Chapter: 4
Sanitation in Calcutta

4.1 Introduction

4.2 Sanitation in Calcutta
  4.2.1 Sewerage and Drainage System,

  4.2.2 Water Supply
    4.2.2.1 Filtered Water
    4.2.2.2 Unfiltered Water

  4.2.3 Roads

  4.2.4 Removal of Solid Waste
    4.2.4.1 Night Soil
    4.2.4.2 Garbage and Refuse
    4.2.4.3 Human Dead Bodies.

4.3 Sanitation in Britain with Special Reference to London.

4.4 Conclusions
4.1 Introduction

There is an old saying "Prevention is better than cure\(^1\)". Preventive medicine here refers to the measures taken to protect the individuals from diseases and to keep them in a state of positive health. **Sanitation** is one such measure in securing positive health of the people. In the past, sanitation was centered on the sanitary disposal of human excreta. Even now, to many people, sanitation still means the construction of latrines. But operationally, the term sanitation covers the whole field of controlling the environment with a view to prevent disease and promote health. "Sanitation is a procedure involving measures to keep the environment clean and free from waste and decaying matters, animals and human excreta, putrefactive agents, gases, poisons, smoke, infective and obnoxious materials dangerous to life, insects and other agents associated with human diseases, and to provide safe and sufficient water"\(^2\).

The detailed historical study of disease and death in the city of Calcutta during the colonial period clearly shows the prevalence of diseases associated with bad sanitary conditions. Although there were other infectious diseases such as venereal diseases, common among the European people in the city, the most prevalent among the Europeans as well as the Indians were cholera, dysentery, diarrhea, fevers in varied forms, smallpox and plague. In this chapter an attempt has therefore, been made to analyze the measures taken to develop the basic civic or sanitary condition of the city so as to prevent the occurrence and prevalence of these diseases which are associated with bad environmental conditions. For this purpose, a brief analysis of the development of the following sanitary measures has been done for Calcutta:

- Sewerage and Drainage system;
- Water supply;
- Construction and widening of Roads; and,
- Removal of Solid Waste.

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\(^1\) Ratan, Dr. Vidya (1983): *Handbook of Preventive and Social Medicine – Hygiene and Public Health*; Delhi: Jaypee Brothers; p.1.

4.2 Sanitation in Calcutta

In the initial years of the city’s growth, the merchants of the East India Company were not much interested in providing improved civic amenities. Some of money the Company collected by imposing taxes, duties and licenses in Calcutta between 1690-1723 by virtue of the zamindari rights they had acquired over the villages of Sutanuti, Kolkata and Govindpur in 1698 was put to develop the settlements’ civic structure. The civic services rendered by the Zamindar mainly consisted of: water supply, drainage, cleansing of streets and, street lighting. The development activities undertaken by the Zamindar included: cutting down the jungles in the town, bridging the watercourses, surveying the lands and other such affairs. The provision of ‘civic amenities’ in the city was brought under the Municipal Administration in 1727.

4.2.1. Sewerage and Drainage System

Calcutta had its natural drainage through the Khal (creek) that originated from the Salt Lakes in the east and joined the Hooghly River just below the Princep Ghat, after meandering through Beliaghata, Sealdah, Creek Row, Dharamtola and Government Place North. The great cyclone of 1737 rendered this creek useless as a watercourse for navigation. Small surface drains had existed in the city since 1695 when a trench was dug round the Sutanuti factory. A deeper trench was constructed in 1710 to separate the British settlement from the indigenous settlement and keep the former dry and wholesome. The ditch ran from Lal bazaar probably to Babu Ghat. It was protected with drawbridges and a guardhouse – as it basically served the defense rather than drainage purposes. In 1742 the Maratha Ditch was constructed initially from Baghbazar to Park Street and then extended to Alipore. This was mainly for the defense against the Maratha raids but it served also as the grand drainage outlet for the whole city until 1801 when it was filled up.

