CHAPTER 13

DRAINAGE, SEWERAGE & SOLID WASTE MANAGEMENT

Drainage is the natural or artificial removal of a surface's water and sub - surface water from an area with excess of water. When an area is urbanized, trees and vegetation are removed, the drainage pattern is altered, conveyance is accelerated and the imperviousness of the area is increased because of the construction of residential or commercial structures and roads. Increased imperviousness decreases infiltration with a consequent increase in the volume of runoff. The improvements in a drainage system will help the removal of surface water in the urbanized area faster. Sewerage refers to the infrastructure that conveys sewage. It encompasses components such as receiving drains, manholes, pumping stations, storm overflows and screening chambers of the sanitary sewer. Sewerage ends at the entry to a sewage treatment plant or at the point of discharge into the environment. Solid waste management is the process associated with the control of generation, storage, collection, transportation, treatment and disposal of solid material that is discarded or is no longer useful together with monitoring and regulation of the waste management process. Improper disposal of solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to out breaks of vector borne diseases that are spread by rodents and insects. Solid waste management deals with complex challenges; hence pose various economic, administrative and social problems which need attention.

In this chapter, the details of existing drainage and issues in sewerage and solid waste management system in Kannur Municipal Corporation area are discussed.

13.1 DRAINAGE

13.1.1 ANALYSIS OF EXISTING STATUS

At present, there are so many issues regarding drainage in the Municipal Corporation area.

