,			
	Donbosconagar,Kollam			
9	C.E.C Kaikkulangara,Vaddy,Kollam			
10	C.E.C Health centre,Polayathodu			
11	C.E.C Palkulangara,Kollam			
12	C.E.C Uliyacovil			
13	Govt.HSS Kollam	7 th ,10th,12th	114	
		Equivalancy Exam		
14	Govt.Highschool for Girls ,Kollam	8 th ,10th,12th		
		Equivalancy Exam		
15	Govt.HSSAnchalumoodu	9 th ,10th,12th		
		Equivalancy Exam		

Source:DEO Kollam

Table 13.4 Institutions conducting adult education programmes in KLMC area

CHAPTER -14
HEALTH

To improve the standards of living of human beings adequate health care facilities approachable to all, need to be ensured. Kerala is well known to developing as well as developed countries for its quality health care facilities and health indicator of people. KLMC being the number one ULB in the district. Higher order health care facilities are located here. At the same time so many issues due to lifestyle and pollution might have affected the health status of people. This chapter attempts to analyse the existing health status of people in KLMC using health indicators, health infrastructure disease patterns and development issues pertaining to the health sector.

14.1 HEALTH STATUS

A person is said to be healthy as per World Health Organization definition of health states "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". When it comes to society as a whole, health indicators such as life expectancy, Infant Mortality Rate (IMR), Maternal Mortality Ratio (MMR), Crude birth rate etc. decides the health status of the people. Health indicators are compiled at district level and hence local level data on health indicators are not available for analysis. Hence the health indicators available at the district level are compared with that of the State and are given in table 14.1. Health indicators except for IMR and MMR show that the health status of Kollam

Health Indicators	Kerala	Kollam District
	2018	2018
Life Expectancy	74.9	68.75
Infant Mortality Rate (1000 population)	5.69	1.53
Maternal Mortality Ratio (lakh live births)	13	21
Crude Birth Rate (1000 population)	14.10	10.78
Crude Death Rate (1000 population)	7.47	7.75
Total Fertility Rate	1.72	1.7

Source: Vital Statistics report 2018

Table 14.1 Health indicators at district level

District is more or less the same as that of the State.

The comparison of the IMR of Kollam with other districts as shown in figure 14.1, shows that the IMR is lowest for Kollam District.

14.2 HEALTH CARE INSTITUTIONS

There are mainly 3 systems of medicine followed in KLMC area namely Allopathy, Ayurveda and Homeopathy.

The total number of health care institutions in KLMC area is 59, out of these 27 hospitals are in Allopathic system of medicine, 12 are in Ayurveda system of medicine and 10 hospitals are in Homeopathy system of medicine. The list of health care institutions is given in table 14.2 .

While analysing the table, it is observed that private health care facilities in the planning area are found more than government institutions.

The planning standards as per the departmental guidelines are given in table14.3. As per the planning standards the medical facilities are in-adequate for PHC in KLMC area. 9 more PHC is to be constructed to satisfy the health facilities of KLMC area for the years 2021 to 2031 but in 2031-2041, 11 more PHC's are needed which is obtained by projecting the population for the upcoming years.

14.2.1 Allopathic Hospitals

In the Allopathic system of medicine, KLMC area has 6 hospitals under government sector and the

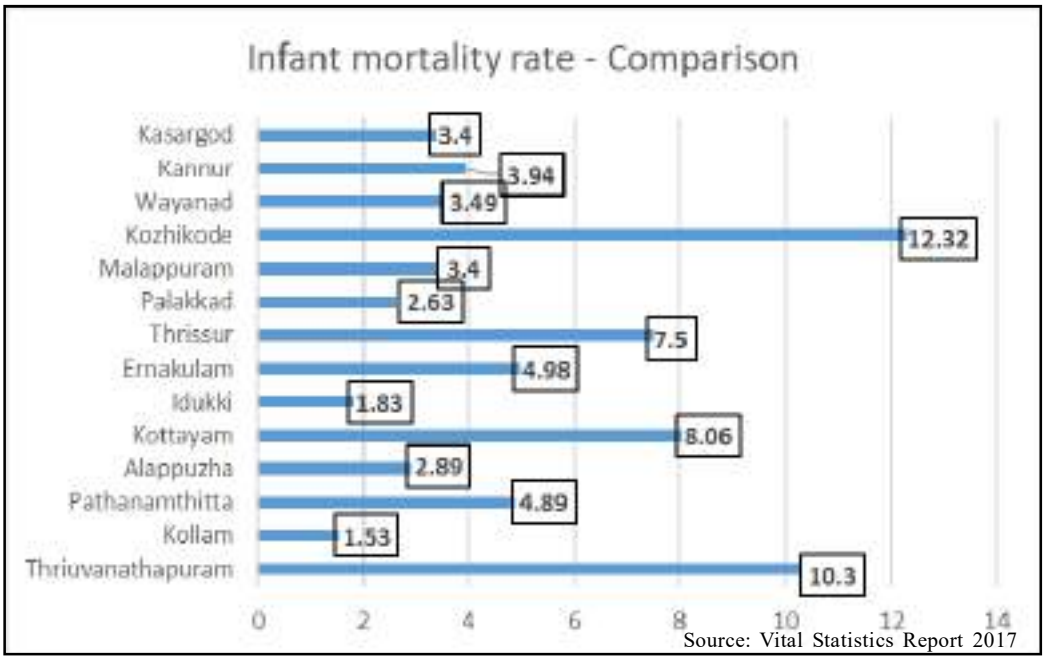


Figure 14.1 Infant Mortality Rate Comparison with other districts

Type of Hospital	Type of Ownership		Total Number
	Government	Private	
Allopathy Hospital	6	21	27
Ayurveda Hospital	6	6	12
Homeopathy Hospital	6	4	10
Urban Primary Health Centre (UPHC)	3	-	3
Primary Health Centre (PHC)	5	-	5
Community Health Centre (CHC)	2	-	2
Total	**28**	**31**	**59**

Source: DMO, Primary survey 2019

Table 14.2 List of Health care institutions in KLMC

Year		2019	2019	Required For Upcoming years		
Population		**Existing**	**Required**	**2021**	**2031**	**2041**
1. District Hospital (1 for 1 Lakh Population)	60 Beds for 1 Lakh Population	1 Hospital & 537 beds	3	3	3	4
2. TB Unit (1 for 5 Lakh Population)		1	0	0	0	0
3. PHC (1 PHC for a population of 20000 to 25000)	4 Beds per 1000 Population	8	17	9	11	12

Source: As per LDP-IDDP Planning Standards

Table 14.3 Planning standards as per the departmental guidelines

remaining 21 are in private sector. The details of government hospitals are given in table 14.4.

The total bed strength of Government hospitals are 1010 and 3067 patients are treated daily there. Lack of pre-operative, immediate and post-operative wards with monitor facilities, absence of adequate number of ventilators, pulse oximeter, inadequate number of operation tables are reported as major issues in Government hospitals.

District Hospital, Kollam

District hospital, Kollam has 537 beds and 1363 outpatients are treated daily there. The total number of doctors is 62, doctors in the district

Sl. No	Name of Hospital	Location	*Category	No.of Beds	No.of doctors	No of Nurses	No of Paramedical staff	Patients Treated (Avg. daily)
1	District Hospital Kollam	Near KSRTC stand	5	537	62	106	132	1363
2	Government Victoria Hospital, Kollam	Near KSRTC stand	4	273	32	55	68	479
3	TB Centre, Kollam	Chinnakkada	1	0	2	1	1	50
4	District Police Hospital	Reserve camp ,Kollam	1	0	1	1	1	35
5	ESIC Super Speciality Hospital	Asramam	6	200	65	178	178	1120
6	Railway Hospital	Karbala	1	-	1	1	-	20
	Total			**1010**	**163**	**342**	**380**	**3067**

Table 14.4 Govt. Allopathy Hospitals in KLMC area

Category - 1	**Clinics only OP**
Category - 2	**Hospitals with 24 hrs. service**
Category - 3	**Hospital with Single operation theatre (Specify no of operation theatres and category i.e. major/minor)**
Category - 4	**Hospitals with more than one OT**
Category - 5	**Hospitals with advanced diagnostic facilities like CT scan, EEG**
Category - 6	**Super speciality hospital**
Category - 7	**Referral hospital (Govt.)**

hospital are considered as less than what is required. Hence a doctor needs to attend about 22 patients every day. Also absence of specialization in Nephrology, Cardiology, Neurology and Urology is affecting in delivering service to patients with such chronic diseases. Treatment system for burns is also not fully developed in this hospital. Trauma care unit is functioning partly. Full-fledged Trauma care unit is essential here. Presently, 3 Operation Theatres and 2 ICUs are functioning. There is no separate department for Microbiology and Pathology. Low bed strength in pain and palliative care units is also found as a major issue. Maintenance of existing buildings need to be done periodically for increasing the aesthetic and convenience of people.

Victoria Hospital, Kollam

Total of 273 beds are available in Victoria hospital known for deliveries. There are 10 NICU numbers of NICU, 8 Nos. of ICU in this hospital. Here also the available number of doctors (32) is less than what is required. Specializations in Gynecology are the main attraction of this hospital where 500 deliveries per month is carried out on an average. Pediatrics, Anesthesia are the existing departments, Laparoscopic Surgery facilities are absent here. 6 Operation theaters with one emergency operation theater are available here. 3 numbers of ambulance facility and bio-medical waste disposal through IMAGE agency are available in this hospital.

Private Hospitals

The details of private hospitals of KLMC area are given in table 14.5.

As noted earlier 21 hospitals (78%) of the health care institutions

Sl No.	Name of Hospital	Category	No. of Beds	No.of doctors	No of Nurses	No of Paramedical staff	Patients Treated
1	Meditrina Hospital	6	140	40	65	40	137
2	NS memorial Institute of Medical Science	6	250	63	300	263	1300
3	DrNairs Hospital	5	100	27	100	27	342
4	Sankers Institute Of medical Science	6	150	21	111	38	950
5	Upasana hospital	5	300	40	195	44	401
6	Bishop Benziger Hospital	6	300	51	220	61	501
7	Ashtamudi Hospital and Trauma care centre	6	47	4	16	3	40
8	Dr. Kumaradas Hospital	4	12	2	5	1	50
9	MathaMedialcentre	4	80	12	36	5	200
10	PNN Memorial hospital	2	75	12	25	6	308
11	Mangalodhayam Hospital	1	0	1	0	0	30
12	Kerala ENT Research Foundation	3	12	4	6	5	54
13	Amardeep Eye Hospital	4	0	10	8	10	180
14	K.Damodharan memorial Hospital	3	18	6	7	3	50
15	Ferns Medical Centre	2	30	1	10	1	10
16	Quilon Dental Clinic&Orthodontic Centre	1	0	1	0	1	10
17	Kailas Dental Hospital	1	0	6	6	1	8
18	Mangalodhayam Dental clinic	1	0	2	2	0	50
19	Chaithanya Eye clinic	1	0	4	10	2	100
20	AVMT Clinic	1	0	1	2	0	2
21	AG Nursing Home	1	30	2	11	3	65
Total			**1554**	**310**	**1135**	**514**	**4788**

Source: DMO, Primary Survey 2019

Table 14.5 List of private Allopathy Hospitals in KLMC area

functioning in KLMC belongs to the private sector. About 80% of these hospitals have IP facilities. Total bed strength of these hospitals is 1554 and a total of 4788 patients treated daily. N.S. Memorial Institute of Medical Science is having the highest number of patients treated, though the total bed strength is lower (250) from that available in Upasana hospital and Bishop Benziger hospital.

Spatial distribution of allopathic hospitals is shown in figure 14.2. It can be seen that hospitals are mainly concentrated in the city centre. However the new health care institutions including N.S Hospital are coming up along the side of NH Bypass.

14.2.2 Ayurvedic Hospitals

In the Ayurvedic system of medicine there are 12 hospitals in which 6 hospitals are under the government sector and 6 under the private sector. In the fast-growing sector of health tourism, ayurvedic institutions can play a major role. The details of ayurvedic hospitals are given in table 14.6.

In addition to the ayurvedic hospitals, 5 ayurvedicdispensaries

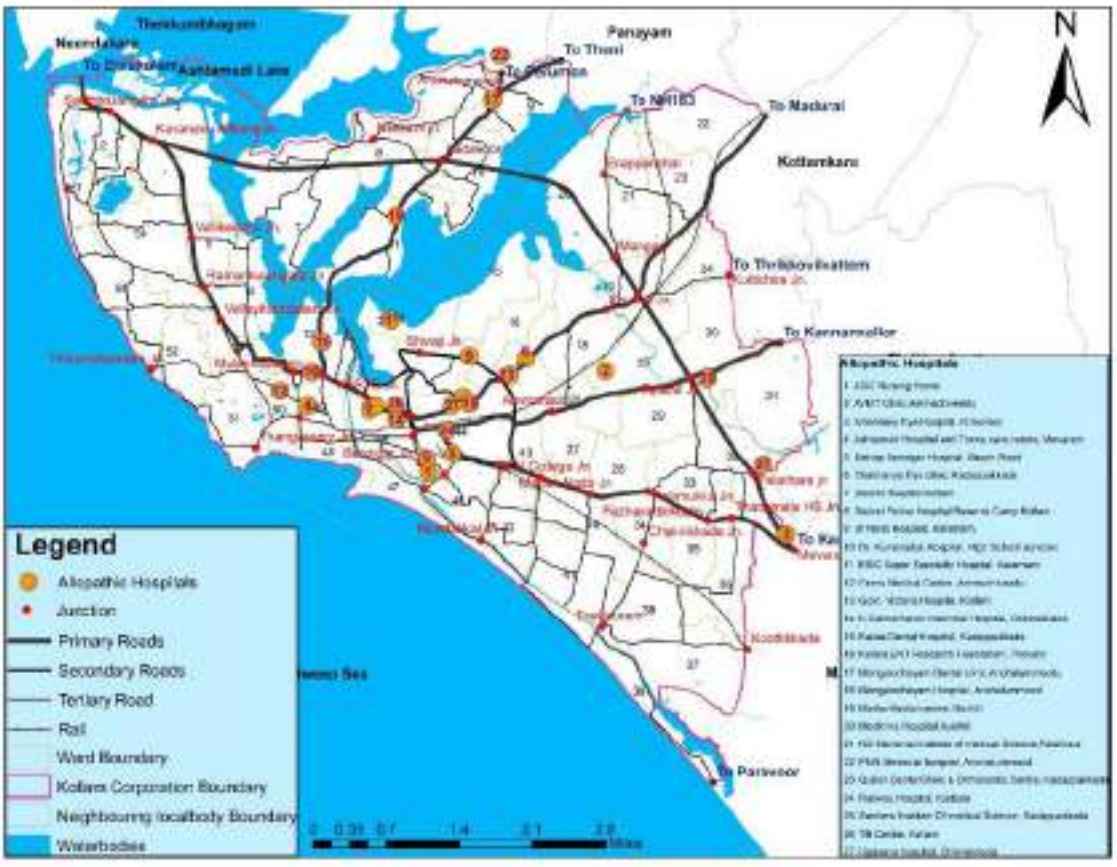


Figure 14.2 Spatial distribution of allopathic hospital in planning area

under government sector are functioning in Kollam Corporation area and 1 nursing home, which are listed below. Total bed strength available in all the ayurveda hospitals comes to 75 with 34 doctors. Total number of outpatients is 956 per day on average. The spatial distribution of ayurvedic hospitals are shown in figure 14.3.

From the spatial distribution, it can be observed that Ayurvedic Medical Health care facilities are also concentrated in the City Centre.

District Ayurveda Hospital, Kollam

The District Ayurvedic Hospital accommodates a large share of

Category 1	Hospitals with OP only
Category 2	Hospitals with advanced facilities

Sl. No.	Name of Hospital	Location	Category	No. of Beds	No. of doctors	No of Nurses	No of Para-medical staff	Patients Treated
1	District Ayurveda Hospital, Kollam	Asramam	2	50	15	4	3	70
2	Govt.Ayurveda Dispensary, Eravipuram	Eravipuram	1	0	1	0	1	100
3	Govt.Ayurveda Dispensary, Kilikolloor	Kilikolloor	1	0	1	0	1	150
4	Govt.Ayurveda Dispensary, Sakthikulangara	Sakthikulangara	1	0	1	0	1	100
5	Govt.Ayurveda Dispensary, Thrikkadavoor	Thrikkadavoor	1	0	1	0	1	100
6	Govt. Ayurveda Dispensary, Vadakkevila	Vadakkevila	1	0	1	0	1	150
7	JayabharadhamArya vaidyasala	Chamakkada	1	0	0	0	1	0
8	KottakkalAryavaidhya sala	Andamukkam, Anandavalleeswaram, kadappakkada	1	0	8	0	12	200
9	KayalVarath Hospital	Thevally	1	10	2	2	1	50
10	KayalVarath Hospital	Kavanad	1	0	1	0	1	15
11	Dhathriayurveda Hospital	Andamukkam	1	10	2	0	1	15
12	Santhi Nursing Home	Polayathodu	1	5	1	2	2	6
TOTAL				**75**	**34**	**8**	**26**	**956**

Source: Primary Survey 2019

Table 14.6 Details of ayurvedic hospitals in KLMC area

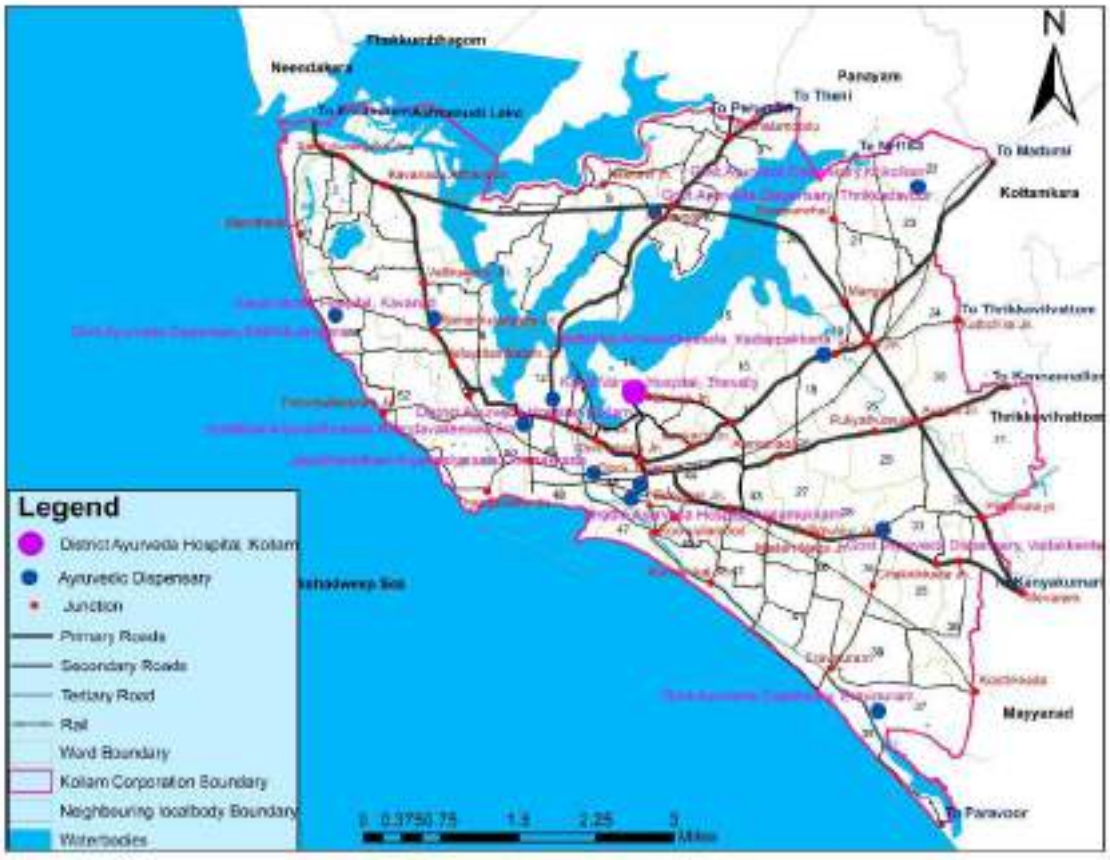


Figure 14.3 Spatial Distribution of ayurvedic hospitals in KLMC area

sanctioned bed strength (67%) in the planning area. However in terms of number of patients treated per day, Kottakkal Arya Vaidyasala in Andamukkam treats 200 patients per day against 70 in district Ayurveda hospital. This is because Kottakkal Aryavaidyasala is more to a pharmacy from where medicines can be purchased without consulting a doctor. Government ayurvedic dispensaries located in different parts of the planning area provide treatment to 100 to 150 patients per day. A total of 15 doctors with specializations in Marma, Panchakarma, Sthri Roga, Manasika and Balaroga are available in District Ayurveda hospital. A mini operation theater with basic lab facilities are available here. The main method of waste disposal is the thumboormuzhi model plant. Other facilities in the hospital are X-ray, Autism clinic, Yoga, Jeevani and sports Ayurveda.

14.2.3 Homeopathic Hospitals

Homeopathic system of medicine plays a major role in reducing morbidity. The clinics are intended to be focused on treatment for specific

diseases such as Allergic respiratory ailments, Diabetes mellitus, Rheumatic diseases, Pediatric ailments, Thyroid disorders, Cancer, Ano-Rectal diseases. The highlights of the treatment include safe, simple, scientific and economic and widely accepted by all categories of people especially rural people. There are 5 government dispensaries other than the district government hospital in the planning area. (table14.7). District Homeo Hospital is located at Thevally, and is catering the entire district. Total number of doctors available in the Homeo hospital are 8 in number with total outpatients of 1700 daily. The existing bed strength is 40. UltraSound scanning and X-ray facilities are available hence IP facilities for 5 Cancer patients and pain and palliative care facilities are also available. Through the Janani scheme, many childless couples have become blessed with babies with the treatment using homoeopathic medicines which are simple, safe and possibly have no side effects; and economic too. In addition to the government Homeo institutions, 4 private homeopathic dispensaries are

Sl. No	Name of Hospital/Clinics/ Dispensary	Ownership (Govt-1; Private-2)	No. of Doctors	No. of Supporting Staff	No. of Beds	Total Out patients
1	Govt. Homoeopathy Dispensary, Eravipuram	1	1	2	0	500
2	Govt. Homoeopathy Dispensary, Polayathodu	1	1	2	0	50
3	Govt. Homoeopathy Hospital, Thevally, Kollam	1	3	12	30	900
4	Govt. Homoeopathy Dispensary, Uliyakoil	1	1	3	0	50
5	Govt. Homoeopathy Dispensary, Sakthikulangara	1	1	2	10	100
6	Govt. Homoeopathy Dispensary, Vadakkevila	1	1	2	0	100
Total		**6**	**8**	**23**	**40**	**1700**

Source: Primary Survey 2019

Table 14.7 Details of Homeopathic Dispensaries and Hospitals under Government Sector

also functioning within the planning area. Details are given in table 14.8. The Spatial distribution of homeopathic dispensaries are shown in figure 14.4. It is seen that homeodispensaries are evenly distributed in KLMC area. Categorization of health facilities are listed in table14.8.