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At a meeting of the “Town Improvement Committee” held on 16th June 1803, Lord Wellesley admitted: “It is a primary duty of the government to provide for health, safety and convenience of the inhabitants of this great town by establishing a comprehensive system for the roads, streets, paths, drains and water by fixing permanent rules for the construction and distribution of the houses and public edifices and for the regulation of nuisance of every description”\(^5\). It was during his regime that the “Town Reforms Committee” was formed for improvement of the town. Since the construction of the public drains and watercourses of the Town was extremely defective, he assigned great importance to the improvements of its drainage \(^6\).

This led to the appointment of a Committee in 1804 to look into the matter. This Improvement Committee, later called the Lottery Committee, undertook extensive development work for Calcutta by constructing roads and filling up filthy tanks in the town and excavating new ones. Beliaghata Canal was the Lottery Committee’s permanent contribution to Calcutta’s drainage system.

It is reported that during the early nineteenth century, the drains in the northern part of the town were unpaved and filthy. Coolies were employed regularly to clean these drains manually which would overflow on to the streets after a light fall of rain as these drains had no outlet.

As a result, various proposals came up between 1835-1855 for the construction of a new drainage system in the ‘Town’.

- The Committee opted for an underground drainage system.
- Captain Princepp preferred a surface drainage system to carry off the water with sinks and ash-pits for every house, to be cleansed by hand-labor. He strongly opposed any scheme of underground drainage in Calcutta.
- Mr. Blechynden, proposed to drain the northern portion of the town, in which no large drains had yet been made, either towards the river or to the east by a large underground tunnel running from the Hughli down Nimtola and


\(^6\) Ibid.
Manicktollah streets to the Circular Canal. The tunnel was to be flushed by the admission of the Hughli water.

- Captain Thomson provided for an elaborate system of large underground drains or sewers, which he proposed to flush partly by river water and partly by means of a reservoir to be formed at the western end of the Entally Canal.

- Captain E. Forbes proposed to construct a large masonry aqueduct from the river Hooghly at old Chitpur Bridge to the Old Park Street cemetery, and link it with the Salt Lakes by a wide-open canal nearly parallel with Entally canal. The canal was to be connected by sluice gates with the river and lake, so that water might be admitted or excluded from both these sources. On either side of the canal masonry sewer or covered drain was to be constructed and linked with a system of subsidiary drains discharging into these two main sewers all the filth and surface drainage of the city.

- William Clark proposed a “water-carriage system” for the town. The original report was submitted to the Municipal Commissioners in 1855, and adopted in 1857 with some modifications and was sanctioned in 1859. Clark’s scheme was a ‘combined sewage-cum drainage system’. It carried off both rainfall and sewage from the Hughli to the Salt Lakes from where the sewage was to be pumped out. The total town area covered by Clark’s Scheme was 4730 acres.

Clark’s scheme comprised of five main sewers with their branches, accessories, and outfall works. Three of the main sewers stretched from the Hughli to the Circular Road along the Nimtola Ghat Street, Colootola Street, and, Dhurrumtollah Street.

There were two main intercepting sewers:

- One from the north, starting from Hughli at Sova Bazaar Street running eastward to Circular Road and continuing along Upper Circular Road to a level at Dharamtola junction. It intercepted the three main sewers already mentioned. Between this Circular Road sewer and the Circular Road canal, he provided four storm-water overflows of much larger capacity than the sewers.

- The other intercepting sewer started from Tolly’s Nullah, near Zeerut Bridge, and following Lower Circular Road to Dhurrumtollah junction. It discharged
together with the sewer from the north and the Dhurrumtollah sewer through a
main outfall to Palmer’s Bridge Pumping station in Entally, and thence into
the Beliaghata Canal.

It appears to have taken 16 years to complete the main sewers of Clark’s scheme. By
1875 nearly 38 miles of brick and 37 miles of stoneware pipe sewers were
constructed. The pumping plant at Palmer’s Bridge comprised two 30 and one 45
P.H.P. vertical centrifugal steam pumps, and two huge silt-pits provided with
penstocks. These penstocks also shut off the flow of the sewers from the channel to
the Beliaghata canal. During the rainy season they were opened so that the sewers
could discharge fully into the canal providing a great relief from storm-water
overflows between Upper Circular Road sewer and the Circular Canal. The drainage
works of the Southern Division were finally completed in 1878 and those of the
Northern Division between 1885–86.