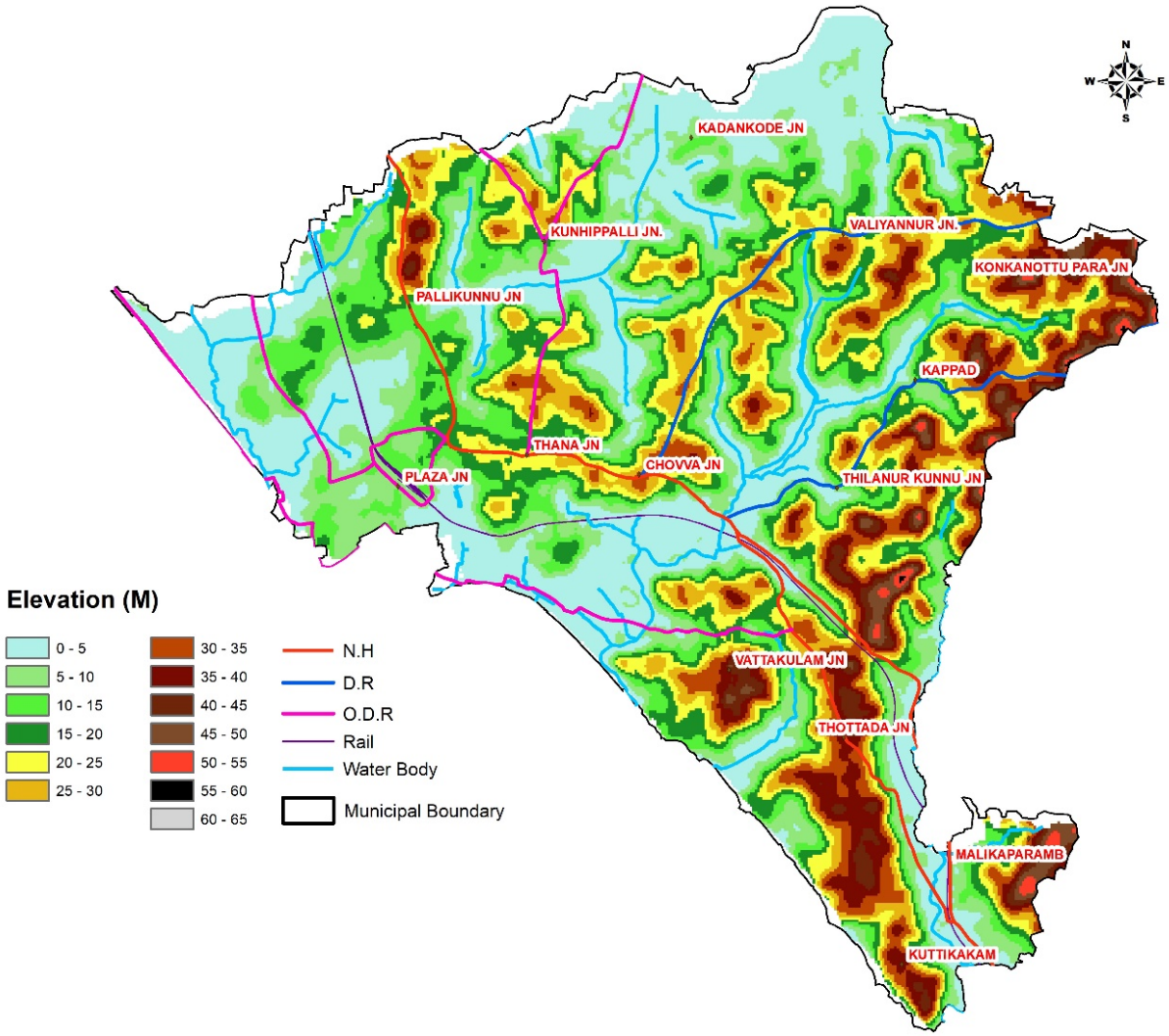


Figure.13.1 Physiography of Kannur Corporation area

Topography

Figure.13.1 shows the topography of the planning area. It reveals that low lying areas are mainly located along the river sides of the Corporation area with an altitude ranging from 0 to 65m above M.S.L (Mean Sea Level) which indicates its good natural drainage condition.

The major rivers flowing through the planning area are Kanampuzha, Kakkad puzha and Kattampally puzha (Varamkadavu and Pullooppikadavu). Thottadapuzha, Ayyarathpuzha (Nadalpuzha) are other minor rivers. Kanampuzha River originates from Ayyappanmala in Munderi Panchayth, once the centre of the Bhoodan Movement. The river flows through Macheri, Vattappoyil, Peringalayi, Kappad, Thilannor, Elayavoor, Thazhe Chovva, before joining the sea at Adikadalayi in Kannur Corporation area.

Pazhassi canal; a major canal is mainly flowing through Puzhathi,

Elayavur and Chelora zones. It is coming under Pazhassi Irrigation Project (PIP) in the Valapattanam River. Other riverlets and canals flowing through the Corporation area are Andathodu, Padannathodu, Ammayithodu, Anjukandythodu, Chalathodu, Mullangandithodu, Varamvayalthodu, Valiyathodu, Cheloravayalthodu, Macheryvayalthodu and Athirakam canal etc.

Even though so many natural drains are there, the planning area has no planned drainage network. The existing drains were designed to cater to the storm water and hence proper flow of water happens only in the rainy season. The road side drains are connected to the natural drains. Most of the road side drains are in seriously damaged condition. Of the existing drains, many of them are not interconnected. However, the connectivity to the main outlets of the existing drains has been lost due to the damage of natural drains. Moreover, there are issues threatening health and environs, due to the discharge of sullage from residences and wastes from hotels into storm water drains frequently. The drains are also filled by wastes and their side walls are damaged. So water becomes stagnant and this restricts the natural flow and creates chance for the breeding of mosquitoes. During the rainy season the unexpected flooding takes place and this causes much difficulty to residents, pedestrians and vehicle traffic. Kakkad area near corporatioin area was flooded during 2019 flood as the Kakkad River, overflowed. Many families in the area were had to be evacuated.

13.1.2 ONGOING PROJECTS

Under AMRUT Scheme by Corporation, there are new proposals for the planning area in drainage system. It includes coverage of storm water drainage network, the construction and rejuvenation of primary drains and secondary drains at Thottadapuzha and its connecting drains, Varam, Varamvayal, Katampallipuzha and their connecting drains. Also, there is a proposal for the construction of sea shore structures at Payyambalam, Thottada, Ammayithodu areas for eliminating sand deposits.

13.1.3 POTENTIALS AND PROBLEMS

Even though the low lying areas are mainly located along the river sides of the Municipal Corporation area with an altitude ranging from 0 to 65m above M.S.L, it indicates the good natural drainage condition of the planning area. But the available road side drains are not designed to carry such large quantities. Thus if proper maintenance as well as construction of new drains are done, it will certainly improve the durability of such roads

and will obstruct the spreading of epidemics due to un hygienic situations.