14.2.4 Primary Health Care Facilities

Primary health care facilities include 3 UPHC (Urban Primary Health Centre), 5 PHC (Primary Health Centre) and 2 CHC (Community Health Centre). The details of Primary Health centre are given on table 14.9.

Hospital	Ownership (Govt-1; Private-2)	Location	No. of Doctors
Amala Homeopathic Dispensary	2	Kadappakkada	1
Cheriyan's Homeopathic Medical Centre	2	Kadappakkada	1
Dr. Chakravathys Multi Speciality Homeopathy	2	Mulankadakom	1
JyothiHomeo medical centre	2	Hospital Road	1

Source: DMO, Primary Survey

Table 14.8 Details of Homeopathic dispensaries under private sector

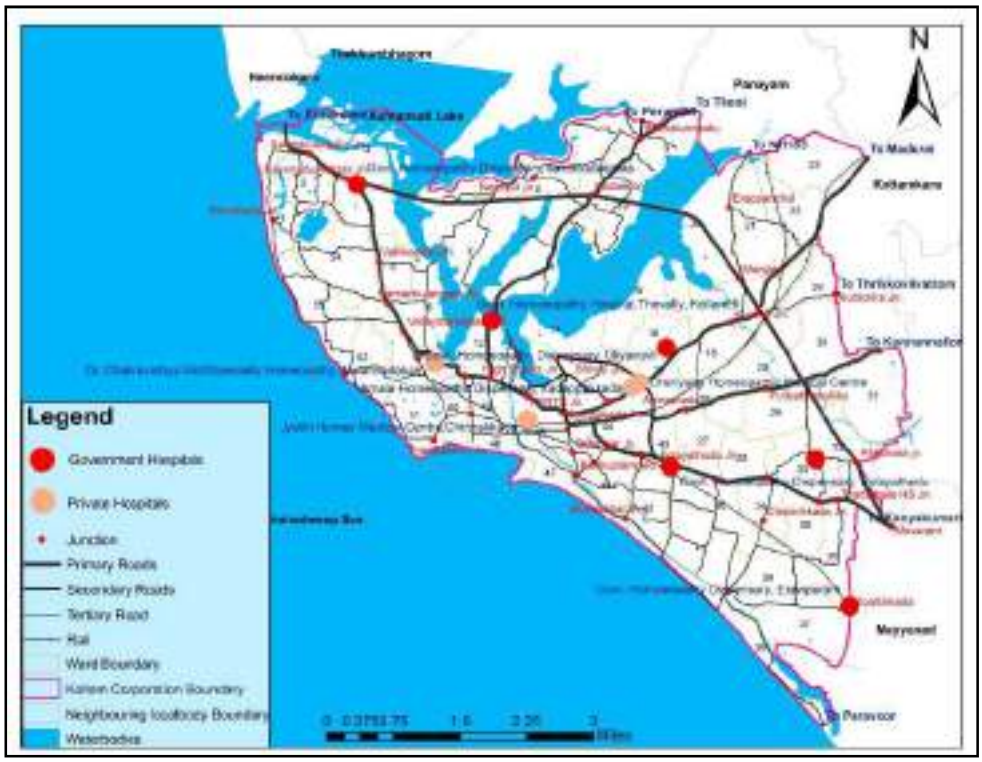


Figure 14.4 Spatial Distribution of Homeopathic dispensaries and hospital in KLMC

The Spatial analysis of UPHC, PHC and CHC are shown in figure.14.5. Total of 3 UPHC, 5 PHC and 2 CHC are present in KLMC area with a total of 10 doctors and 10 nurses with total outpatients of about 700. From the data it can be analyzed that there is a lack of doctors and nurses when considering the number of patients.

From figure 14.6, we can infer that division numbers (8, 29, 32, 35, and 55) has to travel a distance of more than 2 km to reach health centers.

Sl. No	Name of Hospital	Location	No of Doctors	No of Nurses	No of Paramedical Staff	Patients treated
1	UPHC	Mundakkal	1	1	1	100
2	UPHC	Vaddy	1	1	1	100
3	UPHC	Uliyakovil	1	1	1	100
4	PHC Kilikolloor	Kilikolloor	1	1	1	51
5	PHC Eravipuram	Eravipuram	1	1	1	58
6	PHC Sakthikulangara	Sakthikulangara	1	1	1	60
7	PHC Uliyakovil	Uliyakovil	1	1	1	44
8	PHC Vaddy	Vaddy	1	1	1	33
9	CHC Palathara	Palathara	1	1	1	150
10	CHC Thrikkadavoor	Thrikkadavoor	1	1	1	350

Source: DMO, Primary Survey 2019

Table 14.9 UPHC, PHC, CHC's in KLMC area



Figure 14.5 Spatial distribution of PHC's, UPHC & CHC

14.2.5 Other System of Medicine

Siddha, Naturopathy are the other systems of medicine practiced in KLMC area. Siddha systems of medicine are practiced in Ayurveda hospital under the private sector. Naturopathy is also practiced under the private sector in certain areas of Kollam Corporation area.

14.3 DISEASE PATTERN

As per the studies conducted in the health sectors in connection with preparation of IDDP revealed that maximum cases of Dengue and Malaria are reported from KLMC. Hence it can be concluded that even though higher order healthcare institutions are concentrated in KLMC area, disease occurrences are high, this is mainly due to the environmental degradation taking place in this area.

From table 14.10 we can infer that Tuberculosis is the most affected disease in KLMC area, 2130 persons are affected by this disease in which 131 persons are cured from it, and this indicates absence of facilities of treatment even though there is a TB Centre in Corporation area. Total of 42 dengue cases were reported in our planning area due to the unhygienic conditions followed in our area

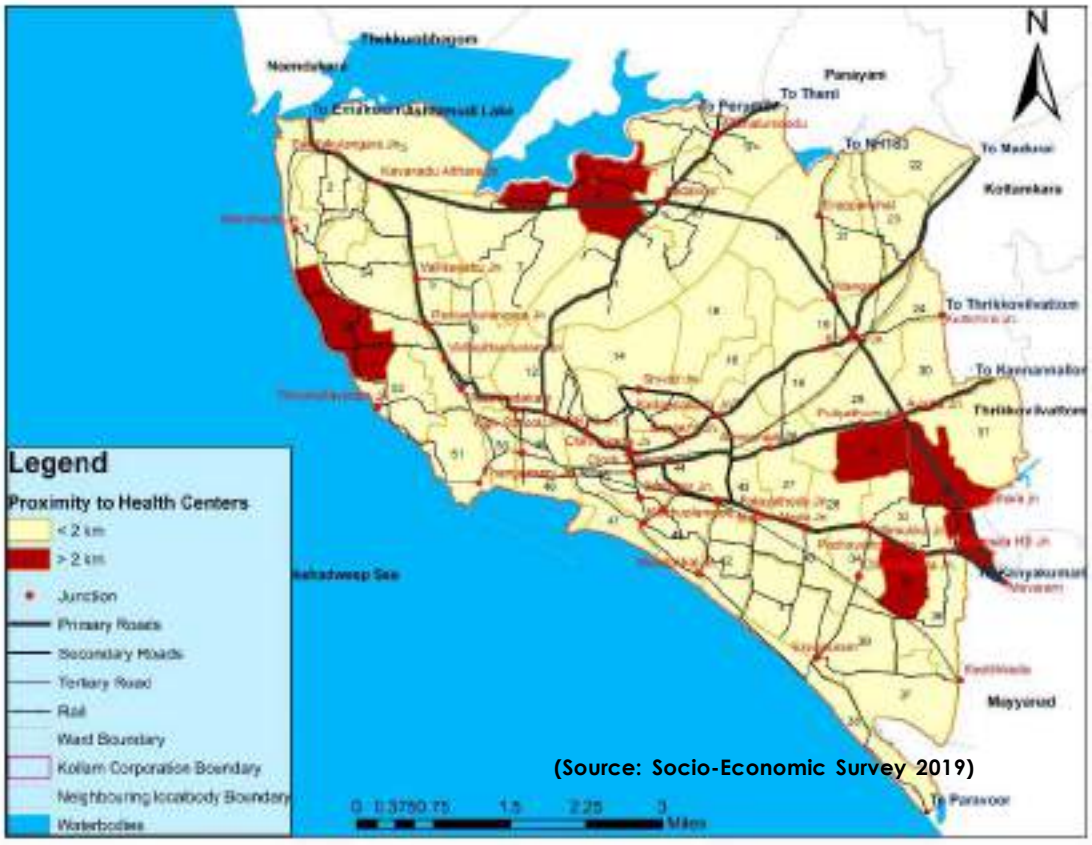


Figure 14.6 Spatial distribution of proximity to Health Centre's in each wards

Sl. No.	Name of Hospital	Fever	Dengue Fever	Chikungunya	Typhoid	Diarrhoea	Tuberculosis	Hepatitis -A	Hepatitis - B	Hepatitis - C	Measles	Malaria Malaria(suspected)	Leptospirosis
1	Thrikkadavoor CHC	1546	7		4	171		3	3		1		2
2	PHC Sakthikulangara	136	6			43		2	3	1			1
3	PHC Kilokolloor	607	10		1	13		26	5			1	3
4	PHC, Palathara	1435	4		1	246			3		4	1	
5	PHC, Eravipuram	1217	1		1	102			6			1	
	Kollam Zone												
6	District Hospital Kollam	14927	14		9	176	2130						
7	Govt.Victoria Hospital, Kollam	7971				1510			9	1	22	6	2
Total		**27839**	**42**	**0**	**16**	**2261**	**2130**	**31**	**29**	**2**	**27**	**9**	**8**

Source: DMO, BSLLD Statistics, 2016

Table 14.10 Communicable diseases reported from Hospitals in KLMC

especially in the coastal areas like Kaikulangara. From the table it is found that among the deadly diseases Hepatitis-A is reported maximum (31 cases) and measles (27 Cases). Corporation area is suffering from occupational diseases like Bronchial Asthmas, Dermatitis and prolapsed uterus also especially in Thrikkadavoor Zone. Another finding of IDDP is that nearby Grama Panchayat Neendakara's area is reported with a greater number of cancer cases. (Source: IDDP). It is assumed that this is due to radiation from the black sand which is widely present in the coastal areas.1554 people (41%) died due to heart attack & 204 people (6%) due to cancer for the year 2017 as seen in figure 14.7, the high death due to heart attacks is reported in Palakkad (70%).

Covid-19

Covid-19 is a biological disaster due to the outbreak of a virus called novel corona in 2020. It is a pandemic that affected the whole world, claimed – deaths within KLMC as on 07/06/2021 are 391 while in district it is 737 as shown in figure 14.8.

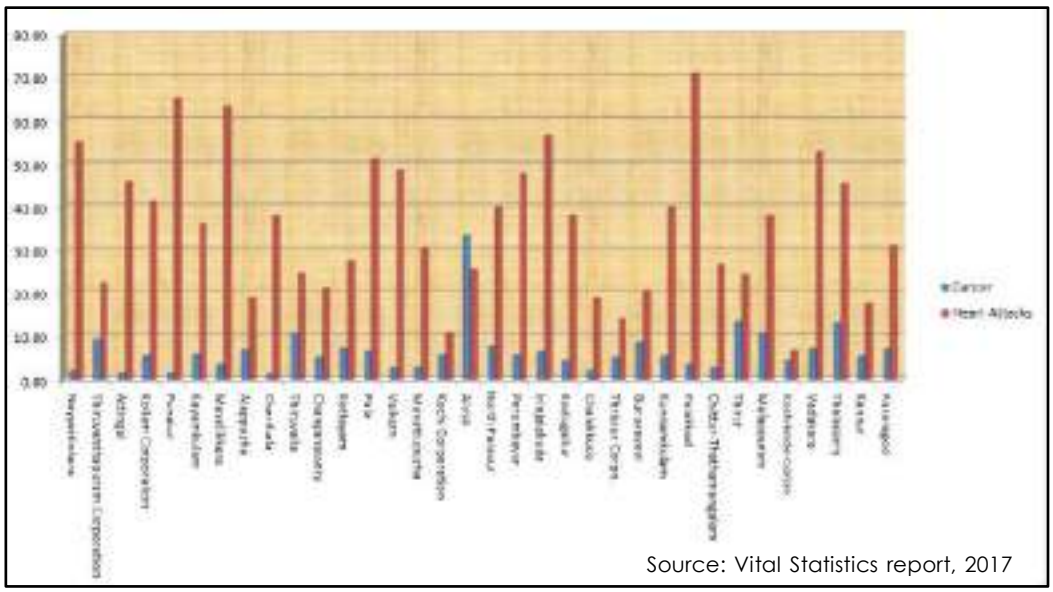
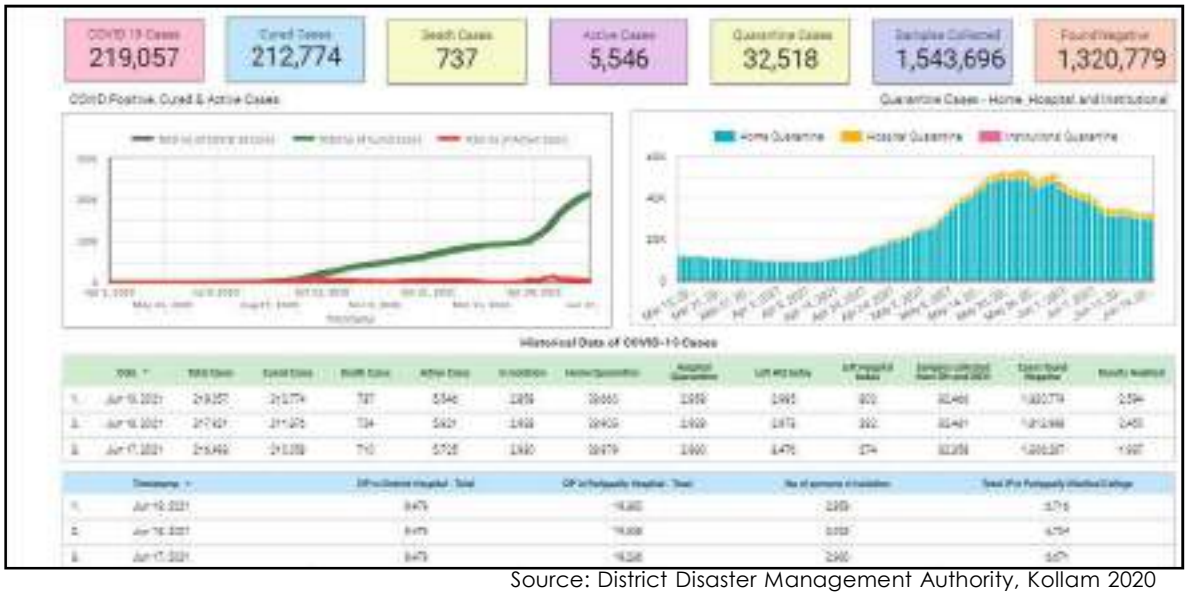


Figure 14.7 Percentage of deaths in Kerala due to cancer & heart attacks

Total reported cases in corporation area is 32,586 while in district it is 219057 and only 28473 got recovered in KLMC area from this pandemic in present situation. About 846 CCG's are functioning in the Corporation area. Covid First line Treatment Centre (CFLTC) for positive cases treatments, there are 17 CFLTC's in Kollam district with total beds occupied by 1250 patients looked after-by 60 doctors and 60 Staff nurses and to accommodate any person in home isolation who cannot follow the home isolation guidelines.



Source: District Disaster Management Authority, Kollam 2020

Figure 14.8 Covid-19 Data of Kollam district as on 07-06-2021

14.4 WASTE DISPOSING METHODS

Waste disposal facilities are more relevant in the case of allopathic hospitals. The details of waste disposing techniques of allopathic hospitals are given in table 14.11.

From the table it is seen that most of the hospitals dispose of waste through Indian Medical Biomedical Waste and Disposal Facility (IMAGE, a state-of-the-art Common Biomedical Waste Treatment and Disposal Facility at Palakkad). For liquid waste, major hospitals have their own sewage treatment plants.

14.5 DEVELOPMENT ISSUES

Following problems in the health sector in the planning area are identified from local level analysis and the studies carried out for IDDP.

- Absence of periodical regional detention camps for life-style diseases is a major issue.
- No separate ophthalmic institute in the government sector.
- Inadequate preventive measures for lifestyle diseases was noticed.
- Maintenance of buildings and wards like white washing, purchase of new bed sheets should be taken up periodically.
- In order to control the widespread communicable diseases, proper measures should be taken like cleaning the surroundings and living in a hygienic condition.
- Special attention should be provided for implementing policies and programs to improve basic health care facilities.
- Monitoring cell should be formed to inspect the functioning of hospitals.
- Mobile health unit for attending emergency cases and to conduct health awareness camps and free checkups.
- Ayurveda and homeopathic institutions have to be modernized by providing necessary infrastructure facilities.

District Hospital, Kollam

- Bed strength is low, additional 500 more beds are needed for accommodating patients
- Doctor-Patient ratio is very low, so 60 more doctors are needed for the well-functioning of the Hospital.
- Absence of Neurology, Cardiology, Nephrology, urology specialized doctors
- Low bed strength in Pain and Palliative care unit
- Poor maintenance of Canteen and hospital buildings

Name of Hospitals	Waste disposing arrangements		
	Solid	Liquid	Bio waste
District Hospital Kollam	Incinerator, Aerobic compost plant	Through Septic Tank	IMAGE
Government Victoria Hospital, Kollam	Incinerator	soak pit	IMAGE
TB Centre, Kollam	IMAGE	Through Septic Tank	IMAGE
District Police Hospital	IMAGE	Through Septic Tank	IMAGE
Meditrina Hospital	Biogas Plant	Own Tank	IMAGE
NS memorial Institute of medical Science	IMAGE	Own sewage treatment plant	IMAGE
ESIC Super Speciality Hospital	Incinerator	Biogas	IMAGE
Dr Nair's Hospital	Paper waste incinerator	IMAGE	IMAGE
Sankers Institute Of medical Science	Incinerator	Treatment plant	IMAGE
Upasana hospital	IMAGE	Treatment Plant Installed Treated effluent discharged into drain	IMAGE
Bishop Benziger Hospital	IMAGE	S.T.P	IMAGE
Ashtamudi Hospital and Trauma care Centre	IMAGE	Treatment Plant	IMAGE
Dr. Kumaradas Hospital	IMAGE	Treatment plant	IMAGE
Matha Medical centre	Incinerator, Biogas plant, sewerage treatment plant	Incinerator, Biogas plant, sewerage treatment plant	IMAGE
PNN Memorial hospital	IMAGE, Treatment plant	Through Septic Tank	IMAGE
Mangalodhayam Hospital	IMAGE	Through Septic Tank	IMAGE
Kerala ENT Research Foundation	Biogas Plant	own Tank	IMAGE
Amardeep Eye Hospital	IMAGE	Through Septic Tank	IMAGE
K. Damodharan memorial Hospital	Incinerate general paper waste, plastic waste giving for recycle and food waste collected by Quilon farms	Sewerage treatment plant	IMAGE
Ferns Medical Centre	Incinerator, image	Through Septic Tank	IMAGE
Quilon Dental Clinic & Orthodontic Centre	IMAGE	Through Septic Tank	IMAGE
Kailas Dental Hospital	IMAGE	Through Septic Tank	IMAGE
Mangalodhayam Dental clinic	IMAGE	Through Septic Tank	IMAGE
Chaithanya Eye clinic	IMAGE	Through Septic Tank	IMAGE
AVMT Clinic	IMAGE	Through Septic Tank	IMAGE

Source: Primary Survey, 2019

Table 14.11 Waste disposing methods adopted by Allopathic hospitals in KLMC area

Victoria Hospital, Kollam

- Bed Strength is low, additional 145 beds needed is included in the KIIFB master plan.
- Facilities like Laparoscopic Surgery, Infertility Treatments are lacking in this hospital.
- No separate ward for septic cases emergency cases.
- There is no working canteen because no proper building is present.
- Ambulance with advanced life support system is needed
- Sewage treatment plants and Liquid treatment plants are to be constructed.

District Ayurveda Hospital, Kollam

- Bed Strength is low, it should be increased to 100 beds Hospital with separate Female and Male wards.
- No. of Doctors is adequate
- Facilities like Post-operative rooms and advanced lab facilities with hormone assessment should be constructed.
- Building for Canteen should be constructed
- STP and advance waste disposal facilities are required to be incorporated

District Homeo Hospital, Thevally

- Very low Bed strength
- Absence of pay ward
- Absence of ICU and ambulance facilities
- Absence of fully fledged lab and updated diagnostic facilities
- Absence of computers which are functioning properly
- Land not available for further extension of the Hospital and Poor maintenance of existing building.

CHAPTER -15
POWER

Energy is a vital component of urban infrastructure. Be it water supply, sewage network, transportation, construction, manufacturing,information and communication technology (ICT) or provision of social infrastructure to enhance quality of life, energy in the form of electricity, oil and gas is an inescapable necessity to enable infrastructure development. Electrical energy is one of the most important factors in the infrastructure and other sectoral development of a society. The following article describes the present scenario of power sector in the planning area and the development issues associated to this sector.

15.1 EXISTING STATUS

Analysis of existing status of power sector includes sources of energy (Conventional sources/ non-conventional sources), transmission and distribution network and consumption pattern.

15.1.1 Sources of energy

Kerala State Electricity Board (KSEB) is handling power sector all over the state. The main task assigned to them includes power generation, transmission and distribution up to consumer level. However, distribution of power for street lighting is transferred to local bodies. The major source of electricity in the state is hydel and thermal energy. Hydel energy is the most reliable and dependable source in Kerala. Monsoon is essential to sustain the hydropower base in the state and the shortage in rainfall usually creates power crisis. The only hydel project in Kollam district is the Kallada Hydroelectric Power Project at Thenmala, which generates about 65 Million Unit (MU) of power annually.