Clark’s original scheme was not complete when the Corporation was compelled to
undertake additional works to prevent the discharge of storm-water into the canal.
Calcutta’s Canals (Circular, New Cut, Bhangore Khal, Kristopore and Tolly’s Nullah)
though excavated principally for navigation, helped in draining the City to a
considerable extent by carrying storm-water until the end of the nineteenth century. In
1880, however, the Government Irrigation authorities objected to the storm-water
being discharged into the canal, although there could be no doubt that the canal had
intercepted the natural surface drainage channels of the city. The Government in
1881–82, stopped the discharge of storm water into the Circular Canal. The city
drainage was thus disoriented and the escapes into the Circular Canal had to be
checked by a long intercepting sewer, which diverted the drainage to the existing
Town Head Cut.

After a long controversy with the Government the Corporation reluctantly agreed in
1881 to: (i) construct an intercepting sewer to increase the dimension on the outfall
channel (the open cut) to a capacity of about 90,000 cubic feet per minute; (ii) to
construct tide-gates of four openings 10 feet wide at Makalpotta; and, (iii) to divert
the storm-water of the northern area of the city to the Beliaghata Canal below
Dhapa. This intercepting sewer ran parallel with and close to the canal from Halsi Bagan road to Palmer’s bridge, where it joined the outfall channel. But unfortunately it was constructed, like most of the city sewers, with the smaller sections joining the larger invert to invert, and the levels at which it was constructed did not allow it to take the required discharges from the storm overflows without causing the water to stagnate in the low-lying areas of the city. There were 37 miles of main or brick sewers and 147 miles of pipe sewers in Calcutta by 1890.

The Added and Fringe Areas, covering 8188 acres, were incorporated in the town of Calcutta in 1889. The development of these areas was entrusted to a committee, called the Suburban Improvement Committee. For the purpose of drainage the new areas fell naturally into 3 blocks:

i) The portion west and south of Tolly’s Nullah, including the new docks. This drained towards the south and southwest;

ii) The area east of Tolly’s Nullah, including Ballygunge and Entally. This drained towards the Bidyadharri; and;

iii) The area lying between the Circular canal, Circular Road, and the Eastern Bengal State Railway lines, devoid of all drainage except in so far as the drains of Calcutta provided outlets.

Under the Suburban Sewerage Scheme executed between 1891 and 1906, 12.5 sq. miles (32 sq. kms.) in the newer southern areas of the city were covered. A new pumping station was constructed at Ballygunge, and the capacity of the Palmer’s Bridge station augmented. The drainage system could therefore dispose off storm water from 6mm. or one-fourth of an inch rainfall per hour plus 40 gallons (182 liters) of sewage per inhabitant per day. This “combined drainage” flow was brought through the underground sewerage network to Palmer’s Bridge and Ballygunge pumping stations. It was then pumped into high-level sewers meeting at a place called “Tapsia A”. From here, the discharge flowed by gravity directly into Raja Khal, a creek of the tidal river – Bidyadhari.

Burdened with the outfall of the entire city’s drainage system, the Bidyadhari began to show signs of rapid deterioration. In 1928, the Government declared it to be a dead
river. The city was thence almost trapped in a drainage deadlock. At this juncture, Dr. Birendranth Dey (1891-1963) came up with a new scheme for both the outfall and the internal drainage system. The Outfall Scheme comprised of:

i) Lined dry-weather flow channel from Tapsia point A to the river Kultigong at Ghusighata, discharging into the river through a sluice at the outfall.

ii) Storm-water flow channel (the Suburban Head Cut) from Ballygunge drainage pumping station to the Kultigong at Ghusighata, discharging through the sluice mentioned under (1).

iii) Storm-water flow channel (the Town Head Cut) direct from Palmer’s Bridge Pumping Station, joining the dry weather flow channel mentioned under (1) at Bantala, where provision was made for two sedimentation tanks for primary treatment of the dry weather flow.

iv) Storm-water flow channel from the Dhapa lock pumping station, joining the channel mentioned under (3) at Makalpota.