At present, there is no proper drainage system in the Corporation area. It creates many issues regarding the drainage system. Majority of the road side drains like Muzhathadam, Capitol mall area, Mele Chovva, Sanjay Road, Azhikkodan Nagar, Ramatheru Mandapam, Ambika Road, Irattakkannan Palam, MLA Kumaran Road, Manal – Muthappan Kavu Road, Pamban Raghavan Road, Mundachali Road etc. are in deteriorated condition and are neither covered nor interconnected. Thus the connectivity to the main outlets of the existing drains has been lost. So it is most necessary for Kannur Corporation area to have a well-designed drainage network. The existing storm water drainage network is insufficient and proper maintenance is needed throughout the network. Discharging of waste water and sullage from residences, hotels and other institutions into storm water drains frequently is a health threat to the people and the environment. The drains are have also become stagnant by the filling of wastes and damaged side walls which restricts the natural flow and creates chance for the breeding of mosquitoes. During the rainy season, the unexpected flooding takes place and this causes much difficulty to residents, pedestrians and vehicle traffic. Near Kannur University building, the Railway underpass area is flooded for every rain. Similarly, so many places like Sreepuram, Kakkad etc. are there in the planning area facing such issues. There is no waste- water treatment plant in the planning area and thus creates severe unhygienic situation especially in Padanna area. Also the main riverlets near Idachery, Kappicheri, Kayappuramthodu and Thulichery need construction of side walls.

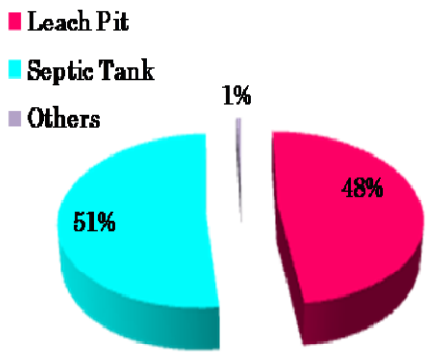
13.2 SEWERAGE SYSTEM

13.2.1 ANALYSIS OF EXISTING STATUS

In the Municipal Corporation area, there is no public sewerage system. Human faeces are the main item of waste. All the houses and commercial as well as institutional establishments depend on on-site sanitation; the collection and treatment of waste is done where it is deposited by means of septic tanks, leach pit etc. The split up of sanitary waste disposal of houses in the Corporation area is shown in Figure.13.2. About 99% of the houses have either septic tanks (51%) or leach pit (48%).

However, there are some cases where discharging of sullage and hotel wastes into storm water drains causing the contamination of the water body that acts as the outlet of those drains. Hence the major water resources of town as well as the

ground water get contaminated due to this misdeed. These open drains act as sewers and as means to dispose of sewage into the canal.



Source: Socio Economic Survey

Figure.13.2 Split up of sanitary waste disposal of houses in the Corporation area

There are so many commercial establishments, restaurants and Corporation owned buildings without any latrine facilities which will be a matter of public concern. The inadequacy of public comfort stations makes the use of open spaces for excretion by the people very common. It creates many hygienic problems and during rainy season, the whole area is spread with remains of human faeces and urine, leading to health hazards.

13.2.2 ONGOING PROJETCS

Under AMRUT Scheme by Corporation, there is a new proposal for the construction of a Septage Treatment Plant at Chelora. Also, there is a project for providing decentralised sewerage network with STP's in Kannur Zone.

Since there is no sewage treatment in the Corporation, there is another proposal for a 1 MLD sewerage treatment plant and a total length of 12.017 km sewer to take up the sewerage system network at Padannapalam near KSEB substation having a plot area of about 60 cent. It covers the wards of Thalikkavu and Kanathoor. Rotating Media Bioreactor (RMBR) is the method adopted here. The outlet of the plant at Padannapalam is Padannathodu.

In RMBR method, the sewage water from all the shops and institutions enters into a large machine, Rotating Media Bioreactor, which is located inside the STP. The oxidation takes place inside the RMBR and the outlet is connected to an outside tank, where it is treated with alum and stored for the Primary Treatment. When the sedimentation of the wastes takes place after a certain period, the supernatant is carefully removed by pipe to Secondary Treatment chamber, which is a double chamber attached by pipes only. The bottom sediments of the sewage from the primary treatment chamber are removed by a motor separately and dried under the sun in a sludge trolley for drying. The effluent from the secondary treatment chambers are passed through the sand chamber followed by carbon (charcoal) chamber

to the Ozonator, where it is processed and sent to Tertiary Treatment chamber through a pipe, from where, the water is released to creek and river. After drying, the sludge is converted to manure soil which is stored in sacks behind the STP and given to farmers and gardeners. Chlorinated water is sprinkled by the workers in and around the area of STP.

13.2.3 POTENTIALS AND PROBLEMS

Majority of houses and major commercial establishments have constructed septic tanks for disposal of sewage. In spite of the importance of the town, a planned sewerage system is not established there through most essential. Even though some areas have open drains along the roadside, whose purpose was to carry storm water into the canal, they are misused for disposing of sewage into it. The waste water discharged into the natural drains or canals is without any treatment.