Kallada Hydroelectric Power Project, Thenmala

The use of non-conventional energy sources such as wind, solar, tidal and biomass are also nominally used in the district. Despite the considerable potential for electricity generation from non-conventionall energy sources, particularly from biomass, the usage of non-conventional energy within the planning area is quite limited. Now a day, various schemes from KSEB to produce electricity through solar energy with the help of public houses, commercial buildings are initiated which is a feather to the use of non-conventional sources. Examples of applications of non-conventional energy in the planning area are:

- Solar LED Street light in 55 wards in KLMC
- Biogas Plant at Govt. District Hospital Kollam
- Biogas Plant at Victoria Hospital
- Solar water heater of 1000 litres capacity at Victoria Hospital
- Solar water heater of 500 litres capacity at Thrikkadavoor PHC
- Solar Fish drier at Sakthikulangara

15.1.2 Transmission and distribution

The backbone of power sector is the transmission of bulk power from the generating source to the distribution load centres. Kollam is situated in the Southern Transmission zone for which the power is transmitted through the state grid (400KV) Tirunelveli - Pallippuram. The power transmitted through the State grid is again transmitted to the load centres from where the power is transmitted for distribution is as follows:

1. Ayathil – 110 KV
2. Kavanad – 110 KV
3. Kundara – 220KV
4. Kollam GIS (near KSEB office) – 110 KV
5. Kottiyam – 110 KV

Of the above Kavanad and Kundara load centres receives power from 220 KV Edappon substation at Alappuzha and all other load centres receives power from 220KV Edamon at Kottarakkara. Kundra and Kotttiyam load centers are located outside the planning area. Due to the commissioning of Kollam GIS substation, the planning area got required power for distributing among all the consumers for different uses such as commercial, industrial, domestic etc. The location of substations is shown in figure 15.1 and the distribution details are given in table 15.1. The location of transformers for distributing power to the consumer level is shown in figure 15.2. From the figure, it can be



Fig 15.1 Locations of substationsin KLMC

Sl No	Substation	Capacity in kV	Number	Location	Serving area
1	Kollam GIS	110	1	Power House Compound, Cantonment, Kollam	Cantonment, Kadappakkada, Pallimukku
2	Kavanad	110	1	Vallikeezhu	Sakthikulangara, Thangassery, Olai
3	Kundara	220	1	Elambaloor	Killikolloor
4	Ayathil	110	1	Ayathil	Killikolloor, Ayathil, Pallimukku
5	Kottiyam	110	1	Kottiyam	Pallimukku

Source : KSEBKollam

Table 15.1 Details of substationsin KLMC

inferred that the transformers are more concentrated at the core of the city when compared to the outskirts. This can be taken as an indication of more power consumption at the city core area than outskirts.

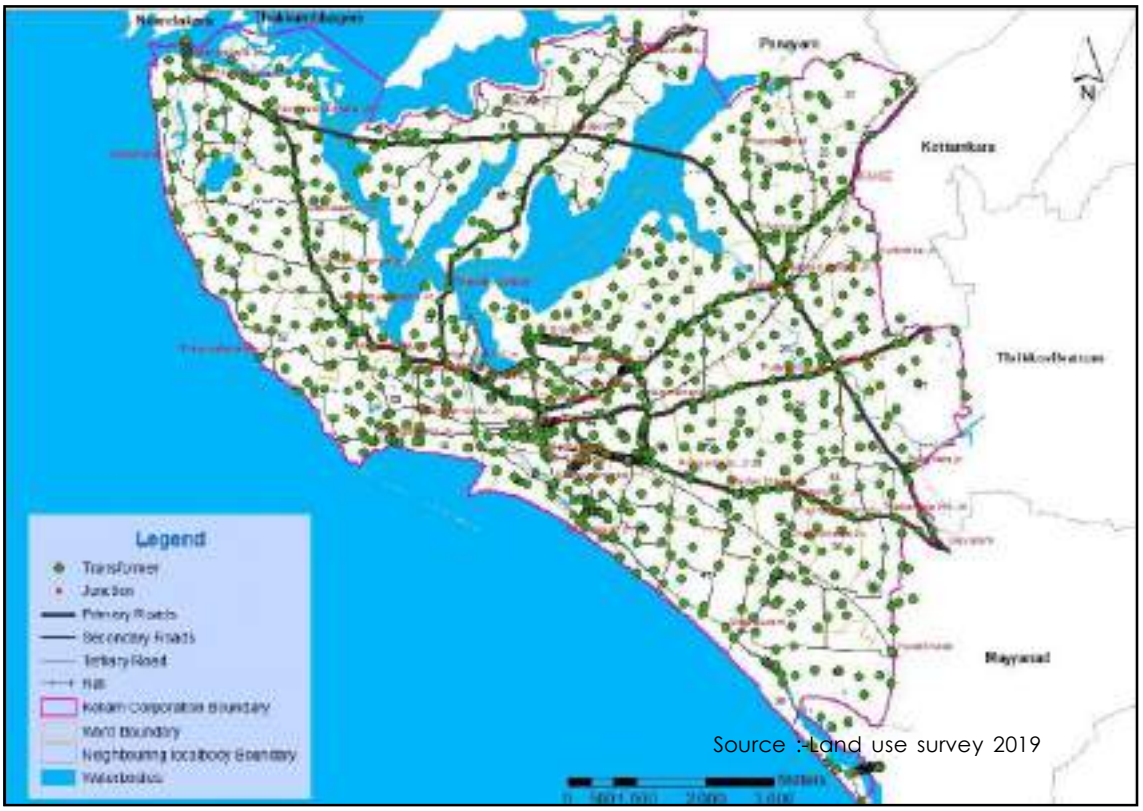


Fig. 15.2 Location of transformers in KLMC

15.1.3 Consumption pattern

Year wise and category wise consumption details are shown in table 15.2 and figure 15.3. It shows that the connections for domestic purpose is much larger than connections for all other purposes and is keep on increasing every year. The second largest number of connections is used for commercial purposes. It also shows an increasing trend each year. However, number of industrial consumers are almost stagnated which shows industrial development in the planning area. At the same time number of agricultural consumers are

Year	Domestic	Industrial	Commercial	Agricultural	Others	Total
2016-17	1,28,238	1,936	27,237	547	94	1,58,052
2017-18	1,30,100	1,923	28,087	625	106	1,60,841
2018-19	1,31,657	1,934	30,486	662	106	1,64,845

Table 15.2 Year wise and category wise consumption details

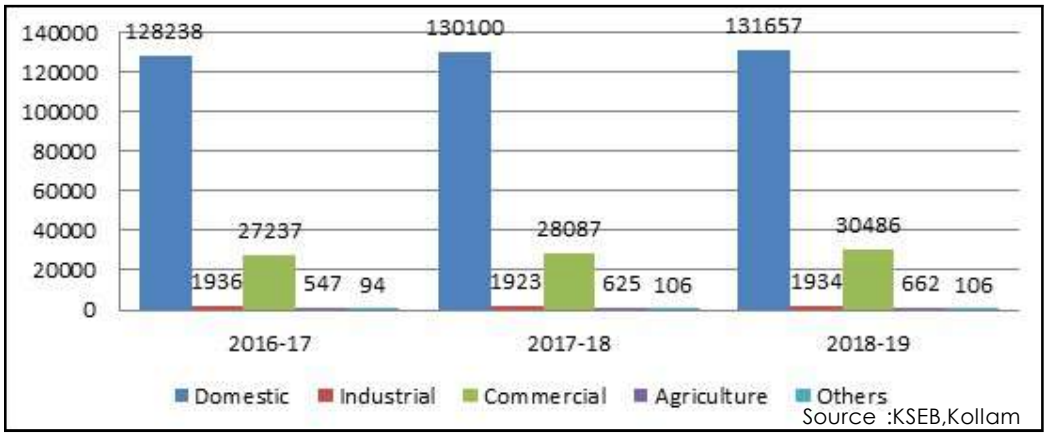


Figure 15.3 Year wise and category wise connections

gradually increasing unlike industrial consumers, this indicates that agricultural sector in the planning area is progressing.

Figure 15.4 shows number of connections break as on 2019. 80% of the connections are taken for domestic purpose and 18.5% for commercial purpose.

The total power consumption during 2018 -19is 28,57,03,965 kWh. Apart from the electrical energy supplied people also uses energy generated from petroleum products like petrol, LPG, diesel, kerosene etc. which is negligibly low in quantity as compared to electrical energy. Table 15.3 shows the details of year wise and

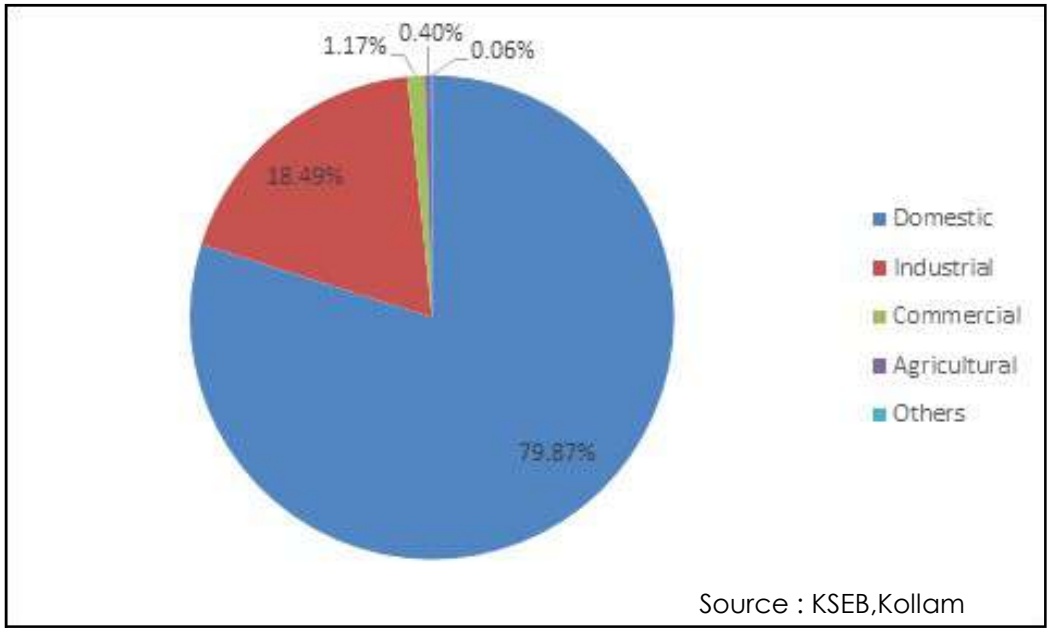


Figure 15.4 Break-up of electricity consumers as of 2019

Category breakup - electricity consumption(kWh)						
YEAR	Domestic	Industrial	Commercial	Agricultural	Others	Total
2016-17	18,73,80,405	2,54,82,434	5,51,83,152	3,50,230	81,07,778	27,65,03,999
2017-18	18,72,94,878	2,45,23,502	5,67,71,530	4,56,956	96,03,743	27,86,50,609
2018-19	19,14,88,808	2,60,54,625	5,84,84,681	4,70,522	92,05,329	28,57,03,965

Source: KSEB,Kollam

Table 15.3 Category wise breakup of energy consumption in KLMC area

category wise energy consumption. From the table, it is found that the total power consumption during 2018-19 was 28570396.

The sector wise growth rate in consumption of power from 2017 to 2019 is shown in figure 15.5. From the figure it is evident that the agricultural sector has made a remarkable progress compared to industrial and commercial sector.Figure 15.6 shows the breakup of power consumption in 2018-19. Domestic activities have the highest share of consumption (67.02%), followed by commercial activities (20.47%) and by industrial activities (9.12%).

15.2 DEVELOPMENT ISSUES

From the analysis, following problems are identified in power sector.

Frequent disruption of power supply.

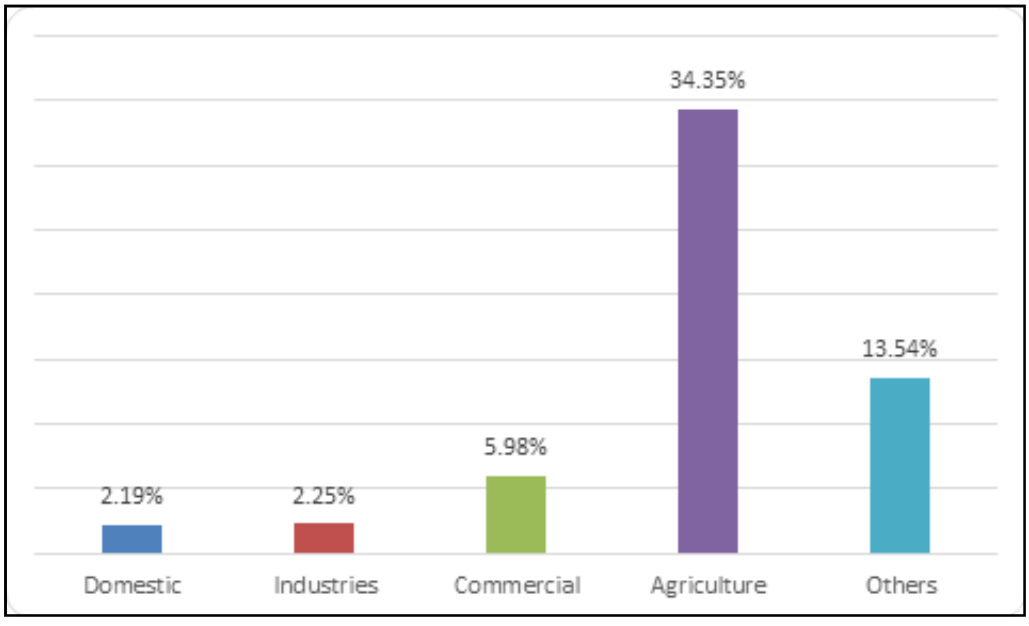


Figure 15.5 Growth rate of power consumption

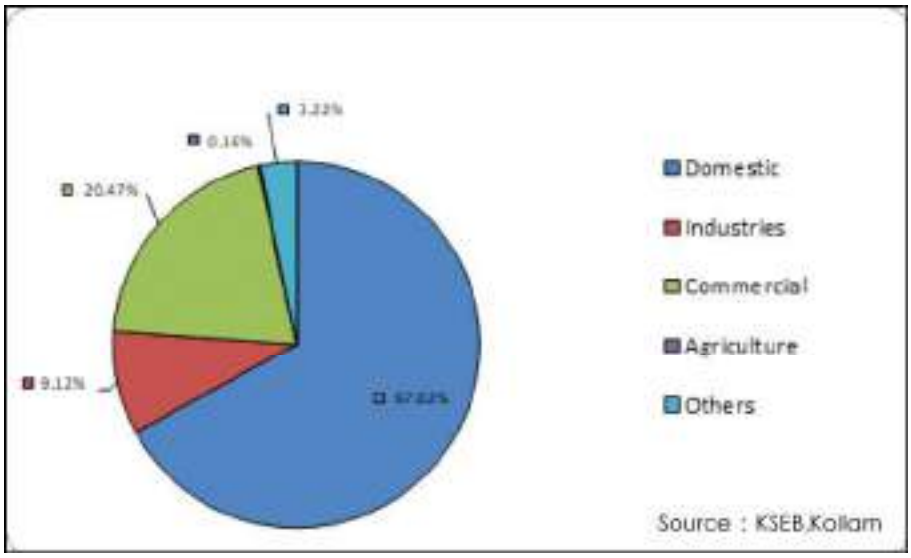


Figure 15.6 Growth trend of sectors based on electric consumption

- A number of high mast lights are installed at junctions without proper planning. The running cost of high mast light is very high due to the requirement of large quantity of power. It is very difficult to bring down the high mast light during repair work.
- Damage to street lights due to the absence of proper shade of covering against dampness etc. are the major problems seen.
- Power extraction from non-conventional energy sources are not implemented in a systematic way.

CHAPTER - 16
WATER SUPPLY

Supply of enough quantity of clean drinking water to the citizen is the prime responsibility of all the local self-institutions. The cities over the years have become highly water demanding and this is particularly true for the metropolitan and the mega-cities of both developing and developed countries as the population is concentrating at the cities. The quantity of water that these cities consume is so high that at present they are often referred to as "Thirsty Cities". This chapter gives a brief description of the existing water sources, water supply system, water treatment plants, distribution system, physical losses, demand and supply, evaluation of major projects, and the issues in water supply system in KLMC.

16.1 EXISTING SOURCES OF WATER

Surface sources and ground water sources are found as main sources to meet the water requirement for different purposes such as domestic, industrial, commercial, institutional, firefighting, livestock, public, agricultural needs. Identification of sources of water supply, their conservation and optimizing utilization are of utmost importance. Present status of water sources are shown below.

Surface Sources

Surface sources include rivers, fresh water lakes, streams, ponds etc. Main surface water sources on which the water supply system of KLMC depend is Sasthamcotta lake (figure 16.1). The lake is situated about 27 km from Kollam city having a spread area of 373 ha. The Water Treatment Plant installed by the side of Sasthamcotta lake is having a treatment capacity of 37.5 MLD. About 20 MLD treated water is supplying to KLMC area. The


Sasthamcottalake


Kallada River

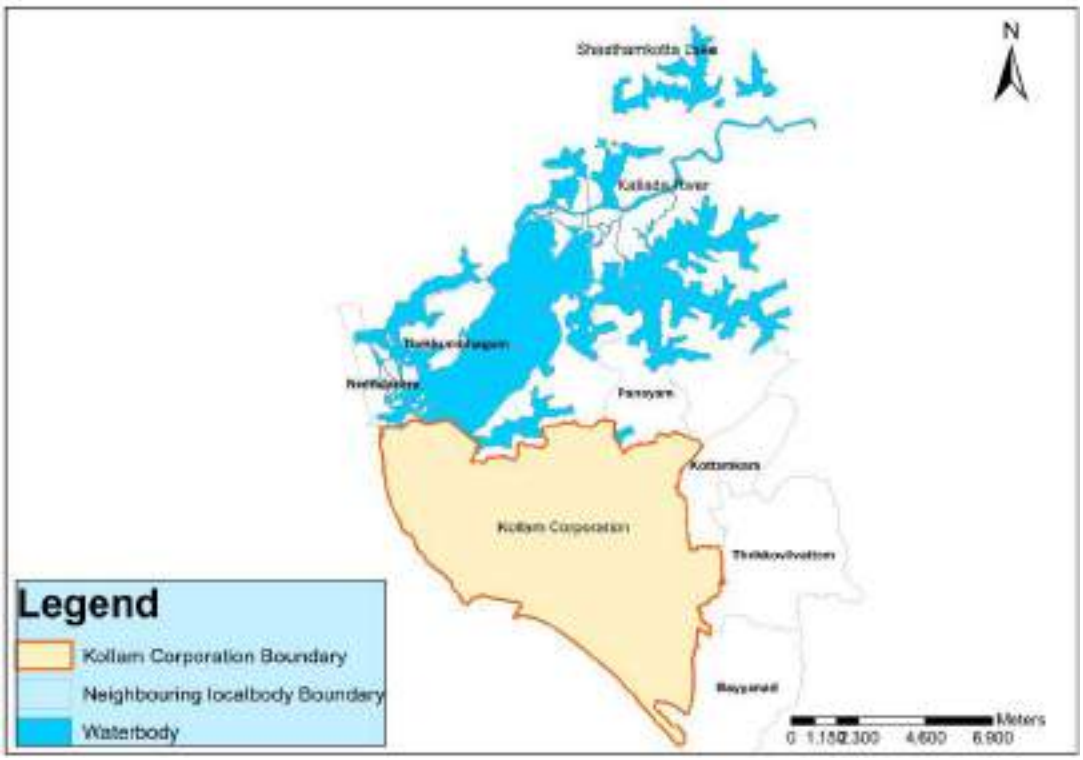


Figure 16.1 Major sources of water in KLMC

lake can supply 60 MLD of water under normal rainfall conditions, however due to pollution in the lake and decline in water level, the lake is slowly dying. The main source of JICA (Japan International Corporation Agency) water supply scheme is Kallada river which is 30 km from Kollam city. This system supplies 4 MLD water to KLMC area.

Ground water Sources

Rainwater percolating into the ground and reaching permeable layers in the zone of saturation constitutes ground water source. Ground water is normally beyond the reach of vegetation and is usually free from evaporation losses. Ground water sources are less severely affected by vagaries of rainfall than surface water resources. Generally, ground water is clear but harder than the surface water of the region in which they occur. In KLMC area, main ground water sources are tube wells, shallow wells, public wells etc. 75% of people depends on open wells as the main source of drinking water except in coastal areas. People living nearby the coastal areas depend on piped water supply. Also, in the coastal areas well water cannot be used for drinking purpose due to saline intrusion. In addition to shallow wells there are

about 39 tube wells in the KLMC area contributing 8 MLD of water to the distribution system.

16.2 WATER SUPPLY SCHEMES

Major water supply systems on which the planning area depends for the piped water supply are Quilon Water Supply Scheme (QWSS) and Japan International Corporation Agency (JICA) Project

- **Quilon Water Supply Scheme**

Quilon Water Supply Scheme (QWSS) is a comprehensive water supply scheme commissioned in 1958 with Norwegian aid and was augmented in 1997 with World Bank aid. Sasthamcotta fresh water lake located nearly 26 km away from KLMC limit is the source of this water supply scheme.

Water is extracted from the lake and further it is treated using rapid sand filters in two plants with a capacity of 22.5 MLD and 37.5 MLD. However, the plant under QWSS with capacity of 37.5 MLD alone is functioning; the old tank is defunct. Hence the capacity of lake cannot be fully utilised. Raw water from the lake is pumped into the water treatment plant located at Sasthamcotta itself and the water treated in the plant is then conveyed to a 20 lakhs liters capacity sump located at Anandavalleeswaram in KLMC area through 750mm diameter cast iron pipes laid for a length of about 26 km. From this main sump water is pumped to 12 overhead Service Reservoirs located at various parts of the KLMC area for distribution. Even though the installed capacity of water treatment plant at Sasthamcotta is 37.5 MLD, only around 34.5 MLD is being produced at present. Out of these quantities produced, only around 20 MLD is reaching KLMC while the balance is being spared for the way side beneficiary grama panchayaths. The schematic diagram of Quilon Water Supply Scheme is shown in figure 16.2.