This scheme was commissioned only in 1943. It has since undergone major modifications and expansion to meet the rapid growth of the city’s area and population.

Figures show 4.1 and 4.2 shows the physical expansion of the sewerage lines in Calcutta since 1875.

With the expansion of sewerage lines the amount of sewage pumped out also increased. According to the Calcutta Municipal Corporation Reports for the period under study, all the lines were not cleared at the same time. The amount of sewage pumped daily, hence, does not show much variation.

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Figure: 4.1

Total Length of Sewer Line Constructed in Calcutta

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<tr>
<th>Year</th>
<th>Length in Miles</th>
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<tbody>
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<tr>
<td>1890-91</td>
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<tr>
<td>1917</td>
<td>247.15</td>
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<tr>
<td>1920</td>
<td>249.60</td>
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<tr>
<td>1926</td>
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</tr>
<tr>
<td>1931</td>
<td>622.18</td>
</tr>
<tr>
<td>1940</td>
<td>700.37</td>
</tr>
<tr>
<td>1943-44</td>
<td>714.95</td>
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</tbody>
</table>

Figure: 4.2

Type of Sewerage and Drainage Line in the Town

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<thead>
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<th>Year</th>
<th>Brick Sewer</th>
<th>Pipe Sewer</th>
<th>Surface Drain</th>
</tr>
</thead>
<tbody>
<tr>
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<td>38.00</td>
<td>37.00</td>
<td>34.71</td>
</tr>
<tr>
<td>1890</td>
<td>34.71</td>
<td>34.71</td>
<td>34.71</td>
</tr>
<tr>
<td>1917</td>
<td>34.71</td>
<td>34.71</td>
<td>34.71</td>
</tr>
<tr>
<td>1920</td>
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<td>222.92</td>
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<td>222.92</td>
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<td>283.38</td>
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<tr>
<td>1943-44</td>
<td>283.38</td>
<td></td>
<td>283.38</td>
</tr>
</tbody>
</table>
4.2.2 Water Supply

An adequate supply of pure water, along with an efficient drainage and sewerage system, is most essential to ensure good health of a population. Although the consumption of water depends upon climatic conditions, standard of living and habits of the people, a daily supply of 150 to 200 litres (34-40 gallons) per head is considered an adequate allowance.

4.2.2.1 Filtered Water in Calcutta

In its early years, Calcutta had its water supply from open tanks, wells and the river Hooghli. The staunch Hindus used nothing but Ganga waters from the Hooghli River. Baishnacharan Sheth of Burra Bazaar made a fortune by supplying the holy water to far off places\(^8\). Wealthy Hindus got their supplies either from Hooghly Town or from Khulna for the apparently purer flow there. The water would be filtered through sand and charcoal, after immersing a red-hot iron rod into it and stored in Pegu jars for as long as a year. The river water was fit for drinking only from October to March. From April till the onset of the monsoons, it was saline. The water when turbid was clarified by alum and strained through cloth. Some people collected rainwater and

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used it when the river water became turbid during the rainy season. In the native part of the city, numerous private wells supplied water to the poorer people, living away from the river. These privately owned tanks were foul smelling and unsanitary, and their water too polluted for human consumption. The Europeans often used stored rainwater. The Great Tank at Dalhousie Square (now B. B. D. Bag), popularly known as Laldighi, was enlarged and deepened in 1709 to ensure a good supply of sweet water to the garrison at Old Fort William and for the British in Calcutta. Many private tanks were also excavated but subsequently decayed due to absolute neglect.

Not much initiative was taken by the European authorities to improve the civic amenities of the city of Calcutta even after it became the capital of British India in 1773. It was only in the early nineteenth century when things began to improve.