Thus the setting up of a sewerage system with sewage treatment plant is the most necessary thing and immediate attention required to be given to insist all establishments to set up toilet facilities with on-site sanitation. Also, it is necessary to provide adequate number of comfort stations at suitable places in this headquarters town in order to keep an environment free of human excretion. It is a major fact of concern that in the areas namely Padanna, Anakkulam and Manjappalam, the ground water is found polluted due to the infiltration of wastewater.

Even though, constructions of new Sewage Treatment Plant near Padannapalam will be very useful, it only covers wards of Thalikkavu and Kanathoor. More Sewage Treatment Plants are to be constructed to cover all the wards.

13.3 SOLID WASTE MANAGEMENT

13.3.1 ANALYSIS OF EXISTING STATUS

Public places, shops, institutions, houses, flats etc. are the major sources of solid wastes in Kannur Municipal Corporation area. The percentage of houses and flats in the Corporation that are having facility of waste treatment at the source is given below in the Figure.13.3.

Even though facilities for solid waste treatment at houses as well as flats are there, the available percentage is just below 20%. Houses in Pallikkunu zone are having the least facilities. Flats in Edakkad, Chelora and Elayavoor have comparatively higher facilities and Puzhathi and Kannur zones have the least.

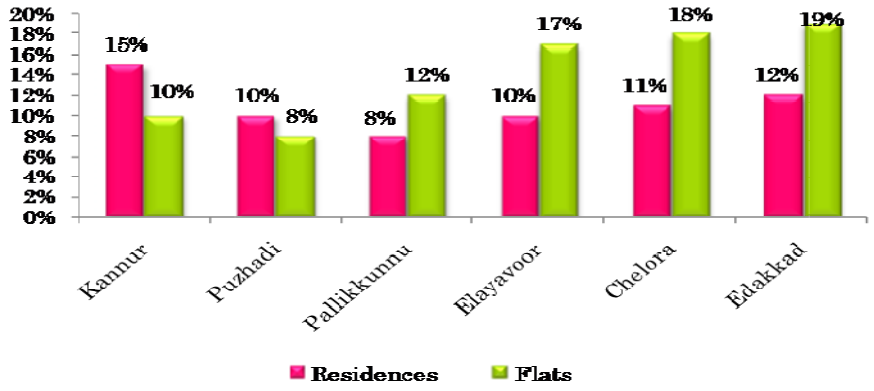


Figure.13.3 Percentage of houses and flats in the Corporation that are having facility of waste treatment

Table.13.1 Details of commercial establishments

Sl. No.	Zone	Number of Commercial Establishments						Total
		Hotels	Bakery	Markets	Tea Shops	Chicken Stalls	Beaf/Mutton Stalls	
1	Puzhadi	12	8	-	16	13	5	54
2	Pallikkunnu	15	18	-	15	2	2	52
3	Elayavoor	11	15	-	13	3	3	45
4	Edakkad	19	21	-	10	10	-	60
5	Chelora	9	19	1	11	4	-	44
6	Kannur	181	48	3	131	26	6	395
Total		**247**	**129**	**4**	**201**	**50**	**16**	**650**

The details of commercial establishments that produce solid wastes in each zone are shown in Table.13.1. Apart from these, there are five fish markets; Ayikkara fish market, Kakkad fish market, Varam fish market, South Bazar and Kannur Central market. Also, one slaughter house attached with a bio gas plant is there in Kakkad town of Puzhathi zone.

The sanitation facilities in these markets are very poor. Due to lack of maintenance, these places also face unhygienic situations. The total quantity of waste generated in the planning area is about 100 ton/day among which non-biodegradable solid waste is about 28 ton/day.

A. COLLECTION

Kannur Corporation area is well known for its scenically beautiful beaches. Also, due to its cultural heritage, it is a major tourist destination too. Tourism activities are a major factor in waste generation. The wastes generally consist of organic waste and high quantum of plastic bottles used by the tourists, which are non-bio degradable. Apart from these tourist spots, there are so many places where wastes are generating.

Solid waste is collected from various parts of the town. There are several waste collecting points in different parts of the Corporation by providing bins and containers for the collection of waste. Primary collection of non-biodegradable wastes in the Corporation area is done through Haritha Karmasena and it is mainly concentrated in twenty town wards. These collected wastes are sent to the collection centre; Material Collection Facility (MCF) located at Chelora.