- **Japan International Corporation Agency (JICA) Project for water supply**

A Water supply project aided by JICA is called Meenad Scheme. This scheme is larger than QWSS and being implemented by KWA. Five projects in five different locations in Kerala are functioning under this scheme. The project has four components: (1) Intake (pump house), (2) Water Treatment Plant, (3) Transmission Main Line, and (4) Overhead Service reservoirs and Water Distribution Lines. Under the JICA project, Kallada river is identified as the new water source

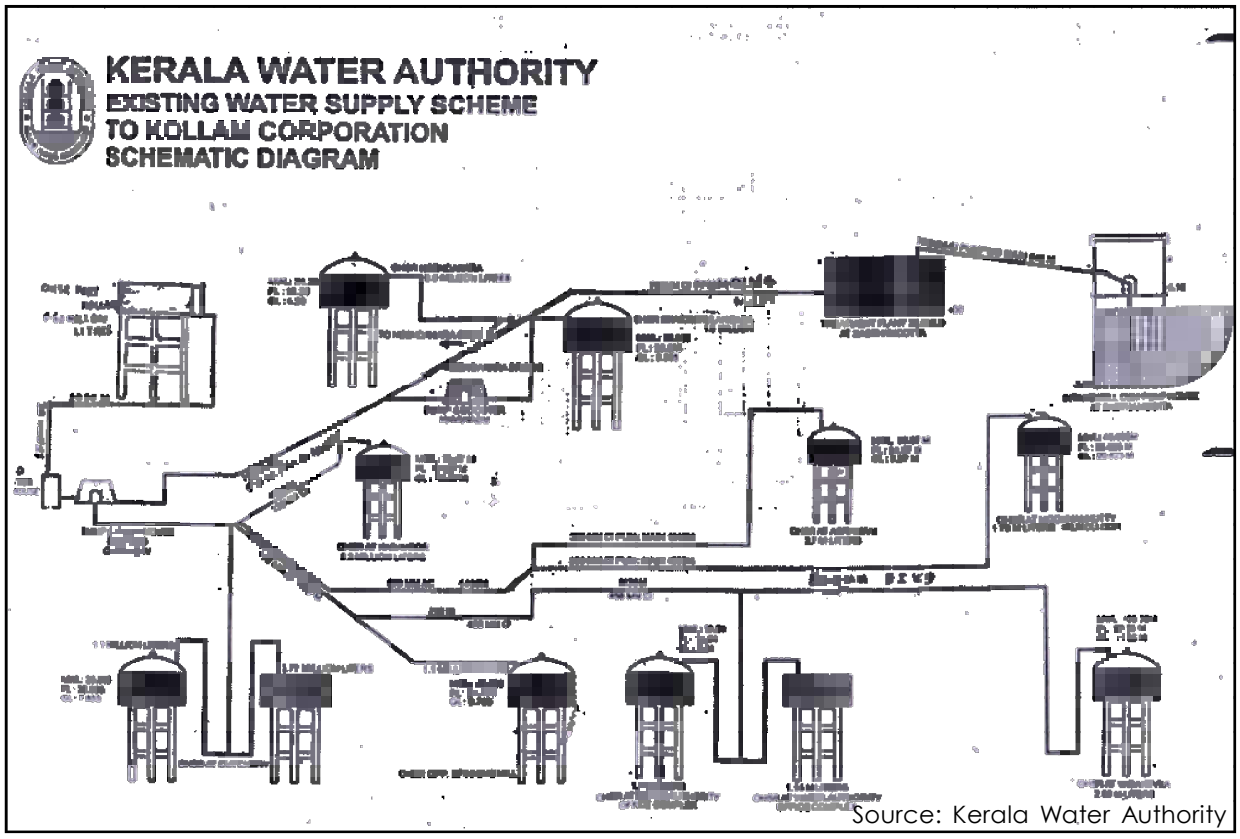


Figure 16.2 Schematic diagram of quilon water supply scheme

which is about 50 km away from Kollam city. It is expected that it would significantly reduce the pressure on the shrinking Sasthamcotta freshwater lake.This scheme supplies 73 MLD of drinking water to the entire district out of which 4 MLD of water is supplied to KLMC area. The project includes interconnection of Meenad scheme with Kerala Water Supply Scheme (KWSS) using 250 mm diameter pipe from the Kottiyam Reservoir to the Pazhayattinkuzhy Reservoir. Under this scheme water is supplied to 21 wards in KLMC area (figure 16.3).

16.3. WATER SUPPLY STORAGE SYSTEM

The treated water from all the schemes is stored in a sump at Anandavalleswarm with a capacity of 2 ML. This treated water is pumped to the service reservoirs and conveyed to 12 overhead tanks (OHT) (figure 16.4) in the KLMC area and thereafter distributed in each ward (table 16.1) through the distribution network.

16.4 DISTRIBUTION NETWORK

Water distribution lines of various pipe sizes from 50 mm to 450 mm have been laid within the city with a total

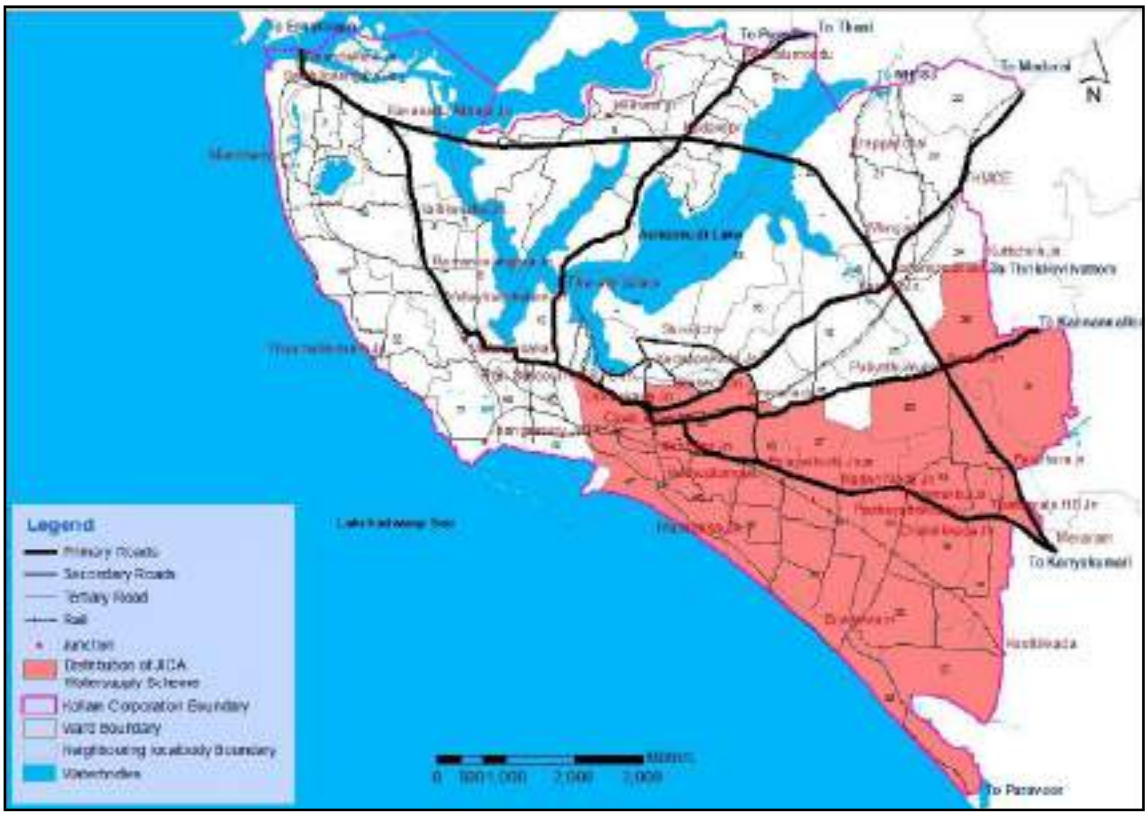


Figure 16.3 Map showing distribution area of water under JICA scheme

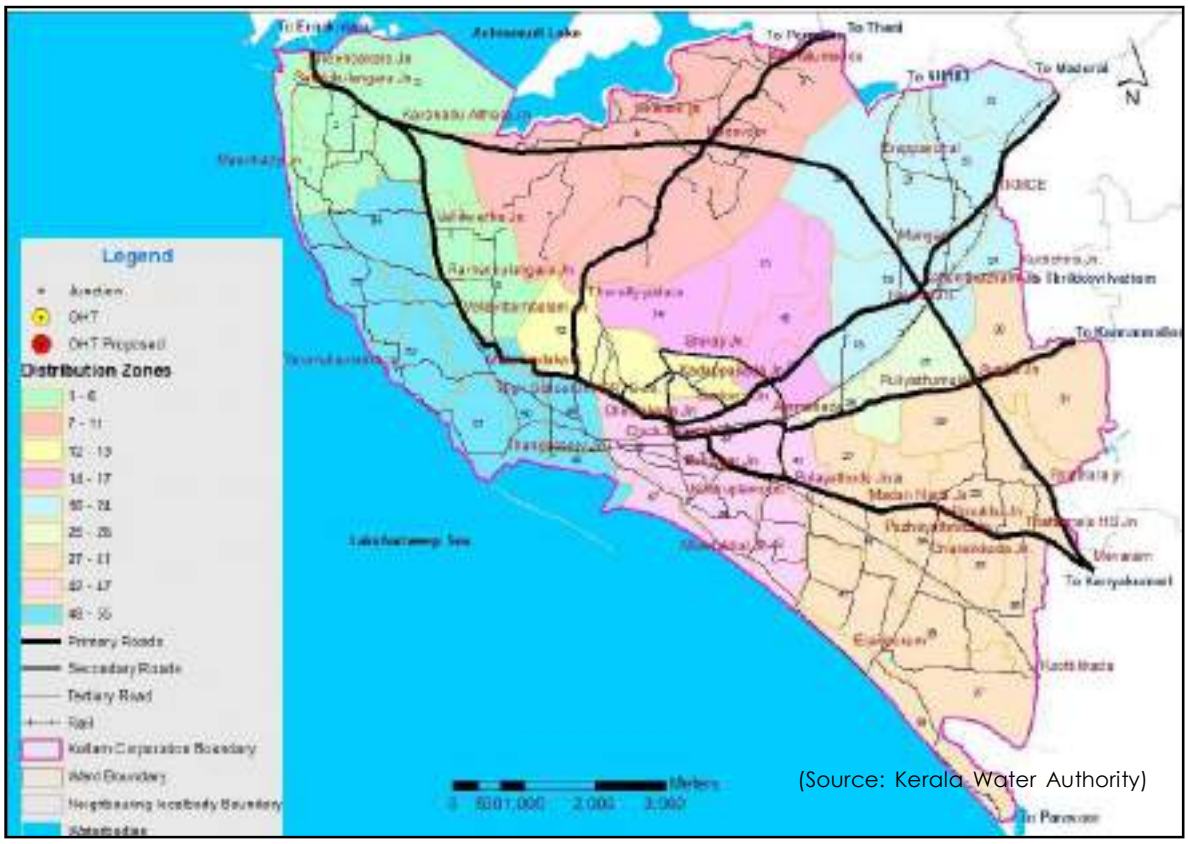


Figure 16.4 Map showing the location of overhead tanks

WARDS	No. of overhead Tanks/Reservoirs& Capacity	Source & Capacity of WTPS	Treated supply as % of total water supplied
1-6	1 over head tank/20 lakh litre	Sasthamcotta lake (20 MLD)	75.00 %
7-11	2 OHT/4 Lakh litre	Tube well	
12-13	1 OHT/ 11 Lakh litre	Sasthamcotta lake (20 MLD)	
14-17	1 OHT/ 20 Lakh litre		
18-24	1 OHT / 20 lakh Litre		
25-26	Tube well /1000 0 litre	Tube well	
27-41	2 OHT/ 20 Lakh litre	Sasthamcotta lake (20MLD) and Kallada river (4 MLD)	
42-47	2 OHT/ 22 Lakh litre		
48-55	2 OHT/48.5 lakh litre	Sasthamcotta lake(20MLD)	

(Source: Kerala Water Authority)

Table 16.1 Capacity of service reservoirs

length of about 363 km. Most of the area within the city is covered with the distribution lines but about 44% of the households are covered with the piped water supply systems. The water distribution network of KLMC area is shown in figure 16.5.

16.5 COVERAGE AND CONNECTIONS

In KLMC area, around 86% of the people have access to piped water supply either via direct house connections or from public stand posts. Also, 3,650 public taps have been installed by KWA for the poor. Around 39 tube wells are constructed within the KLMC limits. As per the KSUDP survey, 75% of the households are dependent on private wells. However, no treatment is given to the water extracted from tube wells and shallow wells. Also, in the coastal areas well water cannot be used for drinking purpose due to saline intrusion. There are about 40975 household connections in KLMC area of which

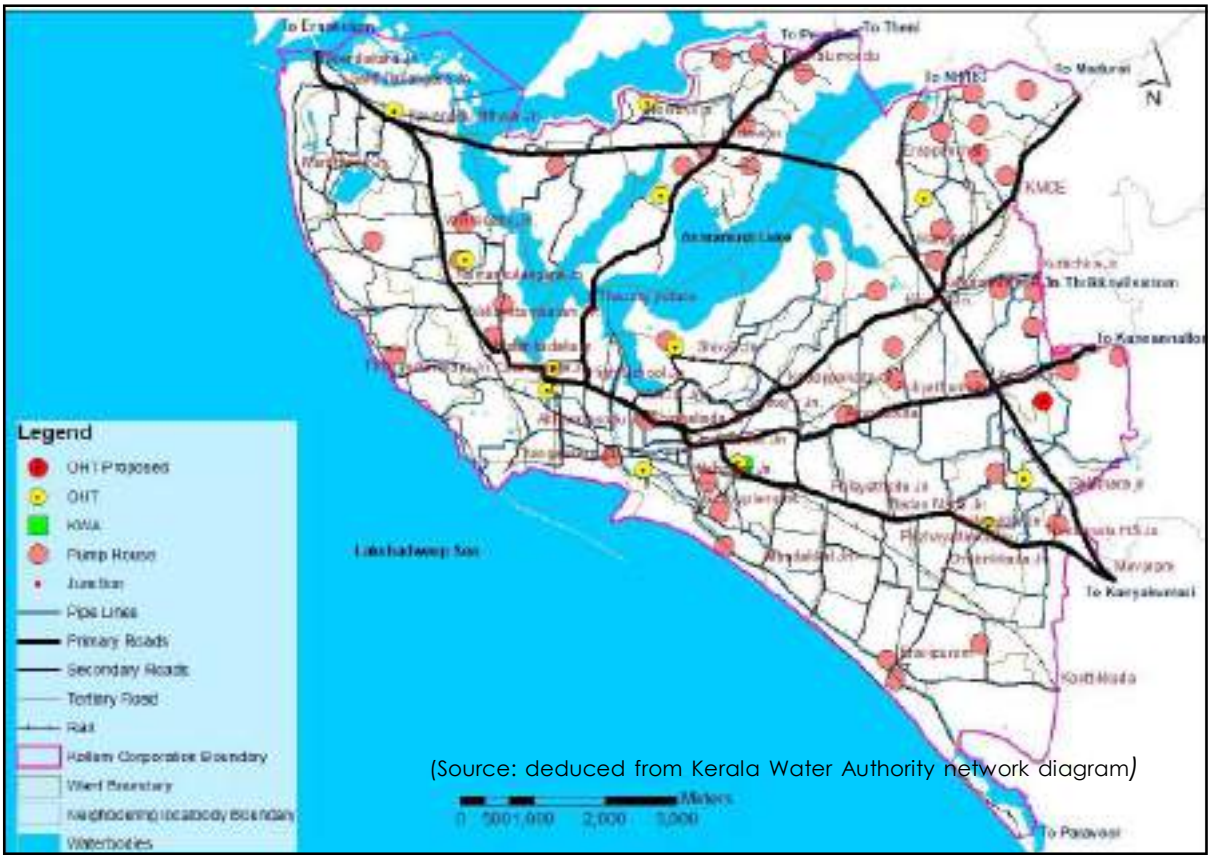


Figure 16.5 Map showing water distribution network of water supply schemes

34550 household connections have treated water supply and 6425 connections from tube wells were already in place for supplying untreated water in KLMC area. The details of coverage and connections are shown in figure 16.6, consumption details are given in table 16.2

16.6 QUALITY OF WATER

The water found in nature contains several impurities in varying amounts. Wholesome water is that water which does not contain anything harmful to human health. Water required for domestic consumption should be free from bacteria and suspended/ dissolved/ organic impurities.

Sl No:	Type of Consumption	No. of connections
1.	Domestic Connections	40975
2	Coverage	44%
3	Non-Domestic Connections	2000
4	Total Public Taps	3650
5	Industrial Connections	35

(Source: Kerala Water Authority)

Table 16.2 Type of consumptions in KLMC area

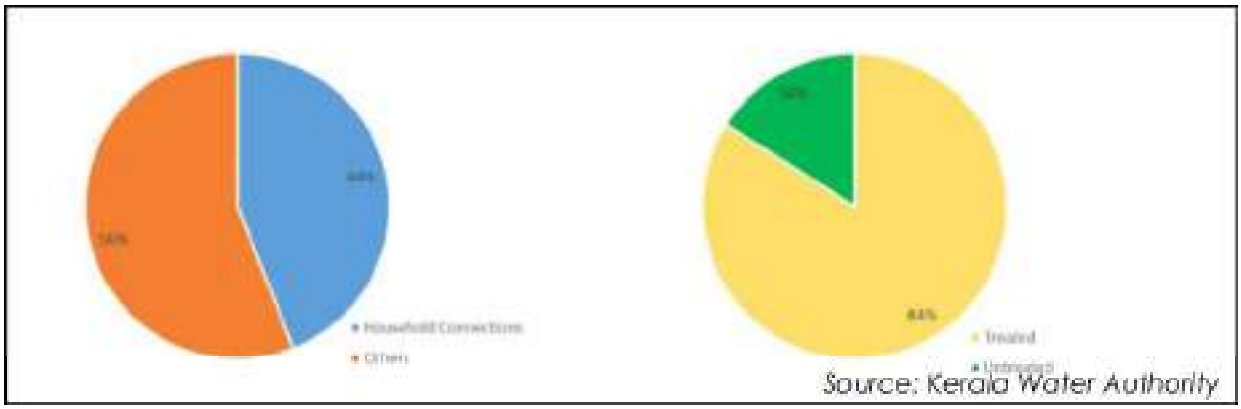


Figure 16.6 Coverage and connections of water supply

The report on the analysis of water from the quality control division, Kollam is shown in table 16.3. The sampling points are 1.Raw water, 2.Treatedwater, 3.Tap near Chinnakada, 4,5,6,7 are Tube wells at Kilikolloor, Vadakkevila, Kollam Town, and Eravipuram respectively.

All the sample collected from various sample points found satisfactory with respect to drinking water standards except for P^H and iron

Sl No:	Characteristics	Units	Desirable Limit	Actual Contents						
				Sampling Points						
				1	2	3	4	5	6	7
1	Turbidity	NTU	1	0.4	0.6	0.7	0.3	0.3	0.4	0.2
2	pH		6.5-8.5	7.06	7.25	7.22	7.07	6.12	-	5.56
3	Electrical Conductivity	µs/cm		96	97	95	352	292	74	291
4	Acidity	mg/litre		2		NIL	16	12	8	16
5	Alkalinity	mg/litre	200	24	22	24	82	54	18	136
6	Sulphate	mg/litre	200	3.52	3.52	3.41	2.42	5.71	1.65	1.43
7	Total Dissolved Solids	mg/litre	500	48	49	48	167	143	37	141
8	Total Hardness	mg/litre	200	26	24	26	42	44	22	66
9	Calcium (Ca)	mg/litre	75	8.0	6.4	7.2	12.0	7.2	6.4	16.8
10	Magnesium (Mg)	mg/litre	30	1.46	1.94	1.94	2.92	6.32	1.46	5.83
11	Chloride (Cl)	mg/litre	250	20	18	18	54	86	18	16
12	Fluoride	mg/litre	1	0.69	0.82	0.50	0.41	0.72	-	0.64
13	Iron (Fe)	mg/litre	0.3	0.20	0.43	0	0.20	0.38	-	0.31

(Source: Kerala Water Authority)

Table 16.3 Report on analysis of quality of water

content. PH value in Vadakkevila and Eravipuram sample is lower than the standard value which means acidity is more in water supply from these source iron (Fe) content in sample 2 and sample 5 exceeds the permissible standards.

16.7 FREQUENCY OF SUPPLY

KWA is able to supply about 32 MLD water. Majority of water supply connection in KLMC area is provided with a daily water supply less than 6 hours in the morning every day. The details of frequency of water supply in KLMC area is given in table 16.4. and service level benchmarking of water supply is given in table 16.5.

Based on the above mentioned (table 16.5) the service level of KLMC area as per MoUD, coverage of household is only 44% and per capita supply (57.5 lpcd) is need to be increased. Continuous water supply is limited to 2-3 hours on average. As the supply of clean drinking water is one of the main thrust areas of the mission, KLMC has to increase the supply of quality drinking water.

Duration of Supply	No. of Connections	Treated water	Untreated water
0 -3 hrs	17575	17575	0
3-6 hrs	13550	13550	0
6-8 hrs	9850	3425	6425

(Source: Kerala Water Authority)

Table 16.4 Frequency of water supply

SI No:	Water supply	Existing	Required as per MoUD Guidelines
1	Coverage of HHs water supply connections	44%	100%
2	Per capita supply of water	57.5 lpcd	135 lpcd
3	Extent of metering of water connections	40%	100%
4	Extent of non-revenue water	20%	0%
4	Continuity of water supply	2-3 hrs	24 hours
5	Efficiency in collection of water supply related charges	80%	100%
6	Quality of water supplied	95%	100%

(Source: Hand book of service level benchmarking - MoUD)

Table 16.5 Service-level benchmarking – water supply

16.8 WATER SCARCITY

From the socio-economic survey conducted in 2019, it is observed that severe water scarcity is seen in Kilikolloor ward and 10 wards seen medium scarcity and 44 wards having sufficient water availability (figure 16.7).