The Lottery Committee excavated a number of tanks between 1808 and 1837, chiefly along the arterial road from Lower Circular Road to Shyambazar at Cornwallis Square, College Square, Wellington Square, Mirzapur, Soorti Bagan, along with several tanks in Shorts Bazaar. The ‘native town’ too had a number of private tanks, sometimes open to the public. By 1847, the total number of tanks within the Maratha Ditch was 1043\(^9\). It appears from the Administrative Report of the Calcutta Municipality for 1877 that there were within the boundaries of the city some 800 tanks covering an area of 146 acres\(^{10}\). In the suburbs, Bhowanipore alone had 823 tanks in 1888.

However, with the growth of population, the existing system was found inadequate, and by 1820, a small pumping plant was set up at Chandpal Ghat for lifting river water into open masonry aqueducts, which distributed the water by gravitation over a small portion of the town comprising Old Court House Street, Dharamtola, Chowringhee, Park street, part of Chitpore Road, Lal Bazaar, Bow bazaar, etc. The aqueducts were filled with water pumped from the river Hughli by a small pumping unit at Chandpal Ghat and settled into a settling tank from which the water flowed


\(^{10}\) Anonymous (1878): “Calcutta Tanks”; Indian Medical Gazette; December2.
into the aqueducts by gravity. Water could be taken from the aqueducts by buckets and the supply was also used for street watering and replenishing the public tanks.

The authorities for the first time recognized the need for pure and wholesome water in 1848 and passed the legislation Act II. The Commissioners subsequently spent large sums for repairing the public tanks. In 1854, the system of aqueducts was extended to Wellington Street, Wellesley Place and College Street. The cost was borne by the Government and the public.

Clark recommended the use of cast-iron pipes laid underground, through which water could be forced from Chandpal Ghat. The Commissioners, however, on the grounds of expense and delay in obtaining materials from England, did not favour the innovation.

Between December 1861 and January 1863 an elaborate analysis of the Hughli water was carried out by collecting samples from the centre of the stream at 6 feet below the surface at three stations, namely from opposite Cossipore, Palta Ghat and Chinsura. It was observed that the Cossipore water was tainted by sewage, and the plan of placing the intake pipes at this point, which its low cost had recommended, was abandoned. The analyst reported that water drawn either at Pulta or Chinsura was comparatively pure, and after settling and filtration would give a pure and wholesome supply. Clark’s original scheme provided for a daily supply of 3 to 4 \( \frac{1}{2} \) million gallons of water.

In 1865 Clark submitted a full report on the Pulta scheme, which was approved in its entirety by the Water Supply and Finance Committees of the Corporation, who recommended that the works should be carried out by contract under the supervision of the Justices, instead of the supply being placed under the control of a water company.

The first water works for the supply of filtered water to Calcutta was built at Pulta (about 30 kms. north of the City centre situated between Barrackpore and Naihati) and took three years (1867-1870) for its construction. It was designed for supplying 6
million gallons (27.28 million litres) of treated water every day to a population of 4
lakhs, thus giving a per capita supply of 15 gallons (68 litres) per day.

In order to obtain the full advantage of the waterworks and to avoid the depreciation
which iron pipes were expected to undergo owing to the salinity of the soil, Clark was
in favour of conveying the water from Pulta by a brick aqueduct instead of through
iron pipes, but his views were subsequently modified. Two pumping stations were
built – one at Tallah and the other at Wellington Square along with two underground
reservoirs with capacities of 1 million gallons (4.546 million litres), and a 6.25 million
gallons (28.41 million litres) respectively. The filtered water from Pulta to Tallah was
conveyed by gravity through a 42 inches (1067mm) diameter cast-iron main laid at a
gradient of 1 inch. Water used to be pumped from Tallah under pressure partly to the
consumers direct and partly into the underground reservoir at Wellington Square from
where again water used to be pumped to the consumers.

The daily consumption of water was 4.5 million gallons (20.5 million litres) by 1870,
and all the principal streets and lanes (385 in number) were piped, to a total length of
piping aggregating 111.75 miles (179 kms.). Over 500 stand posts were erected in the
streets and made accessible to the public.