MCF is a centre where non - combustible solid waste can be temporarily stored by the local body or any person authorized by the ULB to facilitate segregation, sorting and recovery of various components of waste by informal sector of waste pickers or any other work force engaged for the purpose before the waste is delivered or taken up for its processing or disposal. There are 5 sanctioned MCFs among which, only three are functioning; those at Chelora, Edakkad and Thayyil areas. Due to lack of space, MCFs at Parakandi and Puzhathi have not yet started.

The daily trips of collection are being done in the core planning area, others on alternate days. The wastes in these points are collected by means Corporation vehicles. The list of vehicles in the town for solid waste collection in the Corporation area is shown in Table.13.2. The facility for waste collection should be improved by means of providing more vehicles as well as labourers.

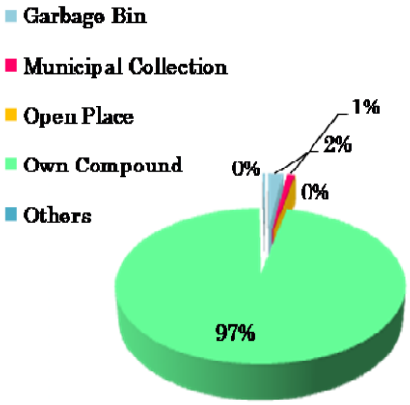
Table.13.2 List of Vehicles in city used for solid waste collection

Sl. No.	Name of vehicle	Numbers
1	Dumper Placer	1
2	JCB Excavator	2
3	Hitachi Excavator	1
4	Mini Tipper	1
5	Tractor	1
6	Auto	3
7	Mini Lorry	1
8	Lorry	1

B. DISPOSAL

The disposal of solid waste from houses is shown in Figure.13.4 which indicates that people use municipal collection facilities, garbage bins, open

space, own compound etc. for the disposal of solid wastes. About 97% of the houses use their own compound for waste disposal. About 2% use garbage while only 1% uses municipal collection facility.



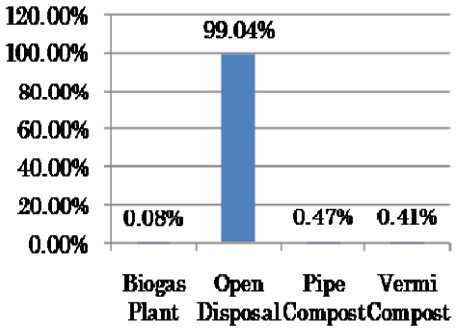
Source: Socio Economic Survey, 2018

Figure.13.4 Disposal of solid waste from houses

C. TREATMENT

I. Treatment of Waste Disposed in Own Compound

The wastes disposed at own compound is treated by means of bio gas plants, pipe compost, vermi compost and landfills.



Source: Socio Economic Survey, 2018

Figure.13.5 Details of waste treatment method at own compound

About 99.04% of the houses dispose the waste simply throwing into the compound without any treatment. Only very less percentage are adopting treatment methods like gas plants, pipe compost, vermi compost. The graphical representation is shown in Figure.13.5.

II. Treatment of Waste collected by Corporation

- **Bio Degradable waste**

Thumboormuzhi Model Treatment

For bio degradable waste, Thumboormuzhi model treatment is used.

Thumboormuzhi model aerobic systems near stadium corner, Kannur

It is one of the world's most efficient and cost effective waste management models. This model adopts layering technique and a single layer may hold as much as 500 kg of wet organic waste. Nature friendly microbial consortiums and other materials are used to begin the compost process.

This model is one of the most successfully run waste transformation models.

In Kannur Corporation area, five Thumboormuzhi model aerobic composting systems are proposed for Payyambalam, Parakkandi and Stadium area. Among these, one plant is successfully functioning in Stadium corner having a capacity of two tons (4 units having 50 kg), but its capacity is very less and is limited for selected public buildings (Corporation building and court) to use. For supervision, a night squad is working to ensure whether any illegal dumping of waste occurs there.

- **Non Bio Degradable Waste**

For the disposal and treatment of non-bio degradable wastes, Kannur Corporation has a trenching site at Chelora with an extent of 23 Acres. A total of 5 ton of segregated non-biodegradable waste is transported to the site per day. Haritha Karma Sena is handling the segregation of waste in trenching ground.

MRF unit at Chelora

But it is not efficient enough right now they deposit or dump both organic and inorganic wastes (like rexine) in the trenching ground without any treatment.