16.9 EVALUATION OF MAJOR PROJECTS

16.9.1 Augmentation of WSS to KLMC (Njankadavu Project)

This project is implemented mainly to meet the increased demand for water within KLMC area. The source of water is Kallada river. This scheme is proposed with an Ultimate Plant Demand Capacity of 100 MLD. The beneficiaries are KLMC and Kottamkara Panchayat. The project is implemented by availing fund for scheme AMRUT and KIIFB, to the time of Rs.78 crores and 235 crores respectively. This project is carried out in two phases: Phase 1 under AMRUT and Phase 2 under KIIFB. Schematic diagram of Njankadavu Project is shown in figure 16.8. Augmentation of WSS to KLMC Phase I under AMRUT

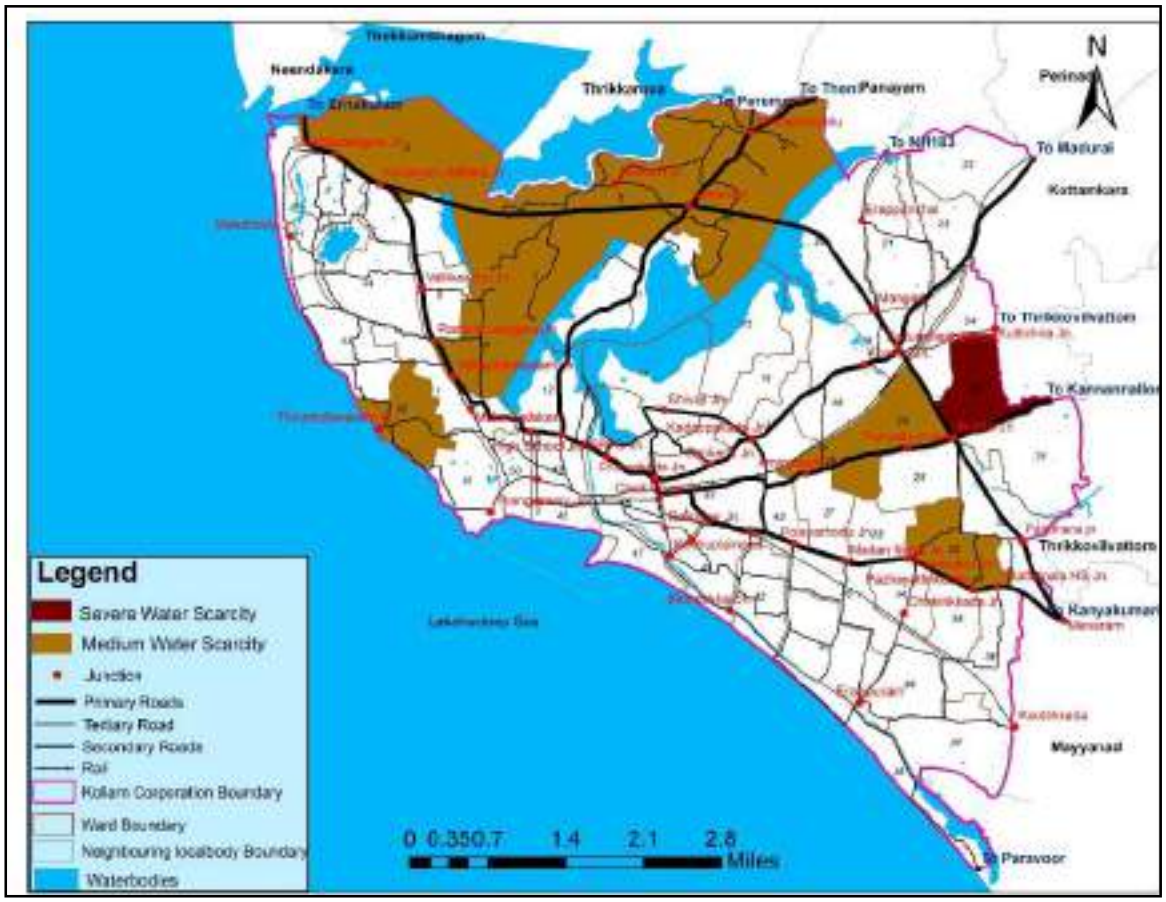


Figure 16.7 Map showing water scarcity wards in KLMC

consists of design, construction and commissioning of 100 MLD water treatment plant at Vasoorichira. Phase 2 consists of supplying, laying, commissioning and maintaining 1016 mm diameter 8.8 mm thick mild steel clear water pumping main from treatment plant at Vasoorichira to overhead service reservoir at Manichithodu and from Manichithodu to Anandavalleeswaram and construction of 54 lakh liter overhead service reservoir at Manichithodu.

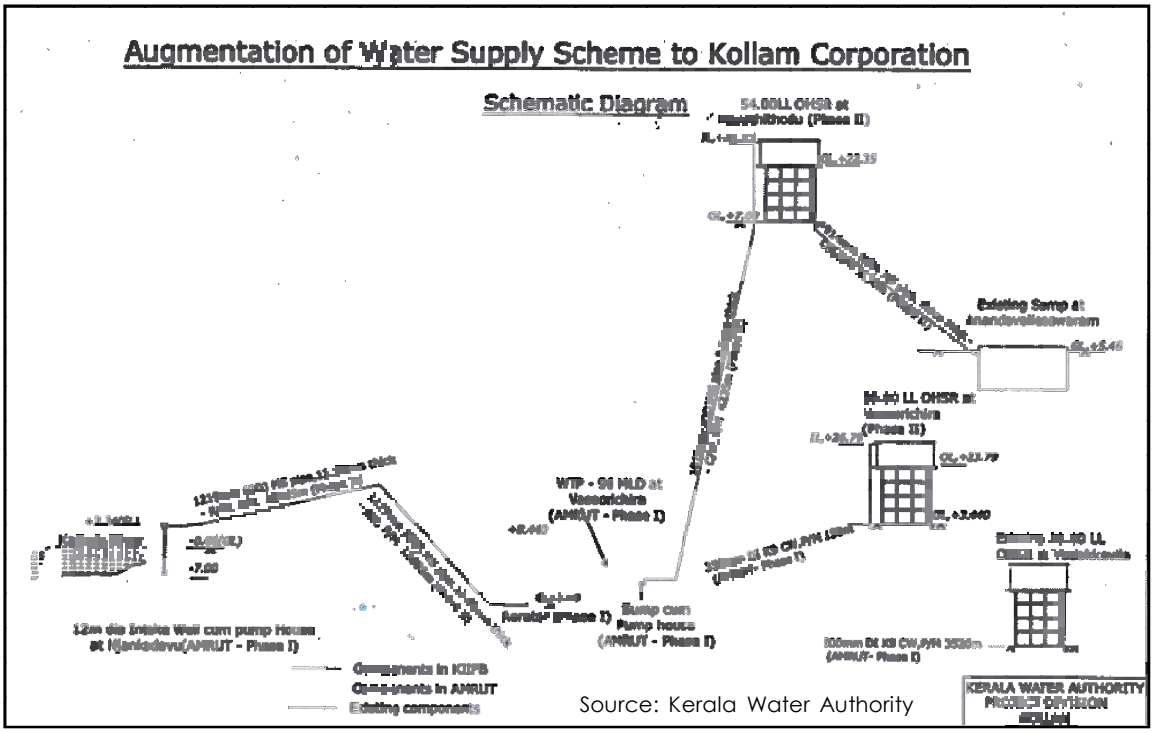
16.10 Water Demand vs Supply

The average duration of water availability through piped water supply is about 2-3 hours. Current water demand in Kollam city is calculated for a projected population of 417151 as follows:

- Water demand for domestic use = 135 lpcd
- Other users like ice-related industries, institutions and firefighting = 25 lpcd
- Current population of the city for the year 2021 = 417151Nos (projected from census 2011)= **A**



Proposed OHT at Vasoorichira under construction



Source: Kerala Water Authority

Figure 16.8 Schematic diagram of Njankadavu project

- Treated water supplied to the city = 32 MLD= **B**
  - QWSS = 20 MLD
  - From tube wells = 8 MLD
  - JICA Project For Wwater supply = 4 MLD
- Approximate rate of water losses 25% = 8MLD = **C**
- Actual water supplied to the city= 32 MLD - 8 MLD = 24MLD = **D**
- Percapita supply = **D/A =** 57.5 lpcd=**E**
- Water requirement of the city= 185 lpcd = **F**
- **Current water demand,G=F*A/(1-C) =102.8 MLD say 103 MLD**
  Backlog=103-32= 71 MLD

16.11 DEVELOPMENT ISSUES

Major development issues identified are listed below.

- Water requirement of the KLMC area is about 92 MLD, but the existing system is able to supply about 32 MLD water.
- Shallow wells are the major sources of water for more than 60% of households in KLMC area, but the water from open wells and tube wells is untreated. Hence, water-borne diseases are frequent especially during monsoon season.
- Lack of assurance on the quality of water supplied by KWA and low frequency of water prevent, households from shifting to piped water supply from private wells.
- Frequency of water supply varied from 8 hours to ½ hours a day in KLMC limits. It implies a huge demand/supply gap, which is likely to widen further in future if immediate measures are not taken to complete the augmentation of WSS.
- Existing water supply system was commissioned in 1960 and the network is in dilapidated condition. Hence contamination of water due to leakage in pipes, resulting infiltration of storm water and ground water frequently during the monsoon season, along with frequent interruption of supply experiences in many places.
- Carrying capacity of existing distribution system is inadequate to meet the current demand.
- Low pressure and uneven distribution of water.
- Present source of water, the Sasthamcotta lake, is on the verge of drying up and cannot meet future demand for water supply.

- The regulatory mechanism to oversee the functioning of the sector and to fix service standards as well as tariffs, to meet capital and operating expenditure is lacking.
- Though rain water is the cheapest source of drinking water if harvested properly, this source is not yet tapped to meet the drinking water demand.

CHAPTER - 17
WASTE MANAGEMENT

Urban areas especially in cities of Kerala are facing lot of issues related to waste disposal due to lack of suitable land for treatment and safe disposal. Environmental degradation of land and water are the tangible impact of improper waste disposal. All the above factors affect public health which in turn will retard the Socio-economic development of cities. This chapter mainly deals with the existing solid waste management system in the planning area and also its issues and management techniques etc.

17.1 SOLID WASTE MANGEMENT

The solid waste management system includes

- Collection
- Segregation
- Conveyance
- Treatment
- And disposal

In order to understand the above process, one should know about the quantity and quality of solid waste generation.

Quantity of Solid waste

Quantity of waste generated in Indian cities are assessed as 210gm - 350gm/capita/day and in some cases it can go upto 500 gm/day as per the studies conducted by National Environmental Engineering Research Institute (NEERI). Also KSUDP in its survey conducted in 2006 through sample survey had assessed that per capita waste generation in Kollam city is 434 gm. As the city is vibrant in trade activities, the waste generation may be on the higher side for KLMC except liquid waste management and storm water management with special focus on key issues associated with this aspect. As per the deduced census data 2011, the total population for the KLMC area is 387942. The total solid waste generated for the year 2011 was calculated as 168.366 MT/day (387942 x 434). Accordingly, the total waste generation for the year 2041 for KLMC area is calculated as 218.638 MT/day (503775 x 434).

Quality of Solid Waste

The major share of solid waste is coming from domestic, commercial establishments, markets, marriage/ function halls, schools/institutions, slaughter house, hospitals, industries,

construction/demolition, street sweeping etc. The compostable organic matter contributes the maximum share of total waste generated at dump site (79%) and at secondary collection point (84%) based on the physical analysis carried out by KSUDP. If the bio-degradable matter is segregated at source of generation and utilized for producing non-conventional energy and for making bio-fertilizers, quantity of inorganic waste for treatment and disposal will be marginal. As per the technical details of 1cum family size bio-waste treatment plant, 2 kg of solid waste along with 20-30 litres of wastewater can produce 0.5 kg LPG and 20 litres of liquid fertilizer. Hence for effective method of solid waste disposal, segregation of bio-degradable waste is essential. From the chemical composition of waste, study conducted for KSUDP, it is found that Carbon/ Nitrogen ratio is 26.25 and 25.82 at collection point and dumping site, it indicates waste is suitable for bio-conversion.

17.1.1 Collection of Waste

KLMC area is divided in to 10 health circles for organizing sanitary works. These health circles are responsible for the management of sanitation waste from waste collection up to disposal. The zone-wise details are shown in the (figure17.1). There are 10 health inspectors and 307 Haritha Karma Sena workers are engaged for

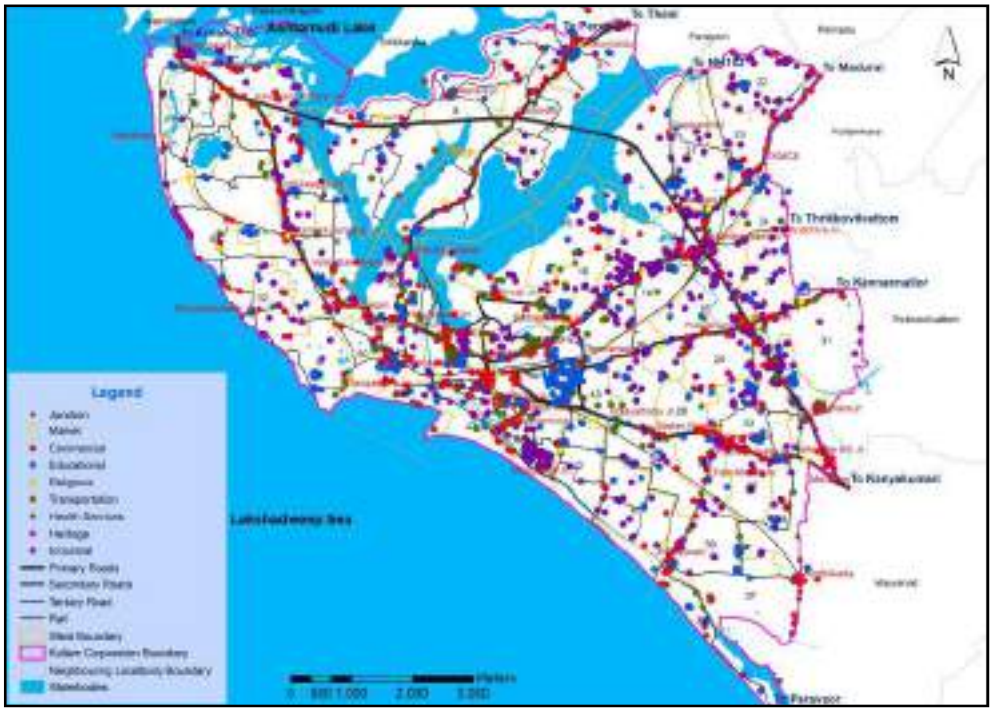


Figure 17.1 Health circles in KLMC area


Waste Dumping on public space


Burning of solid waste without any treatment in coastal areas


Waste dumping on water-logged area

doing the whole activities of solid waste management in these circles. Haritha Karma Sena is involved in the collection of solid waste from house hold level around 177 numbers labors are deputed for this activity. Waste is collected from households once or twice in a month and once in a week from commercial establishments. Eravipuram zone has the highest number of Haritha Karma Sena workers 33 nos and Thevally having the lowest of 6 numbers. Door to door collection for dry waste is only 47% and wet waste is 9% from household level and from the establishment's dry waste collection is only 17.5% and there is no wet waste collection from the establishments (figure 17.2). Burning and dumping at owners compound or a common place outside the premises are the current practices for waste disposal. Corporation sanitary workers collect these dumping waste to nearby areas for burning/burying instead of treatment. Street sweeping is also the responsibility of sanitary workers; they do it on the major road stretches in the KLMC area.

17.1.2 Conveyance

Now KLMC is equipped with 2 tippers, 1 dumper placers, 1 pickup to transport solid waste to dumping site.

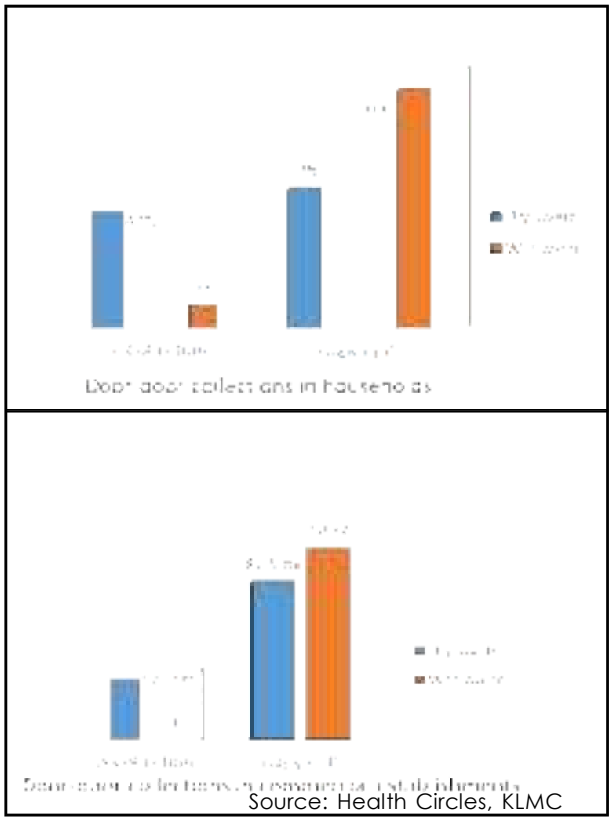

Source: Health Circles, KLMC

Figure 17.2 Door-door collection details of KLMC

A petty auto rickshaw is provided by Thrikkadavoor zone for collecting and conveying waste to biogas plant.

17.1.3 Treatment and Disposal

KLMC could not develop proper treatment facility so for managing solid waste due to public protest. There is a land fill site at Kureepuzha where the waste conveyed from KLMC is dumped without any kind of sorting and recovery facility. It is located near the Ashtamudi Lake so that during monsoon season the leachate directly percolates through the soil to the nearby lake and ground water resulting pollution of lake water. Public of nearby areas of the site rises dispute and strikes against the unscientific dumping and resulted closure of the plant. Total capacity of the plant was 60MT/day and the method adopted was windrow composting. About 40MT/day was achieved in the first phase .KSUDP developed operation strategy for this project and also installed biogas plants at various locations of KLMC area. Unfortunately the waste management of KLMC remains as a thriving issue till date.

Presently decentralized treatment facilities for house hold and community level are adopted by providing pipe compost, portable type biogas plants, community level biogas plant, aerobic composting plant, bio composter treating etc. For commercial establishments, marriage/ function hall the waste generator is responsible for its management as per SWM Rules 2016. Bio degradable waste from commercial establishments are collected by private agency for pig farms. A waste to energy plant of 200 Tpd with a Bio-Methanisation plant and a refuse derived fuel unit was proposed by Government of Kerala at Kureepuzha aiming to achieve 100% management of Municipal Solid Waste with a vision of Zero Waste City. Wastes from markets and street sweeping are collected and disposed to Bio-Methenation plant or Thumboormuzhi model areaobic compost plant. Bio-degradable fraction in the municipal solid waste will be processed using bio-methanation technology. Non biodegrable wastes are collected by Haritha Karama Sena, shredding and bailing of these wastes are carried out at Anchalumoodu MRF (Material Recovery Facility) center. KLMC established 7 MCF, 1 RRF and the requirement is 275 MCF and 2 RRF.

Plastic shredding is carried out at the rate of 500 kg/week. Capacity of shredding machine is 90 kg/hour and



Vegetation Growth over Dumped Waste

that of bailing machine is 120 kg/hour. Shredded plastic is used for road construction purpose. Bailed plastic is collected by various private agencies for recycling. Now the unit is not functioning properly due to maintenance of machineries. An ETP (Effluent Treatment Plant) is installed in slaughter house area but due to improper maintenance slaughter house is not functional now a days. Hospital waste collected is collected by a private agency called IMAGE and construction, demolition waste is used for land filling. Figure 17.3 shows waste management facilities provided by KLMC.

17.1.5 ISSUES

Various problems related to solid waste management in KLMC area are listed below.

- Banned solid waste management plant at Kureepuzha is the only space for centralised and processing safe disposal of solid waste. Bio mining of accumulated solid waste in Kureepuzha chandi depo is not yet finished.
- Previously dumped solid waste now seen like a vegetation hill. Bio mining and segregation of these waste need to be completed urgently so that issues like pollution of Ashtamudi and public protect for starting treatment facilities including for sewage treatment plan can be solved.
- Public objection against land acquisition for treating and disposing solid waste.


Thumboormuzhi model waste treatment facility at Chamakkada Market


Thumboormuzhi model waste treatment facility at Anjili road


MCF Near vadakkevila zonal office


Bio-gas plant at Collectorate compound


MRF at Anchalumoodu old block office


Proposed MRF at Kochalumoodu Mini Industrial estate





Bailing machine at MRF



Figure 17.3 Existing waste management facilities of KLMC

- Waste dumping into Ashtamudi lake and other water bodies, along the road sides and vacant land creates land and water pollution besides spoiling the aesthetics of city, spreading of diseases, creating stray dog issues and creating eyesore to the tourists.
- Existing dumping site at Thamarakulam area where waste is dumping without any segregation if not converted into a proper sanitary fill site will create issues severe than that of Chandi depo as the site is in the heart of the city.

- Monetary value of waste is not recognised by the people as there is not much model projects for converting waste to energy there by generating money.
- Through Haritha Karma Sena is functioning in all wards waste generated at source is not fully collected as many households and commercial establishments are reluctant to segregate, store and hand over to Harithakarma sena. Instead this waste is either burn or deposited along road side, water bodies or at vacant land.
- Due to the absence of an enforcing mechanism for handing over the

waste to Haritha Karma sena and also for paying the monthly charge Haritha Karma sena members are not getting regular income.

- Basic facilities such as drinking water, sanitation facilities, rest place etc are absent in the existing RRF.
- Lack of awareness of waste management techniques from household to community level result in throwing, open dumping, burning etc.
- Holistic approach in managing solid waste is not in place.

The potential for solid waste management system in KLMC area are identified and listed below:

- Dumping site at Kureeppuzha is suitable for aerobic treatment units for Bio-degrable wastes, Windrow composting, Thumboormuzhi model composting methods. The site can manage large quantity of biodegradable waste to manure. And these manure can be marketed for value added products in the label of KLMC.
- Bio-gas plant installed at market area if maintained and functioned proper, significant quantity of bio deportable waste can be disposed besides generating energy to maximum.
- RRF/MCF will help effective segregation of waste into reusable materials so that if can generate money and employment.