It was soon found that the working of the filters was unsatisfactory during the rainy
season. In 1871 the Engineer proposed to increase the number of filters and to make
other extensive works. With the increasing demand for filtered water the problem of
water wastage began to assume great importance. As a measure of economy, the
extension of the unfiltered water supply was extended for street watering, fire
prevention and trade. Gradually, an additional engine was installed at Tallah, the
pumping plant at Chandpal Ghat was strengthened, and unfiltered water supply was
further extended. The supply of filtered water, however, did not exceed 7 million
gallons daily. It soon became evident that the works should be enlarged.

With the inclusion of the southern suburbs within the municipal area in 1888, there
was need to increase the supply of water. During 1888-1891, some extension works
were carried out. These included:
- Construction of a new Pumping Station with three 75 H.P. pump sets at a distance of about half a mile (0.8 km.) from the old station at Pulta.

- Excavation of four large kutcha settling tanks/reservoirs with a total capacity of 82.75 million gallons (376 million litres).

- Construction of twenty-four additional slow-sand filter beds.

- Laying down of a new 48-inch (1219 mm.) diameter cast-iron pipe, 66,000 feet in length between Pulta and Tallah, to convey the increased supply of water to Calcutta.

- Strengthening of the works at Tallah by the addition of two new pumping-engines, while the reservoir accommodation was increased from 1-3 million gallons.

- Installation of an additional pumping-engine at Wellington Square Station, and construction of a new pumping station at Halliday streets, with four beam-engines and an underground reservoir of 4 million gallons (18.18 million litres) capacity.

- Construction of a new pumping station at Bhowanipore for the supply of the southern suburbs newly incorporated in the Municipality. This pumping station was fitted with two triple-expansion Worthington engines and provided with an underground reservoir of nearly 3,000,000 gallons capacity (13.64 million litres).

The new works were completed in 1891. Subsequent minor alterations included the installation of a new Worthington pumping-engine at Tallah, capable of raising 900,000 gallons per hour (1894), and two triple-expansion Worthington engines (1898) engines.

During 1891-1900 considerable extensions of filtered water mains were carried out. Attention was drawn in 1901 to the need of a continuous system of water supply through elevated reservoir. It was proposed to abandon the three pumping stations at Wellington Square, Halliday Street (Md. Ali park), and Bhowanipore and to substitute them with a system of gravitation by using the pumps at Tallah to raise the water into an elevated steel tank or reservoir. It was also proposed to construct two such reservoirs, one for the north and east, and the other for the south of the town.
The Government agreed to the proposal with some modifications and executed the plan by 1902. A new Worthington engine with a pumping capacity of 22 million gallons (100 million litres) a day was installed at Pulta in 1900 and in 1902 steps was taken to construct an additional reservoir of 5 million gallons (22.73 million litres) capacity at Tallah. By 1903 the supply per day was 22 million gallons (100 million litres).

A fresh scheme was submitted in 1903. The principal features of which were – the laying of a new 48-inch main from Pulta to Tallah to deliver an additional supply of 12 million gallons of water, and substitution of gravitation for pumping as a method of distribution.

There was a serious demand for increasing supply even after it was increased from 20.5 million gallons (93.2 million litres) to 26.5 million gallons (120.5 million litres) a day by 1905. To meet this increasing demand, the Corporation sanctioned another scheme in 1907 and the Government in 1908. The works were duly executed by 1911, increasing the supply from 26.5 million gallons to 32 million gallons (145.5 million litres) a day. After the completion of these schemes, the practice of storing and boosting filtered water supply from the underground reservoirs and pumping stations was abolished. The total supply again rose to over 36 million gallons (163.7 million litres) in 1913-1914, and in 1921 it was a little over 38 million gallon (172.7 million litres).