Only Chelora plant has Material Recycling Facility (MRF). The wastes collected from houses after cleaning are segregated and then shredded into small pieces by means of plastic shredding unit and then transferred into MRF. It contains Services of Plastics Processing Machineries and recycling process. Here, the segregated as well as cleaned plastic wastes are converted into small pieces by means of plastic shredding units. The other non-bio degradable wastes that are not treated are just dumped at the Chelora trenching ground.

Street sweeping in main roads is done daily whereas in sub roads, it is done on alternate days. The collected wastes are transferred to the vehicle operated by the Corporation to secondary collection points and then to Chelora trenching ground. The sweepers are employed on contract basis and the entire collection is done manually.

- **E-Waste**

E-Waste is collected by Haritha Karma Sena. It is transported to Chelora trenching ground.

13.3.2 ONGOING PROJECTS

- Waste **- to - energy plant**

The capacity of the unit 400 tonne per day is proposed at Chelora. The plant is proposed to be set up at Chelora under the State government's initiative to set up waste-to-energy plants in seven districts. Kerala State Industrial Development Corporation Ltd. (KSIDC) is the nodal agency for establishing the waste-to-energy plants. This project is similar to waste to energy plant at Jabalpur in Madhya Pradesh. The waste is being burnt at a large burner in the plant and the gas generated thus was emitted after treatment. The other salient features include Flue Gas Treatment and water and ash treatment, which ensures that all the waste generated as a part of the processes are also treated before emission.

- **Aerated (Turned) Windrow Composting Unit**

An aerated windrow composting unit having an area of 500 sq. m is also proposed at Chelora. This method is to accommodate large volumes of diverse wastes, including yard trimmings, grease, liquids and animal by-products (such as fish and poultry wastes) with frequent turning and careful monitoring. This method is suitable for large quantities, such as that generated by entire communities and collected by Corporation.

13.3.3 POTENTIALS AND PROBLEMS

In Kannur Municipal Corporation area, even though there are some waste collection facilities (monthly only), all of the wards are not covered. Hence there arises the need for decentralised waste management system in the planning area irrespective of the distance from the town centre, by incorporating the help of any private agency. Since Thumboormuzhi model of waste treatment plant is a very widely accepted method of treatment, its use in the Corporation area will be very effective. But the coverage of all the wards is to be ensured.

Thumboormuzhi model of waste treatment plant can be implemented in every ward. To treat bio degradable wastes, ring compost or pipe compost bin can be provided. The MRF at Chelora is not working effectively and its proper functioning should be ensured. Also, door to door waste collection centres are not there in all the wards; hence it is necessary to provide door to door waste collection facilities under payment which can be utilised for the maintenance of the utensils.

13.4 INFERENCE

Kannur Corporation area is blessed with three major and two minor rivers and the physiographic conditions are good for drainage as the low lying

areas are mainly located along the water bodies. But proper maintenance of existing drains in the planning area is very less. Hence the urban storm water drainage collection and conveyance systems have to be designed in such a way that flooding is avoided and transportation is not adversely affected. It is a proven fact that there should be a good drainage system for roads and it will certainly improve the durability of such roads. For that not only workers, but also machinery facilities should be provided. For that new schemes should be established. There shall be a good network of drainage by providing culverts, conduits etc. The unwanted land use conversions are to be strictly prohibited which affect the natural drainage of the area. The natural drains are very useful as they are helpful in collection of storm water during rains to permit percolation into the soil and helps in slow discharge into the natural stream.

Improved sanitation play a major role in the overall well-being of the people, with a significant bearing on the infant mortality rate, death rate, longevity and productivity. There are no sewage treatment plants in the planning area. Lack of sufficient comfort stations makes the Corporation area unhygienic. In the areas like Padanna, Anakkulam and Manjappalam, the ground water is found polluted due to the infiltration of wastewater. The newly proposed Sewage Treatment Plant near Padannapalam only covers wards of Thalikkavu and Kanathoor. Hence it is necessary to cover all the wards and for that, more Sewage Treatment Plants are to be constructed.

Waste management is important because improperly stored refuse can cause health, safety and economic problems. The available waste collection facilities are not covered for all the wards. Hence decentralised waste management system all over the Corporation area is to be initiated. Localized collection and processing techniques need to be introduced. Thumboormuzhi model of waste treatment plant can be implemented in every ward. To treat bio degradable wastes, ring compost or pipe compost bin can be provided. The efficiency of the existing treatment facilities like MRF at Chelora is to be ensured. Advanced technologies like of Vermi Composting may be introduced. E-Waste treatment plant should be established at Chelora.