17.2 LIQUID WASTE MANAGEMENT

KLMC area is enriched with varieties of water bodies like wells,ponds, canals especially Kollam Thodu, lakes (AshtamudiLake, Vattakayal, Kattakayal) etc. Hence maintaining the quality of water is one of the major problems where the method of disposal of sewage is unscientific. For example household level liquid waste management is done through septic tank or pit latrine which can cause contamination of water bodies where the soil is highly permeable. As a result, the quality of raw water supplies to water treatment plant becomes unsuitable and well water cannot be used as drinking water. Ward wise household level liquid waste management systems adopted in corporation area are shown in figure 17.4. From the figure it can be seen that pit latrine is found more in Alattukavu used of which presence of water body such as Ashtamudi lake, Vattakayal etc are also seen. Hence septage

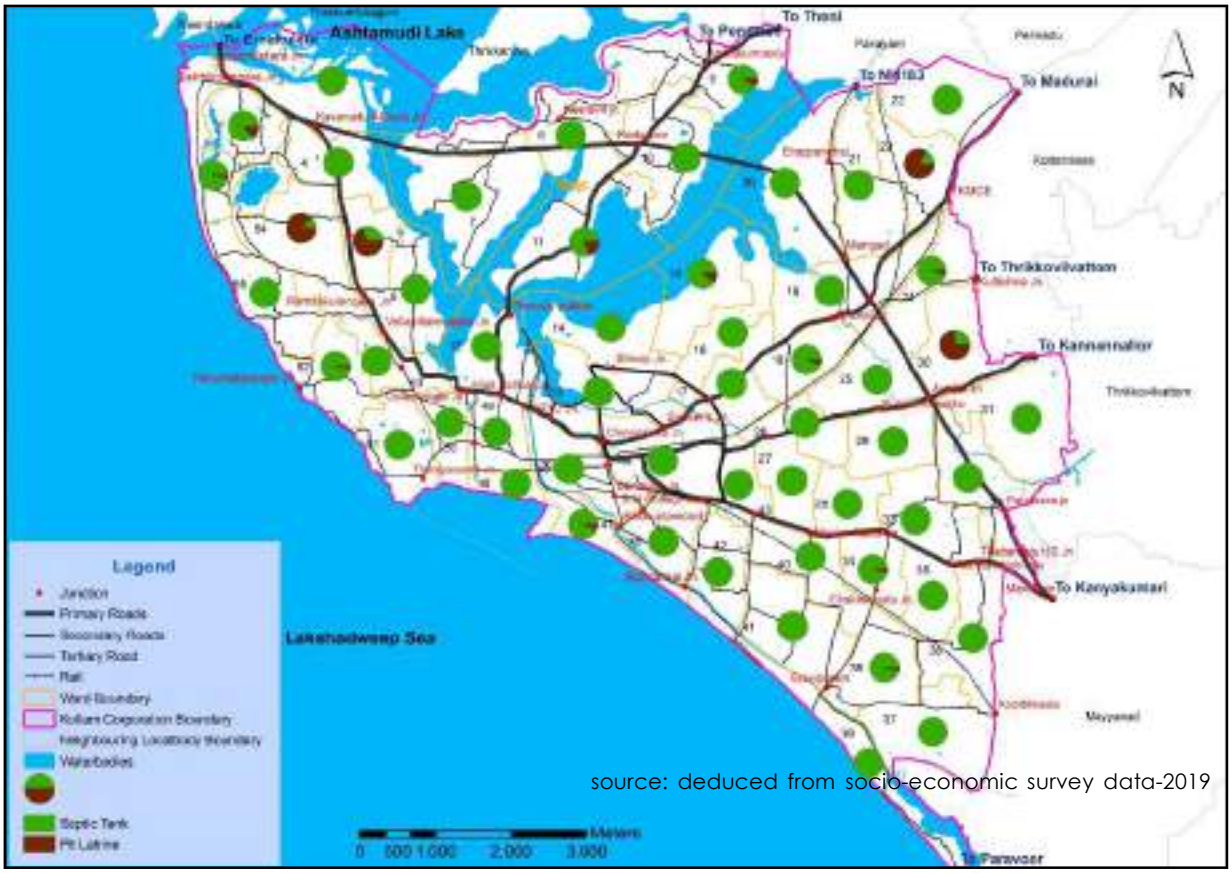


Figure 17.4 Ward wise household level liquid waste management

management is found very much essential in these areas.

At present the planning area is not fully covered with proper sewerage network system. A project was initiated in 1975 for sewage treatment plant, for the liquid waste management of then KLMC area (18.48 sqkm.) Under this project sewer lines of total length 38 km and pumping main for 3.35 km was laid. However the work was stopped due to lack of funds. Municipality upgraded as Municipal Corporation in 2015 and area of the local body has increased to 71.73 sqkm with a population of 387942 persons.

17.2.1. Suitability of System

In order to assess which means of sanitation facilities are suitable for the area, the average size of plots in each of the wards in the KLMC area is analysed in the year 2011 and shown in figure 17.5. From the figure it was found that the average size of plot in most of the wards in KLMC is less than 15 cents. Now after being a decade, the average size of the plot at the core area will be even less than the size of the plot at that time. So, absence of


Ashtamudi Lake
To Thevalakkara
To Perinad
To Thevri
To Mayyanad
To Mathilil
To Madanad
To Thekkumbhagam
To Kanjavelil
To Kanjavelil
To Kanjavelil

QUANTIFICATION OF LIQUID WASTE GENERATED-KOLLAM CORPORATION							
Sl No	Type of Establishment	No	LPCD	Total No.of Seats/beds/users	Total water consumption/day (L)	Quantity of waste water generated/day (L)	Remark
1	2	3	4	5	6=(4)*(5)	7=(6)*0.75	
1	Hotels / Lodges	85	180/ bed	2240	403200	302400	
2	Restaurants	200	70/ seat	7500	525000	393750	
3	Resorts	34	180/ bed	625	112500	84375	
4	Hospitals with number of beds exceeding 100	8	450/ bed	2250	1012500	759375	
5	Hospitals with number of beds less than 100	12	340/ bed	379	128860	96645	
6	Nurse homes	35	135	2250	303750	227812.5	
7	Hostels	50	135	1500	202500	151875	
8	Boarding schools & colleges	12	45	2200	99000	74250	
9	Day schools & colleges	113	45	82504	3712680	2784510	
10	Offices	170	45	9500	427500	320625	
11	Factories	6	30-45	3750	168750	126562.5	
12	Cinema halls/concert halls/auditoriums	72	15	25500	382500	286875	
13	Apartments	40	70	3000	210000	157500	
14	Any other establishments	20469	45	102345	4605525	3454143.75	Total number obtained from assessment Register of Kollam Corporation and no.of persons calculated based on the assumption that 5 persons/ establishment. Water consumption assumed to be same as that of offices
15	Total quantity of water consumed(L)				12294265		
	Total quantity of grey water (75% of water consumed)(litre/day)					9220698.75	
	Total quantity of grey water (75% of water consumed) (KLD)					9220	

Table 17.1 Quantification of liquid waste for grey water

Population of Kollam (2011 census)	3,87,942
Projected population for 2021	4,17,151
Projected population for 2041	5,03,775
Total quantity of grey water for 2021	9220 KLD
Total quantity of grey water For 2041	11,134.59 **say11 MLD** (i.e. 9220*503775/417151)

Table 17.2 Projected quantification of liquid waste for grey water

Option1: The report "Human Excreta Management in Urban Kerala: Towards Sustainable Options State-Wide by World Bank" gives the quantity of septage generation in the 93 urban local bodies of the State. As per this document, the quantity of septage generated in KLMC area is given as **126 KLD**.

Option:2: IS Code (CSE, 2017)

The IS Codes (CSE, 2017) suggest a value of 120 litres/capita per year as the septage generation rate in Indian conditions. As per this calculation, the quantity of daily septage generated in KLMC area is given as **165.62 KLD**. The details of the calculation are given in table 17.3.

Based on the estimated quantity of septage generated in Kollam as per both the methodologies (option 1 & 2), an average of both the values (126 KLD and 165.62KLD) of septage generation is taken for further calculation purposes. Therefore, the quantity of septage generated in KLMC is obtained as 145.81 KLD. It is assumed that 50% of the septage would be collected. This is the quantity of septage taken for the design of a treatment plant. The details of the calculation are given in table 17.4.

Quantity of Total Liquid Waste Generated

The total quantity of liquid waste generated in the town is the cumulative of the quantity of grey water and septage generated.

Total quantity of liquid waste = quantity of grey water + quantity of septage = 11000 + 72.905 = 11072.905 **say 11MLD.**

Population of Kollam	5,03,775
Septage generation rate	120 L per capita per yr
Annual septage generation in Kollam	6,04,53,000 L per yr (i.e. 120*5,03,775)
Daily septage generation in Kollam	165624.658 say **165.62 KLD** (i.e. 60453000 /365)

Table 17.3 Calculation of daily septage generation

Septage generated (Option 1)	: 126 KLD
Septage generated (Option 2)	: 165.62KLD
Septage generated (value taken for further calculation)	: 145.81 KLD (i.e. avg of 126 and 165.62)
Septage collected (@50% of generated waste)	: **72.905 KLD (i.e. 145.81/2)**

Table 17.4 Calculation of total septage collected

17.2.3 Selection of Treatment Technology for Liquid Waste

The selection of technology options shall depend on the efficiency of treatment, capex and opex parameters, land requirement and availability, ease of operations etc. In determining what kind of technological solutions will be relevant for the different settlement typologies, the current analysis thus took account of the following factors:

- The nature of urbanization in the state, especially urban- rural continum
- The soil and geo-hydrological characteristics – both at the State and within the ULSG
- Historical and planned investments in sanitation were also analysed to understand the infrastructure deficiencies and planned interventions.

In addition, the study took account of two practical consider actions:

There is a practice of decentralized management of waste prevalent historically in the state (for e.g. for grey water arising from kitchen/bath etc.) and cultivated and augmented through the solid waste management program wherein households are made responsible to manage household wastes within households.

There is the preference for "small" solutions (household or community level) instead of large infrastructure projects. This is partly due to space constraints and popular opposition / NIMBY syndrome faced by a number of waste management projects in the past.

The proposed technology approaches for KLMC area considering the size, class and hydro geological conditions is selected as small scale STP with Low network and Major Faecal sludge treatment plants, the dense core area will be served by the STP (for both grey water and faecal sludge), a faecal sludge treatment plant is to be proposed for the remaining area.

17.2.4 Extent of Land Required for the Plant

Based on the quantity of liquid waste (grey water and faecal sludge) and appropriate technology for the treatment of liquid waste for the local body is decided, the area requirement of the plot for the treatment plant is calculated. The standard is given below.

A. Sewage Treatment Plant (STP)

In the case of KLMC area, the quantity of grey water generated to be considered for design purposes is taken as 11 MLD. Therefore, from table 17.5, row 4, a land area of 1.50 acres is required for construction of STP. Further, adding another 25% land for office space, parking of vehicles and the like, the land area requirement is calculated in table 17.6 below:

As per the calculation, an area of approximately 1.875 acres is required for the design of STP plant with its accessory buildings and functions in KLMC area.

B. Faecal Sludge Treatment Plants (FSTP)

Note: Take 25-40 % of the land required for the treatment plant as space for office space, parking of vehicles etc.

CAPACITY	LAND AREA
upto 1 MLD	upto 25 cents
1-5 MLD	upto 50 cents
5- 10 MLD	upto 1 acre
10- 20 MLD	upto 1.5 acre
20 - 30 MLD	upto 2 acre

Table 17.5 Land area requirement for different STP capacities: standard values

In KLMC area, the quantity of septage generated to be considered for design purposes is taken as 72.905 KLD. Therefore, from table 17.7, row 3, a land area of 50 cents is required for construction of FSTP. Further, adding another 25% land for office space, parking of vehicles and the like, the land area requirement is calculated in table 4.8 below:

As per the calculation, an area of approximately 62.50 cents is

Capacity	Land area
10 - 25 KLD	upto 25 cents
25 -50 KLD	upto 30 cents
50-100 KLD	upto 50 cents
above 100 KLD	50 cents to 1 acre

Table 17.7 Land area requirement for different FSTP capacities: Standard values

Quantity of grey water generated (for calculation)	11 MLD
Land area required for STP	1.50acres
Land for office, parking etc (@ 25% of area of STP)	37.50 cents
Total land required	**1.875 acres**

Table 17.6 Calculation of Land requirement for sewage treatment plant in KLMC

required for the design of the FSTP plant with its accessory buildings and functions in KLMC area.

17.2.5 Public Toilets

Most of Our public toilets are constructed and maintained by ULB but the designs are outdated and the locations are not convenient to

Quantity of septage generated (for calculation)	72.905 KLD
Land area required for FSTP	50 cents
Land for office, parking etc (@ 25% of area of FSTP)	12.50 cents
Total land required	**62.50 cents**

Table 17.8 Calculation of land requirement for FS treatment plant in KLMC

women, child, and physically disabled persons. E-Toilets are installed in some places but most of them not in a usable condition. Figure 17.6 shows the public toilet facilities in corporation area. Due to improper maintenance as well as non-preferable locations, public toilets are not effectively utilized in KLMC area.

17.2.6 Issues

• Absence of Sewage Treatment Plant (STP) is the main reason for contamination of water body since no other practical alternative is available nearby area for sewage treatment.

The de-sludging is very important for septic tanks of residents, commercial establishment and public utility buildings etc. Current practice of emptying and dumping septic tank waste in to open places will lead to intense health issues to public.

- Lack of awareness of public about treatment of black and grey water
- Open defecation practiced at some places can cause contamination of water bodies and land pollution.
- Presence of hanging latrines along the side of Ashtamudi Lake.



E-Toilet at Thangassery light house area



SULABH model toilets at Polayathodu

- Lack of improper maintenance as well as non-preferable locations of public toilets in KLMC area.
- Availablity of land at Kureeppuzha Chandi depo can be considered as the main potential as land availability is very crucial in developing sewage treatment plant.

17.3 STORM WATER MANAGEMENT

City's drainage system consists of natural and artificial (constructed) drains. KLMC is blessed with large number of natural drains but due to dumping of waste free flow of water is obstructed in many places. KLMC area lies in the low land area of Kollam District. The average annual rainfall of



Figure 17.6 Public toilet facilities in KLMC area

Kollam District varies from 2500-3000 mm with heavy rainfall occurring in the months of June to August, after every rain, many people residing in low laying areas need to be evicted.

Flood occurred on the banks of Ashtamudi Lake, Vattakayal, Eravipuramkayal and paddy fields of Karikkuzhi ela, Mundakkal as shown in figure17.7 Hence storm water drainage system to be analyzed properly while making the development plan.

The list of natural and artificial drains used for disposing storm water is shown in table 17.9.

17.3.1 Present Scenario

At present there is no complete drainage network system in the KLMC area. But existing drain discharge storm water from east side to Kilikolloor thodu, north side of Ashtmudi Lake, Vattakayal, Kattakayal etc. Kollam Thodu and Lakshadweep Sea receive storm water from west and south side of KLMC area. The constructed drains are not fully connected to form a drainage network as shown in figure 17.8 in many places. Missing links lead to water logging issues. Lack of proper maintenance, and dumping of solid waste are found as other reasons for

Sl No	Drain name	Ward Number
1	Muttarakkulamchaal	2
2	Kanjiathilthodu	2,54
3	Kattakkalkayalthodu	2
4	Maamoottithodu	6
5	Vadakkechiraayyankoyikyal	7
6	Thekkechiraaakalkaaluvaram	
7	Kalikinmooduthodu	
8	Bhoothakkavuthodu/Neeravilthodu	10
9	Kunnanithodu	
10	Kollamthodu	12,13,37,38,39,42,45,46,47
11	Manichithodu	13,17,25,26,43
12	Kandolithodu	16
13	Punnamooduthuruthelthodu	
14	Alakkuthodu	17
15	Kilikollurthodu	18,19
16	Elayilvayalthodu	28
17	Munnanikulamthodu	29
18	Kuttannathuvilathodu	29,33
19	Ayathilthodu	31
20	Appuzhakayalvaaramthodu	20
21	Choorankilthodu	32
22	Paalatharathodu	
23	Thumbattathodu	
24	Kaarikkuzhivaliyathodu	37
25	Kaarivayalthodu	
26	Aadikkaduthodu	40
27	Kallukandamvayalilkalunkuthodu	43
28	Aattukalthodu	46
29	Kaayalvaadithodu	50

Table 17.9 Details of natural & artificial drains in KLMC area

flooding. Reclamation of paddy land without planning for surface drainage for constructing houses in paddy land causes flooding in and around paddy area. Figure 17.8 shows the water logging areas in KLMC area identified in the survey conducted under KSUDP.



View of Kollam Thodu different perspective active & non active

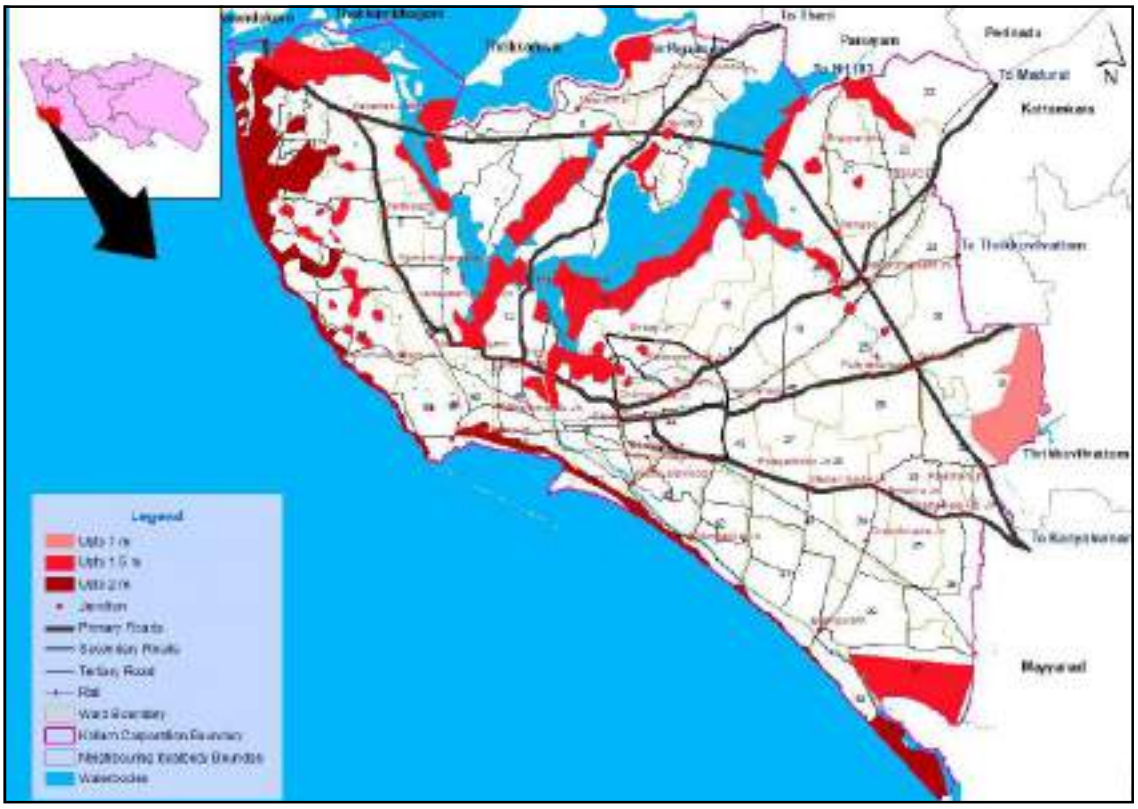


Figure 17.7 Flood affected areas of KLMC in 2018



Figure 17.8 Existing drainage network of KLMC area

While comparing the flood affected areas in KLMC with natural and artificial drains, water logging is seen in the eastern parts of KLMC area, where drains are already present. As per the studies conducted by the Town and Country Planning Department to assess the spatial impact of 2018 floods, depth of flood in eastern area was found as maximum. Hence it may concluded that chocking of existing drains and inadequate capacity leads to water logging conditions in KLMC area.

17.3.2 Issues

- Lack of well connected drainage network, improper maintenance of drains, dumping of solid waste causes water logging.
- Conversion of paddy, wet land areas etc. for building houses without planning for surface drainage causes water logging.
- Dumping of solid waste into the drains leads to stagnant water flow leads to pollution
- Water hyacinth growth and encroachment by human being reduces the capacity of drains which leads to flooding.

CHAPTER - 18

RRECREATIONAL FACILITIES & OTHER CIVIC AMENITIES

Recreation is an activity of leisure which is an essential element for releasing tensions in the busy life of urban people. The importance of recreation amenities in improving the physical, mental and social health of any community is accepted world-wide. Therefore, as part of urban planning it is necessary to understand whether the city is provided with enough recreation facilities. Also other civic amenities such as civil station, police station etc. are also to be studied to assess whether proper service is provided to the public. This chapter includes the present status of recreation facilities including parks and open spaces and water bodies, stadiums, art galleries etc and other civic amenities.

18.1 RECREATION FACILITIES

Recreational facilities include water bodies, parks and open spaces, stadiums etc. The existing natural resources like beaches, island, water bodies, green areas etc. forms major share of recreation means in the city. Conservation of existing natural resources ensures sustainable recreation facilities while maintaining environmental sustainability. As per the existing landuse map area under recreational facilities including natural and manmade is 10.2 sqkm of land i.e. 14.2% of the total developable area.

18.1.1. Natural Recreation facilities

Present status of natural recreation facilities are reported below

18.1.1.1 Ashtamudi Lake

Ashtamudi Lake with an area of 51.8 sqkm extends Northwards from Kollam town. It possesses a unique wetland ecosystem and a large palm shaped (also depicted as octopus – shaped) water body, second largest to the Vembanad estuary ecosystem of the state. Ashtamudi means eight braids. As the name indicates the


Ashtmudi Lake

lake's topography is with eight branches intruded in to main lands. The extreme length and width of the Lake is 16 km and 14 km respectively where as the average width is only 3 km. Within the boundary of Kollam Corporation, the lake covers about 8.48 sq. km according to primary survey. Steep slopes of lateritic capping's and escarpments developed over rocks are visible. A few individual islands (thuruths) with very steep side slopes are also observed within the lake. Boat services are operated by Kollam Boat Club from Kollam to Alappuzha providing transport access to many other towns and villages along this route. Through boat journeys one can experience lakes, canals and water bound villages, Chinese fishnet used by fishermen are visible. Accessibility to the side of Ashtamudi kayal by roads is very limited. Also dumping of solid waste in the kayal is another issue that needs immediate attention. Adventure park is located in Asramam Bio diversity Heritage Site Area (BHSA) in Kerala. 15 species of mangroves, 22 supporting mangroves species, 122 species of plants, 34 edible fishes, and 62 species of birds present in Asramam mangrove and Watershed region.

18.1.1.2 Beaches

There are 5 beaches in Kollam Corporation area, namely Kollam, Thirumullavaram, Thangassery, Mundakkal and Eravipuram beaches used as recreational open spaces shown in figure 18.1.

Kollam Beach

Also known as Mahatma Gandhi beach, it is one among the few beaches in Kerala with lifeguard outpost and Kollam Beach is just 2 km away from the city centre, during evening times it is very busy, especially during Weekends and holidays



Mundakkal Beach Kollam Beach

This beach is situated at Mundakkal, it became famous after the arrival of dredger ship, Hansitha washed ashore on 21 January 2016. Scrapping of the dredger ship started on 18 October 2017. This beach is also known as Mundakkal Papanasam Beach. Devotees believe that a dip in the waters of Mundakkal Papanasam

beach will wash off the sins in one's life.

Thirumullavaram Beach

This secluded beach is a beautiful picnic centre and has frequent bus connections to the town. This beach is famous for the yearly ritual of Karkidaka Vavu Bali. As per the district tourism promotion council, Thirumullavaram beach is one of the most safe and potential beaches in Kollam.

Rising tall palm grooves is the prime attraction of the beach.

Thangassery Beach

Thangassery beach is a 3 km long beach by the side of which a 144 feet lighthouse stands. It is a popular beach of Kollam town, which was one of the preferred settlement locations for the British, the Portuguese and the Dutch. The beach has silver colored sand. Thangassery lighthouse and



Thirumullavaram Beach



Thangassery Beach



Figure 18.1 Beaches in KLMC area

breakwater, remains of Dutch cemetery and St. Thomas fort, port etc. are the major tourist attractions by the side of this beach. 1.5 km long breakwater is used for morning and evening walks by the public.

Eravipuram Beach

Eravipuram beach is a developing beach situated at about 1.5 km to the South - East of Mundakkal beach. Fast growing Thanni beach in Mayyanad Gramapanchayat is located about 5 km from this beach. Presently Eravipuram beach is visited by domestic tourists. If facilities are provided in this beach, it can be developed as a tourist attraction point.



Eravipuram Beach

18.1.1.3 Vatta Kayal

Vatta kayal having an area of nearly 18 hectares is the second largest kayal in Kollam Corporation area. The kayal was connected to Ashtamudi kayal through Kattaka kayal. As on date the Vattakayal has almost disappeared due to encroachment and dumping of waste. Now Vatta kayal is a polluted kayal which sustains due to infiltration and storm water drainage. This water body and its bank acts as the sole breathing space of the locality. Hence maintaining the kayal and surrounding as an environmentally sensitive area is very much essential.



Vattakayal

18.1.1.4 Katta kayal

Katta kayal, a fresh water lake originates from Vattakayal at Maruthadi, flows into the vast Ashtamudi Lake at Sakthikulangara. It is actually an outlet through which the Vattakayal breathes by letting out and taking in water from the Ashtamudi Lake. Kattaka Kayal was once served as the lifeline for most of the commercial activities at Sakthikulangara. Garbage dumps, sewage outlets and encroachments have choked the stream to such an extent that the stream is now facing environmental hazard.

18.1.2 Manmade Recreation Facilities

Man made recreational facilities in KLMC includes Kollam Thodu, parks and open space, stadium and others. Present status of these facilities are reported below.

18.1.2.1 Kollam Thodu

Kollam Thodu is a part of T.S. Canal, the main goods transportation route along the coastal area of the state.

Kollam Thodu has the potential for developing as one of the beautiful recreation corridors in Kollam. However, effective measures for cleaning and maintaining the canal and beautification of canal banks is essential.



18.1.2.2 Parks and Open Spaces

Park and open spaces in the town are only 0. 545 sqkm, i.e. 0.76% of the total geographical area. The famous parks in Kollam Corporation area are Mahatma Gandhi Park (MG Park), Adventure Park, Children's park and Thangal Kunju Musaliar Park and other small parks..

Mahatma Gandhi Park

It is a public park which is owned by Kollam Municipal Corporation and is operated by Rural Tourism Development Company (RUTODEC) a private firm, engaged by KLMC for a contract period of five years for maintenance. It was opened on 1st January 1967 by the Honorable Vice President of India, Dr. Zakir Husain. Major attractions in the park are water foundations, artificial waterfalls, swimming pool, bowling machine, observatory point etc. The park was a very busy area before the outbreak of Covid-19. However as it was closed for more than two years, park is almost destroyed. Marine aquarium at the Mahatma Gandhi Park in Kollam beach that showcases a wide variety of marine organism. There are a total of 18 marine fish varieties including Banner fish, clown fish, Blue trigger and Moorish idol on display. The fish ecosystem has been set-up in 24 tons and the pool has a capacity of 12,000 litres.



Children's Park Kollam

Asramam Children's park is situated at the north west boundary of Asramam maidan in Kollam city. This park is owned by Kollam Municipal Corporation. It is also called Children's traffic park. Major attractions in this park are open air auditorium, Mandapams, swimming pool, video games, multipurpose gymnasium, restaurants, children ride like air balloons rides, battery cars, cycles, duck boats, Toy trains etc. Covid-19 has affected the maintenance of this park also.


Children's Park Kollam

Adventure Park

Asramam Adventure Park is situated by the side of Ashtamudi lake right in the core of Kollam city spreading an area of 3.1 acres. It was opened after 1980 and is considered as a silent place where people can enjoy the genuine beauty of Ashtamudi at the same time cooling effect of dense vegetation. It is owned & operated by Kollam Municipal Corporation. This place is popularly known as Asramam picnic village. The mangroves near this park are very famous all over India. So many endangered species of trees are conserved in this park. Another attraction is sculptures. There are 10 sculptures included as part of a 10-day state level sculpture camp called monsoons sculptures. Other attractions are open gyms, boating, swimming pool etc.


Adventure Park


Top View of Adventure Park & Mangroves area

Thangassery Park

It is a small park in front of St. Thomas Fort in Thangassery. It is a perfect hangout spot with wide lawn, playground and seating to spend evening for watching the final rays of sunshine and breathtaking view of the sea.

Thangal Kunju Musaliar Park

It is owned and operated by Kollam Municipal Corporation. Paved walkways, children rides, and seating for 30-40 people are the major attractions.

Other Parks

Other small parks in KLMC area are listed below:

1. Sethu Lakshmi Bai park at Sakthikulangara
2. Municipal park at Kadappakada
3. T.K Divakaran memorial park
4. Thevally Children's park
5. M.G park at Kurvanpalam Municipal Colony
6. Jalakeli Kids Park
7. Kambiyil Kulam

All these parks lack proper maintenance and kept under-utilised. Nehru Park or T.K. Divakaran Park is now renovated under the scheme of AMRUT Green space and parks. Jalakeli Kids park adjacent to M.G. park is run by DTPC with utilizing the recreation of Kollam Thodu. There are various child friendly activities like, rides, boating etc. Kambiyil kulam in Thrikkadavoor area is recently developed as a neigbourhood recreation facility. However neigbourhood and sector level parks and open space are absent in the north eastern part of the planning area.

OPEN SPACES

There are two major open spaces in Kollam Corporation area viz Asramam Maidan and Peeranky Maidan.

Asramam Maidan

The extent of Asramam maidan is about 53 acres and is the largest Maidans in Municipal limits in the state. The famous Kollam Pooram is performed here. Also, this place acts as a venue of people's gathering especially for onam fair, Circus etc. Maidan is used as helipad, whenever there is a visit of VIP in the planning area. It is regularly used for driving classes by driving schools and driving tests by RTO. This area can be



developed as breathing space for the city. However, maidan is not utilised effectively for recreation purposes due to lack of public amenities. Beautification of maidan is not fully completed. During night time trucks occupy the road sides just outside the maidan. Also lighting around maidan is not sufficient to make the place safe and attract people.

Peeranky Maidan

Peeranky Maidan is a historical ground situated in the city centre very close to KLMC office. This 19 acre area accommodates Lal Bahadur Shastri Stadium, Office of Sports Authority of India, Kudumbasree and Social Welfare departments, the QAC (Quilon Athletic Club) and the open space. Peeranky maidan witnessed the infamous battle took place between Velu Thampi Dalawa, and a detachment of the British East India Company in the Battle of Quilon in 1809. The same ground was the venue for the conclusion of the Kallumala Samaram (Stone Necklace Protest), an agitation or social revolution by the Pulayar community in 1915. It was also here that Mahatma Gandhi addressed a gathering on independence in 1927. Sx people were killed in the revolution of 1938 at this same maidan. The cannons that were erected here due to the name of the field are still kept in Sardar Vallabhai Patel Police Museum in Kollam. Now Peeranky Maidan is used for conducting exhibitions, melas during the time of festival, freedom parade, conventions, circus shows etc. Portion of this maidan adjacent to SN College campus is converted to build a stadium, there by reducing the area of maidan considerably. This area is affected by water logging. Also nearly ¼ area is dumped with logs, earth and other debris so that entire maidan is not available for the purpose of recreation. Landscaping is absent in this park. Through the space can be developed for regular recreation place, no serious effort to transform the maidan for attracting people is made so far.



Peeranky Maidan

18.1.2.3 Stadiums

There are two stadiums in Kollam Corporation area namely Lal Bahadur Shastri Stadium built in 1988 and Kollam International Hockey Stadium built in 2015.

Lal Bahadur Shastri stadium is a multi-purpose stadium of 8.57 acres for playing cricket, football, rugby and athletics. The matting type of pitch used in this stadium is very much suitable for playing cricket. The Sports Authority of India is having a training centre in this stadium. Ranji Trophy 1979 &1988, Santosh Trophy match 2013 were held in this stadium. SAI Badminton stadium is also included in this stadium. The seating capacity of this stadium is 30,000.



Lal Bahadur Shasthri Stadium

Kollam International Hockey Stadium

The International AstroTurf Hockey Stadium has a normal capacity of around 5000 seats. Various national level programs were held here. The stadium is located at an area formerly known as Depot Maidan within the Asramam Government property. It is surrounded by Ashtamudi Lake amid a lot of Greenery, the total plot area of this stadium is around 4.56 acres.

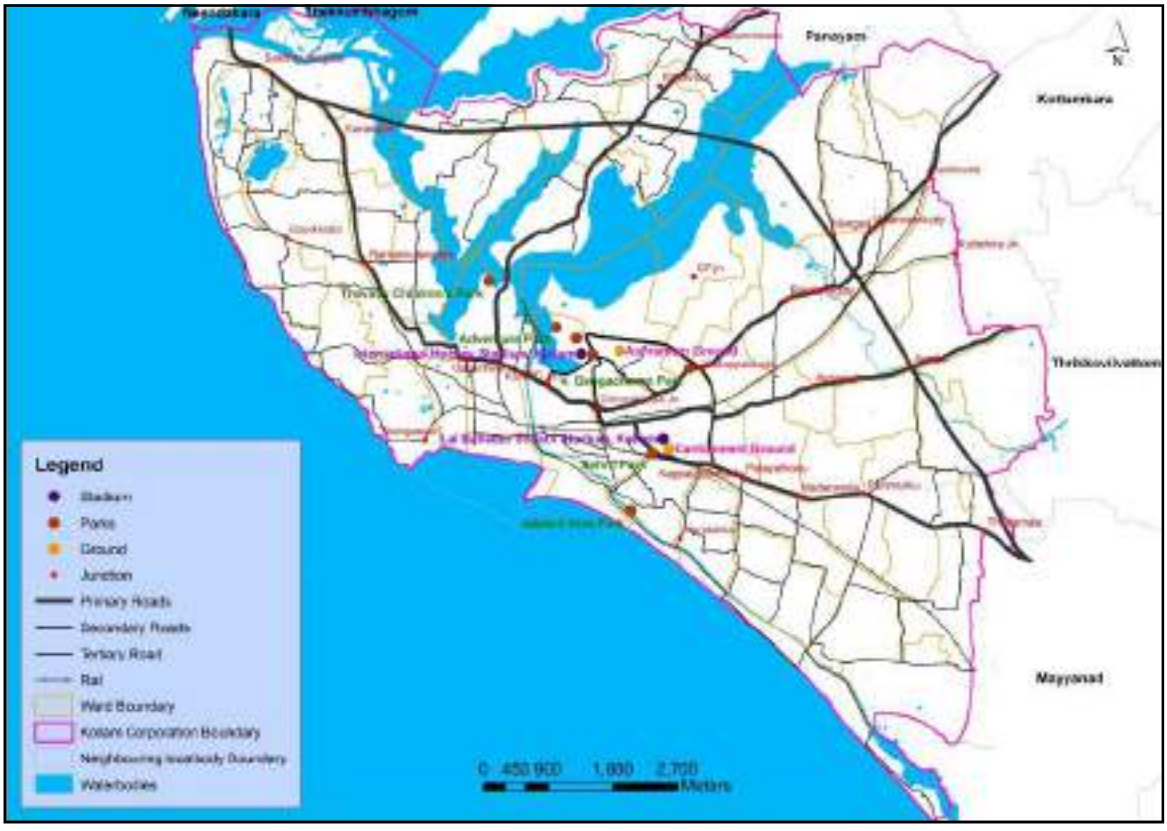


Figure 18.2 Spatial distribution of parks, open spaces & stadiums



International Hockey Stadium

18.1.2.4 Cinema Theaters

There are 12 cinema theatres in Kollam Municipal Corporation area. The details of cinema theatre are shown in table18.1.

18.1.2.5 Art Galleries

Art Galleries in Kollam are building or space for the exhibition of visual art mostly paintings, sculptures, decorative arts, drawings, pastels, Collages etc. There are 3 art galleries in KLMC area namely 8-point Art Cafe, white cube Art Gallery and Quilon Art Gallery at the Public library. The 8-point art cafe is located in a colonial villa in the government guest house complex at Asramam. White cube art gallery is a privately owned art gallery located at Asramam exhibits an ever-changing collection of fine art from both locally and nationally renowned artists. The Quilon Art Gallery in the public library conducts various exhibitions during season times. In addition to the above art gallery 28 number of arts & sports clubs are functioning in the corporation area.

18.1.2.6 Ashtamudi Water Sports Centre

Water sports center of Ashtamudi is promoted by District

Name of Theater	Location	No. Of Screen	Capacity
Dhanya/Remya	Kadappakkada	2(530 seats & 200 seats)	730
Usha	Chinnakada	1	500
Pranavam	Near Railway station	1	690
GMAX	Jerome Nagar	2(150 each)	300
Carnival	RP Mall	2(100 each)	200
Archana/Aradhana	Kollam	2(200 each)	400
Capithans	Sakthikulangara	1	600
Parthasarathi	Moonamkutty	2(250 each)	500

Source: Corporation, primary survey

Table 18.1 Cinema theatres in KLMC area

Tourism Promotion Council, Kollam & Asramam Destination Management Council, Kollam in association with Alpha Adventures introducing Water Sports in Asramam Adventure Park. The main activities of this sports centre include Parasailing, Banana boat, Pedal boat, Kayaking, Tarzan swing, archery etc. One more multi-purpose ground is needed for the horizon years.





18.2 OTHER CIVIC AMENITIES

Station of other important civic amenities in the planning area are shown below.

Sl No	Name of Auditorium	Location	Capacity
1	Janatha Auditorium	Pallimukku	1000
2	Town Hall	Camp Railway Crossing	2000
3	A.Y.K Auditorium	Asramam	400
4	Sarada Auditorium	Randamkutty	700
5	Younus convention centre	Asramam	1300
6	Sana Auditorium	Moonamkutty	650
7	Sopanam Auditorium	Y.M.C.A.Road	600
8	Sumangali Auditorium	Cutcherry	800
9	S.P.M.Auditorium	Pallimukku	
10	Lekshmi Auditorium	CKP Jn	600
11	Ushas Auditorium	Pallimukku	600
12	Greeshmam Auditorium	Eravipuram	600
13	M.M.K.Auditorium	Karicodu	
14	S.B.Auditorium	Asramam	
15	Devaki Auditorium	Anchalumoodu	800
16	A.K.Auditorium	Decent.Jn	400
17	Royal Auditorium	Bypass Road	700
18	Kairali Auditorium	Kilikollur	
19	Corporation community Hall	Kavanad	
20	M.S.M Auditorium	Pallimukku	500
21	T M Varghese Memorial Hall	Kollam	

Source: Corporation, primary survey 2019

Table 18.2 Auditoriums in KLMC area

18.2.1 Civil Station

Main Civil Station the head quarters of district administration is located in the planning area. 38 government offices are functioning in the Civil Station Complex. It include Collectorate, Judicial Magistrate Court, sections court, District Head office of various departments, District Treasury. Also, district offices of all government department are functioning in Kollam Municipal Corporation area at various places.

18.2.2 Auditoriums

There are 20 numbers of auditoriums/Community halls functioning in KLMC area as listed in table 18.2. Town hall being the

one with maximum capacity of 2000 seats are situated in the CBD of the city.

18.2.3 Police Stations

There are 12 police stations in KLMC are for maintain law and order. The details of the police station are shown in table 18.3 and spatial representation on figure 18.3. Sardar Vallabhai Patel Police Museum is a museum that traces the history and growth of the police force in India and this museum is dedicated to barrister and statesman, Vallabhai Patel. District Police Headquarters, District Crime Branch office and Armed Reserve Camp (AR Camp) are also situated in KLMC area. From the spatial distribution of police station, it is observed that most of the stations are located within the city centre area. After extending NH-66 bye-pass upto Kavanad many accidents were reported. Also many developments including multi specialty hospitals have come up by the side of this NH. However in between Kilikolloor police station and Eravipuram police station no other police station is available. Also population density of area between NH-744, NH-66 bye-pass and Kappalandimukku- Kadappakada road is found as increasing. But no police station is available in this area.



18.2.4 Fire Stations

As per the planning norms of India (URDPFI guidelines), 1 fire station is required for 2 lakh population. KLMC has 2 fire stations, one at

Sl.No.	Name and location	No.of staff
1	Kollam West Police station, Near Civil station, Kollam	47
2	Kollam East Police station ,Near Railway Station, Kollam	87
3	Police station, Anchalumoodu	47
4	Police station, Sakthikulangara	78
5	Police station ,Pallithottam	36
6	Police station, Kilikollur	37
7	Police station, Eravipuram	31
9	Vanitha Police station, Near Railway station, Kollam	18
10	District Crime Branch office	37
11	District Headquarters	81
12	Armed Reserve Camp	10

Source: Corporation, Primary survey

Table 18.3 Police stations in KLMC area

Chammakada and other at Kadappakada the details of the fire station are given in table18.4 and spatial representation on figure 18.3.

Location	No of Staffs	Tank capacity	Vehicle capacity
Chammakada	39	25000 L	11500 L
Kadappakada	73	40000 L	25000 L

Source: Corporation, Primary survey

Table 18.4 Fire stations in KLMC area

18.2.5 Fuel filling Stations and Gas godowns

The details of the fuel filling stations are shown in table 18.5. There are 30 numbers of fuel filling stations and 12 numbers of LPG Go-downs located in KLMC area as given in table 18.5 and spatial representation on figure 18.4.

From the map it is observed that these facilities are available within a reasonable distance to all the people.

18.2.6 Crematorium and burial ground

There are 3 public crematoriums under Corporation at Polayathodu, Akkollil and Mulamkadakom as given in table 18.6 and spatial representation on figure 18.3. Burial grounds are also available within churches and mosques. From the figure It is seen that public crematorium are available to the western side of the planning area and missing to the north –east part of the planning area.



Figure 18.3 Spatial representation of police stations, fire stations, and crematorium

Sl.No	Name	Location	Company
1	General Oil Services	Chinnakada	Bharat Petroleum
2	Jenifer Alphonse	Sakthikulangara	Bharat Petroleum
3	Parappadil Fuels	Sakthikulangara	Bharat Petroleum
4	B&B Fuels	Sakthikulangara	Bharat Petroleum
5	D.P.N.Fuels	Kilikolloor	Indian Oil
6	Pattathuvila Fuels	Kadappakkoada	Indian Oil
7	Suresh&Raju	Kilikolloor	Indian Oil
8	Silpa Fuels	Thattamala	Indian Oil
9	Gopinathan Pillai &co.	Vadakkevila	Indian Oil
10	Chithira Petroleum	Punthalathazham	Indian Oil
11	Sundale Fuels	Mangad	Indian Oil
12	Lekshman Fuels	Eravipuram	Indian Oil
13	Sreekrishna Petroleum	High school Jn	Indian Oil
14	Milan Fuels	Anchalumoodu	Indian Oil
15	Kiran Fuels	Thangassery	Indian Oil
16	Devi Mulamkadakom Fuels	Thirumullavaram	Indian Oil
17	Bathel Fuels	Thirikkadavoor	Indian Oil
18	Johns Fuels	Kavanad	Indian Oil
19	HPC Delers	Ayathil	Hindustan Petroleum
20	Jacob Joseph	Beach Road, Kollam	Hindustan Petroleum
21	Thajudeen	Ramankulangara	Hindustan Petroleum
22	Thajudeen	Polayathodu	Hindustan Petroleum
23	B.R.Prasad	Sakthikulangara	Hindustan Petroleum
24	Holy Star Fuels	Kavanad	Hindustan Petroleum
25	Thankam Fuels	Chinnakada	Hindustan Petroleum
26	Vedhika Fuels	Mulamkadakam	Hindustan Petroleum
27	Patropil Fuel Services	Sakthikulangara	Hindustan Petroleum
28	Patropil Fuels	Anchalumoodu	Hindustan Petroleum
29	Kaveri Fuels	Cutcherry	Hindustan Petroleum
30	Kadayil Fuels	Vaddy	Essar
Sl.No.	**Name**	**Location**	**Company**
1	Quilon Gas services	Kollam	Indian Oil
2	Siva agencies	Kollam	Indian Oil
3	Sneha Indane service	Eravipuram	Indian Oil
4	St.George Gas Agency	Mundakkal	Indian Oil
5	Visakh Gas Agency	Kadappakkada	Hindustan Petroleum
6	Karthika Gas Agency	Palathara	Hindustan Petroleum
7	St.Jude Gas Service	Vadakkevila	Hindustan Petroleum
8	Breeze Gas	Mangad	Hindustan Petroleum
9	Leela Gas Agencies	Kavanad	Hindustan Petroleum
10	Chittoor Agencies	Kollam	Bharat Petroleum
11	Sree Dharmasastha Gas Agency	Kavanad	Bharat Petroleum
12	K.K Bharat Gas Agency	Thangassery	Bharat Petroleum

Source: Corporation, Primary survey

Table 18.5 Fuel stations and LPG Go-downs in KLMC area



Figure 18.4 Spatial representation of fuel stations and LPG Go-downs

Sl. No.	Location	Burial Ground	Crematorium		
			Electric	Gas	Firewood/ Country material
1	Mulamkadakam	Yes	yes	yes	Yes
2	Polayathodu	Yes	Not working	yes	Yes
3	Aakollil	Yes	No	No	Yes

(Source: Disaster Plan report, 2019

Table 18.6 Crematoriums and Burial Grounds

18.2.7 Public Libraries

There are a total 24 Public Libraries within KLMC area. Libraries with large collection of books are:

- Quilon Public Library & research Centre
- Municipal Library & Reading Room, Kaankathumukku

There is a Children's Library in Karbala area.

18.2.8 Communication Facilities

Communication facilities mainly included post offices, telephone service, internet facilities and fax services. The details of communication facilities are shown in table 18.7.

No. of Telephone exchanges	6
No. Of Telephone connections(Landline)	24403
No. Of Public telephone Booths	152
No.of Mobile connections	49356
No.of Mobile Towers	26
No.of Post/Telegraph office	Telegraph offices closed in 2013
No.of Internet connections	10260
No.of wi-fi hotspots	37

Table 18.7 Communication facilities in KLMC area

18.2.9 Banks & Credit Societies

There are 30 Nationalized Banks 11 State Co-operative banks, 13 District Co-op Bank, 71 ATM counters, 26 Agricultural Credit Societies & 11 Non-Agricultural Societies in Kollam corporation area.

18.3 DEVELOPMENT ISSUES

Though sufficient means of recreation including natural and manmade are in place within the planning area following problems are associated with these facilities.

- Improper maintenance
- Congested roads to parks and beaches.
- Absence of access to many parts of Ashtamudi lake.
- Proper parking spaces are not available during season times.
- Pollution of beaches, backwaters, Kollam Thodu and other water bodies.
- Lack of proper sign boards to parks, beaches and other recreational facilities
- Lack of proper waste management system for maintaining cleanliness and aesthetics of recreation facilities.
- Encroachment of natural resources.
- Inadequate fire stations need to be considered
- As the civic amenities and recreation facilities are concentrated into core area of the city, traffic congestion reduces productive man hours.
- Neighbourhood and sector level parks and open space are absent in the north – eastern part of the public KLMC area.

- Public crematorium is not available in the north- eastern part of the KLMC area.
- Even though residential, commercial and institutional developments are shifting towards north – east part of the planning area police stations are concentrated along coastal belt. Hence enforcement of law and order in these areas found difficult.
- Inspite of the issues as mentioned above following potentials are available for development of recreation facilities in KLMC.
- Presence of natural water bodies.
- TS canal can be developed as number one neigbourhood recreation facilities.
- Presence of low lying vacant land in and around city centre can be developed for recreation facilities.

CHAPTER - 19
ART AND HERITAGE

Studying urbanization and its heritage gives us deeper knowledge about human existences and their experience that often is useful for development of human society. Article 29 of Constitution states that 'Any section of the citizens residing in the territory of India or any part there of having a distinct language, script or culture of its own shall have the right to conserve the same'. Quilon or present-day Kollam is one of the oldest settlements in Kerala. Quilon has been known to the outside world by the honored proverb- 'If you saw Quilon, you would need no home anymore'" (Kollam Gazetteer, 1964). The oldest name of Kollam is 'Desinganadu' which also known as "cashew capital of the world". Kollam City is consecrated with many heritage sites. The Forts, Palaces, light house, places with historical value, traditional temples & houses/ settlements, are the examples of Heritage precincts of Kollam City. This chapter tries to reveal the present situation of heritage precincts in Kollam city with respect to the issues in conserving the same.

19.1 PRESENT SCENARIO

It is seen in the spatial distribution map (Figure 19.1) that heritage tourism precincts are maximum in KLMC (26 nos.) when compared to other local bodies in the district.

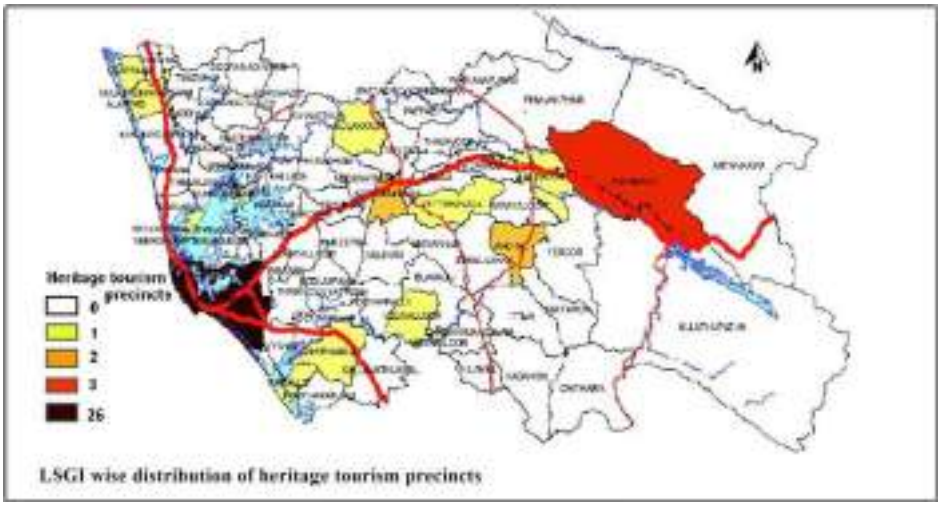


Figure 19.1 Spatial distribution of heritage tourism precincts

Kollam city has few sites of cultural value within its limits and many historical monuments including old churches established in the 18th century, the light house built in 1902 and forts exist in this area. Old areas of any city undergo a process of gradual decay and incompetence to cope with the changing land use and space requirements. A number of historical monuments, places and forts, buildings of architectural importance available in the city need to be protected.

The heritage monuments are listed below.

1. British residency, Government Guest House building, Asramam
2. Thangaserry Fort
3. Thevally palace
4. Cheena Kottaram
5. Thangassery Light House
6. Chinnakada Clock Tower
7. English and Dutch cemetery
8. SMP Palace
9. Chamakada market
10. Thangassery Arch
11. Tuet Church
12. Anandavalleswaram temple
13. Rameswarathu Temple
14. St Casimir's Church at Kadavoor
15. Thirumullavaram temple
16. Thrikkadavoor Mahadeva Temple
17. Sreekrishna Swami Temple, Asramam
18. Jonakapuram Mosque
19. Ganapathy Temple- Stone Bridge
20. Lekshminada Temple
21. 8-Point Art Gallery
22. Cashew House
23. CSI Church
24. Asramam Maidanam
25. Rantha School, Eravipuram
26. Bishop House

In addition to the above, the newly declared Asramam Bio-Heritage area is also situated within the planning area. It hosts a unique diversity of mangrove species with diverse flora and fauna. The area habours 15 species of true mangroves, 22 species of mangroves associated, 122 species of plants, 34 species of edible fishes and about 62 species of birds. Most importantly, the site has the rare and endangered heritage trees of syzygium travancoricum which is listed as critically endangered in International Union for Conservation


Mangroves Area

of Nature (IUCN) red list. The true mangrove species are confined to salty-marshy environment along back waters, whereas the mangrove associate species were also found in other areas apart from the mangrove environment.

Sacred Groves associated with temples are also rich in bio-diversities. The mainly identified scared groves are found at Eravipuram, Mundakkal and Ayathil which are considerably large in size. Conservation strategies are to be made to conserve the existing pristine ecosystem in the area.

Issues

- Environmentally sensitive areas in other words (natural heritage areas) such as mangrove forest, Scared Groves etc. are struggling for existence due to various issues such as encroachment, pollution, destruction of these sensitive areas etc.

The above listed monuments are explained hereunder.

19.1.1 British residency, Government Guest House Building, Asramam

The British Residency also known as Residency Bungalow is a two-storeyed palace situated at Asramam



Figure 19.2 Spatial representations of heritage monuments


Govt. Guest House, Asramam

along Ashtamudi Lake and was constructed as residence of Colonel John Munro, the first British Diwan of Travancore in 1812.The building came up during the reign of Travancore by Rani Gowri Parvati Bayi when Colonel John Munro was the British Resident. It was constructed with a blend of European, Indian and Tuscan architecture. The central part has a rounded front with a large gable decoration. There is a crown with a lion seated on it, atop the building with the motto *Dieu et mon Droit* (God and my right) inscribed above. The conference hall in the palace with an antechamber with an adjustable partition-like door and a large fanlight arching over divides the two rooms. The walls of the conference hall having cornices and dentils bordering the four sides with embossed designs of festoons ,urns and floral forms. An embossed motif of a large arch with an ornamental keystone, resting on pillars over the main doorway is quite interesting. As for upper story, rich wooden flooring is quite attractive. In some places, the walls are adorned with antique prints in polished wooden frames. This Residency building is one of the most majestic colonial structures in India. Now this building is used as Government Guest house.

Issues

- Landscaping of precinct is not properly maintaining.
- Continuation of adaptive reuse is not done.

19.1.2 Thangassery Fort

Thangassery was associated with the Chinese trade in the first millennium A.D, and later, it was a bone of contention between the Portuguese, Dutch and the British. The Thangassery Fort was constructed by Haiter Rodrings the leader of the Portuguese who visited Kollam in 1517. The fort was completed in 1520 and named as Fort Thomas. In 1658 the Dutch took the possession of Thangassery after defeating the Portuguese and occupied the fort for

several years. In its initial design, the fort had three towers and four bastions, and the entrance was from the seafront. The structure was equipped to meet all the artillery requirements then. Scattered remains of the Portuguese and the Dutch fort and cemeteries still exist here. Earlier the city was fortified on land side with two half and one whole bastion but today a portion of the wall is restored here. It was constructed in laterite with lime mortar. Previously the Fort had tiled roof which were destroyed by the Dutch. The Fort is a reminiscence of the foreign invasion which later became part of social integrity which leads to our independence. The site is a centrally protected monument under the control of Archaeological Survey of India.

Issues

· Fort is not properly maintained.



Thangassery Fort

19.1.3 Thevally Palace

Thevally Palace was constructed during the period 1811-1819 by Gouri Parvati Bai. It is believed that the palace was used as a residence by the Maharaja, who came to Kollam for short visits. The Palace is located on the banks of Ashtamudi Lake and has an amalgamation of English, Dutch and Portuguese styles of architecture. Lime plaster and laterite are the materials that had been used in the construction of the palace. Currently, the palace is owned by Kerala PWD.

Issues

- Adaptive reuse of Palace has not taken place.
- The tower restoration is not properly done.
- Public accessibility is not promoted.

19.1.4 Cheena Kottaram

Cheena Kottaram or Railway Palace is located in Railway station compound, Chinnakada, It was



Thevally Palace

constructed after the commissioning of Kollam-Thirunelveli meter gauge in 1904. This was constructed for Sree Moolam Thirunal Maharaja for taking rest on his trips to Rameshwaram. Because of its resemblance to traditional Chinese buildings, it is popularly known as Cheena Kottaram but claimed to follow an Indo-Saracenic style of Architecture. The central structure has elegant Gothic arches, with stained glass panes in leaden frames, on all sides. Beautiful glass murals, Venetian floor tiles, wood carving that is vintage Kerala, and unique dragon-like wooden supports for the roofs, are the arresting features of the building. Now the building is owned by Southern Railway.

Issues

•The building restoration should be done.

19.1.5 Thangassery Light House

The light house is situated near the Thangassery beach. It is one of the oldest light houses in the state and was built in 1902. It was strengthened on 1940 by A.N.Seal, Engineer in Chief, lighthouse Department. The 144 feet lighthouse stands as a sentinel, warning seamen of the reefs of Thangassery. The lighthouse emanation from a 5000 Walt bulb is visible at a distance of 18 miles out in the sea. It's a typical round Light house structure. The light house along with its scenic beauty makes it an attractive tourism destination. The lighthouse is under the control of Government of India.

Issues

The light house has to be kept functional as a tourist attraction and made open to public. Periodic removal of vegetation is not doing properly.


Light house

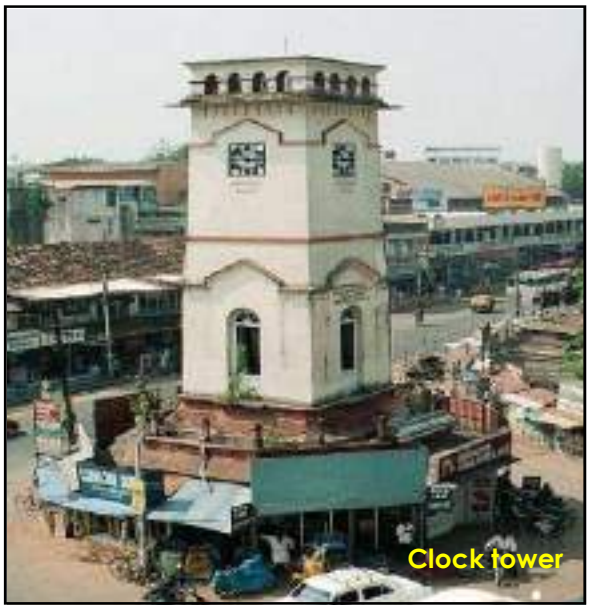
19.1.6 Chinnakada Clock tower

It is a famous landmark of Kollam City. The tower lies in the heart of the city, close to Kollam Junction Railway Station. The quadrangular clock tower was built in 1944 by the natives as a Tribute to K.G. Parameshwaran Pillai, the former Chairman of Kollam Municipality (1932–48). The construction of Clock tower started in

1941 and was finished three years later. The tower includes four clocks that were brought from Kolkata and face the city's four cardinal directions.

Issues

- It is not properly maintained.
- Remove the encroachments near clock tower and protect this as the symbol of Kollam city.


Clock tower

19.1.7 English & Dutch cemetery

It is situated in Thangassery and was constructed around 1519 as part of the Portuguese invasion of the city. It is a huge cemetery with two sections, English and Dutch, both triangular in shape. More than 300 persons have been buried there and it is a site with great historical relevance. There was a guillotine among the ruins and its blade was still intact till 30 years ago. Scattered remains of the Portuguese and the Dutch fort and cemeteries still exist here.

Issues

- The place is in a very deplorable state as the residents have constructed toilets and other structures near the tombs.
- It already has lost much due to lack of concern and proper conservation, but it is still possible to restore it.
- There are over 20 families living in cramped houses in the area concealing the tombs and other structures in their maze.


English & Dutch cemetery

19.1.8 SMP Palace

Sri Moolam Thirunal Palace is situated near the heart of Kollam city. It was constructed as a commemorate for the shashtiabdapoorthi (60th birthday) of the then ruler of erstwhile Travancore, Moolam Thirunal Rama Varma. But the construction of palace


SMP Palace

was completed only after the death of the King. MoolamThirunal Rama Varma died in 1924. The town hall was completed in 1936. Later, the authorities have converted the palace as a movie theatre. SMP Palace is the oldest cinema theatre in Kollam.

Issues

Adaptive reuse of the palace is not taken place

19.1.9 Chamakada Market

According to the reconnaissance survey, Chamakada market area is considered to be the oldest market area. Old settlements are also found at Chamakada which includes single, double and triple storied residential buildings since 1976. Now the buildings are being used either as warehouses or small shops.

Issues:

· The dilapidated conditions of old existing buildings due to inadequate maintenance and lack of tourism promotional activities make the old prominent market lose their pride.


Chamakada Market

19.1.10 Thangassery Arch

Thangassery Arch was built by British in the year 1939 at Thangassery. It was built as a result of an act passed by the British Parliament in the 1930's.The arch is now part of the Archaeological Survey.

Issues:

Inadequate maintenance of the structure.



Thangassery Arch

19.1.11 Tuet Church

Tuet Church or St Sebastain's Church is located in Chinnakada. It was built in the present site in 1745. In 1845 when Quilon Vicariate was erected the church became the cathedral and Bishops stayed Tuet till 1905. Rt.Rev.Ildephonse Borgna OCD, who died in 1894, was buried in Tuet Church. The church was extended in 1911 and was rebuilt in the present form in 1991.


Tuet Church

19.1.12 Anandavalleeshwaram temple

Anandavalleeswaram, a part of the town, has derived its name from the temple dedicated to the Goddess Anandavalli. The main Sanctum Sanctorum of Anandavalleeswaram Sri Mahadevar temple is 1200 years old. In the days of Velu Thampi Dalawa, image of Goddess Anandavalli was consecrated in the temple. According to another version, the consecration of this Devi took place earlier ie. during the reign of Raja Kesava Das.

Issues

- Lack of open spaces around the temple which was taken over by settlements or roads.
- Lack of proper policy environment to develop and conserve historical precincts.
- Absence of a defined architectural language after reconstruction around the historical religious structures.


Anandavalleeshwaram temple

19.1.13 Rameswarathu temple

The temple is situated right on the heart of the Kollam Municipal town. The temple is one of the 108 Shaivite temples established by Lord Parasurama in Kerala. It is situated adjacent to the Anandavalleeswaram temple and was established during 825 A.D. The annual festivals are Pallivetta and Arat

are held in January. Main festivals and rituals include Thrikodiyettu, Pallivetta ritual, Arattu, AratuEthirelpu, Ezhunallathu, KazhchaSribali, Kettukazhcha ritual and other cultural programs comprising dance, dramas, music programs and also pyrotechnic display as part of the annual festival.



Rameswarathu temple

19.1.14 St.Casimir's Church at Kadavoor

One of the important churches in Kollam, St. Casimir's church or Kadavur Church is situated at Kadavur, a picturesque village on the banks of the Ashtamudi Lake. It was built in 1873 and was renovated several times and the present structure was completed in the year 1993. The annual 14-day long festival of Saint George is held in the month of April.



St.Casimir's Church

19.1.15 Thirumullavaram Temple

The major landmark of Thirumullavarum is the Sri Maha Vishnu Swamy temple. The 400 year old temple was taken by sea and the new temple was constructed east of the old temple. There is Vattezhuthu in the temple. The architecture of the temple is that of a typical mandapa style of south Indian. The temples spreads over in a ground floored establishment with a boundary entrance for giving entry inside the temple. To the left of the entrance is a bell tower with a huge brass bell hanging in it. There is a temple pond behind the temple, few feet away from the Arabian sea. This is the most famous place for Balitharpana not only



Thirumullavaram Temple

for Kollam, but for Pathanamthitta and Alappuzha district as well. During the KarkadakaVaavu season - Malayalam era (July–August), thousands of devotees offer oblation to the manes every year to pray for their dear departed on the new moon day in the month of in Thirumullavarum beach. 'Thirumullavaram fete' is another program which is annually held there as part of the 10-day Thiruvona Mahothsavam at March or April celebrations. The traditional flag hoisting ritual will be held. Folklore has it that the temple was one of the seven established by Parasuram who raised Kerala from the sea. Now the copper covering work at the Temple is progressed.

19.1.16 Thrikkadavoor Mahadeva Temple

The Sree Mahadeva temple, is an ancient temple situated in Thrikkadavoor, is the most prominent of Shiva temples in the district and on the banks of the Ashtamudi lake.The Temple is said to be 700 years old with Lord Siva as the diety.According to legend the Siva linga of the temple is the one which Markanteya used for pooja.


Thrikkadavoor Mahadeva Temple

19.1.17 Sreekrishna Swami Temple Asramam

Asramam Sree Krishna Swamy Temple is located on the shores of Ashtamudi Lake. Lord Krishna in the form of Navaneet Krishnan or Krishna with Butter is worshiped here. The temple sits on the top of a mount created by digging earth from a nearby place, which now forms the temple pond. Sub-deities include Swamy Ayyappan Naga Devatas and Navagrahas. It is believed that this ancient temple was established by Villwamangalath Swamiyar. Unnuneeli Sandesam, one of the literary works written in the 14th century AD had


Sreekrishna Swami Temple

mentioned about this temple. Obviously the temple might have been established before 14th Century A.D. Records say that Maharaja Marthandavarma, the architect of erstwhile Travancore (1706–1758) renovated the temple. There is a grove at western side of the temple is called munikkavu. Annual Festival of the temple is celebrated for 8 days in the month of Medam (April-May) and this festival is known as Pooram of Kollam. Now the temple is governed by the Travancore Devaswom Board.

19.1.18 Jonakapuram Mosque

Jonakappuram Juma Masjid is located in Thangassery and is the second mosque established by Malik Ibn Dinar about 1400 years ago. The original structure of the mosque was destroyed by coastal erosion and the present mosque is constructed on the remnants of the old one.


JonakapuramMosque

19.1.19 Ganapathy Temple

It is located near Stone bridge, Kollam.It is known as Nethrapuram temple during the reign of Jaya Simha Kerala Varma Raja. There is stone inscription written in 1496.


Ganapathy Temple

19.1.20 Lekshminada Temple

It is situated in Thangassery and was constructed about 100 years ago. Navaratri Maholsavam is the important festival celebrated on October every year.


Lekshminada Temple

19.1.21 8-Point Art Gallery

The Eight-point Gallery Cafe or 8 Point Art Cafe is an art gallery and cafe situated in Kollam. This is the first international standard art cafe in the city of Kollam. Eight-Point is established in a renovated heritage building, 'Parambarya,' inside the Asramam Picnic Village campus. Famous muralist and art director Mr. Shenley had taken the Parambarya building from Kollam DTPC(District Tourism promotion Council) for five years to set-up this art cafe. Now the art cafe is home for various exhibitions, performing arts and other events. The name 'eight-point' represents the eight creeks of Ashtamudi Lake and the eight art forms incorporated in the gallery. The facilities provided are gallery, café, theatre, library, venue for music. The first Little Free Library in Kerala is set up at 8 Point Art Cafe. The library is having 50 books in the small shelf situated at the courtyard and readers can take any book without fee by keeping another book.


Point Art Gallery

19.1.22 Cashew House

Cashew House, is situated in Mundakkal was built in 1935. The gigantic two-storied building was owned by an American businessman Lindsay Johnson. He came to Kerala as the representative of a New York-based food company. Due to World War II, he was forced to go back to his country, handed over his cashew business to his manager. Later the business was running at a loss due to the war, Kerala Government makes it the headquarters of Kerala State Cashew Development Corporation Limited,a public sector company that deals with cashew business in Kollam and the entire Kerala.


Cashew House

19.1.23 CSI Church

CSI Christ Church, one of the oldest and historically remarkable parishes in Kollam. The Church is located very close to the back entrance of Kollam railway station. The Church was established in year 1837. The church was erected to the Glory of God and in memory of missionaries who laboured in the Quilon District during the period of year 1821 to 1898. The remodelled and renovated church building was re-dedicated in 1979 by Bishop N.D. Ananda Rao Samuel.The seal of the church was modified. Also Late Rev. James Chales Thomson is remembered for his contribution as third missionary of the London Missionary Society in Quilon. He died on 18th may 1850 and his mortal remains lie buried in the church.

In adition to the above, Rantha School at Eravipuram is also has historical value though not much details are available in literature.


CSI Church

19.1.24 Asramam Maidan

It is an urban park in the city of Kollam and has an area of 55 acres. It is the largest open space within Kerala Municipal Corporation limits. The Maidan is considered as one of the green lungs of the city and regularly hosts the city's main cultural and sports events. It holds an adventure park, picnic village, mangrove forests & British Residency. Asramam Maidan was used as an aerodrome during the British rule.

19.2 ART & INTANGIBLE HERITAGE

19.2.1 Festivals

Major festivals conducted in Kollam city are Kollam Pooram, Kadavoor Church festival, Puthyakavu Pongala, Thrikkadavoor temple festival etc.

19.2.2 Presidents Trophy Boat Race

The President's Trophy Boat Race is a popular Vallam Kali held on the Ashtamudi Lake in Kollam on 1st November every year. The day marks the birth of the Indian state of Kerala known as Kerala Piravi. The race is conducted at Ashtamudi Lake.

19.3 DEVELOPMENT ISSUES

- Ashtamudi Lake has become a waste dumping site for the town.
- The shoreline of the Ashtamudi Lake at Thoppilkadavu is filled with debris, oil wastes, plastics and black water.
- Lack of awareness among local people to keep the lake and its surroundings clean.
- Lack of conservation measures and negligence in the periodic maintenance.