The number of house connections in 1920 was 37,023 that included 2684-metered connections. For the purpose of waste prevention, the whole city was divided into 238 water meter districts. The total length of filtered water mains rose to 385 miles (616 Kms.). However, the objective of continuous high-pressure supply throughout the day couldn’t be achieved because of excessive wastage. Moreover, there was an acute shortage of water especially during the hot weather in the southern parts of the city. In order to maintain a continuous supply at a minimum terminal pressure a new scheme was submitted and was approved by the Corporation in 1921. This estimate
was, however, subsequently revised for supplying water to the areas newly added to Calcutta in 1924\textsuperscript{11}.

With the help of the existing and the newly constructed mains as mentioned above, arrangements were made for delivering water from the Tallah pumping station to different parts of the city through the various zone mains\textsuperscript{12}. All the above-mentioned works were started in 1922 and completed in 1936.

\textsuperscript{11} The scheme included the following major components:

- Construction of a wrought steel intake jetty to arrest weeds and floating bodies;
- Provision of three new wider steel suction mains over and above the existing cast iron mains.
- Modification of the intake pumping station at Palta with removal of three old engines and pumps.
- Alteration of four old Kutcha settling tanks to serve as pre-settling tanks and construction of a new settling tank to the existing ones provided with a baffle wall.
- Addition of 18 new slow-sand-filter-beds at Palta.
- Provision of 3 Parsons Turbines coupled to Mather and Platt centrifugal pumps at the Palta Pressure Station.
- Extension and maintenances of the existing CI mains between Palta and the new storage reservoir at Tallah.
- Construction of a new masonry reservoir of 10 million gallons (45.46 million litres) capacity at Tallah with its lowest water level at 7 feet (2.13 m.) above the ground along with ancillary pipe works and valves.
- Construction of a new pump house at Tallah with four turbine-driven centrifugal pumps.
- Laying of 2 new mains for delivery of water from Tallah to the Town.
- Construction of a new screw pile bridge over the Circular Canal to carry pipes and another pipe bridge over Tolly’s Nullah.

\textsuperscript{12} The main zones and their alignments were:

- **Zone- I Main**: 30-inch (762-mm.) diameter cast iron main along Cornwallis Street (now Bidhan Sarani) and College Street.
- **Zone - II Main**: 54-inch (1372-mm.) diameter steel pipe from Tallah across Chitpur Yard and Circular Canal and along Galiff Street and Raja Dinendra Street to the junction of Maniktala Road, 48-inch (1219-mm.) diameter steel main along Maniktola Main Road and Maniktola Spur up to Cornwallis Street, 42 inch (1067 mm.) diameter steel main along Maniktola Spur, Chittaranjan Avenue, Chitpur Spur to Chitpur Road.
- **Zone - III Main**: 45 inch (1143 mm.) diameter steel main from Tallah running parallel to Zone- II main up to Maniktola Road and continuing along Raja Dinendra Street, Ram Mohan Roy Road, Upper Circular Road (now A.P.C. Road) to the junction of Dharamtala Street for connection with the existing 60 inch (1524 mm.) main along Dharamtola Street.
- **Zone- IV Main**: The existing 72 inch (1829 mm.) and 60 inch (1524 mm.) main from Tallah to the junction of Circular Road and Dharamtola Street, and then, a new main laid along Lower Circular Road (now A.J.C. Bose Road) upto its junction with Elgin Road and then a 52 inch (1321 mm.) diameter steel main laid along Sambhunath Pandit Street, Bhawanipore Road, across Tolly’s Nullah, Belvedere Road to the junction of Alipur Road where, one 42 inch (1067 mm.) diameter pipe branched off for Garden Reach, and a 33 inch (838 mm.) main continued straight across the Zoo Gardens, the Meteorological Office up to Diamond Harbor Road, the 42 inch (1067 mm.) main went along Alipur Road, Sterndale Road, Diamond Harbor Road, Remount Road, across the Port Commissioners’ land, the Taratola Diversion Road to the junction of Circular Garden Reach Road and Garden Reach Road, at the Elgin Road junction with Lansdowne Road, a 39 inch (991 mm.) diameter steel main went along Lansdowne Road up to Hazra Road and then a 33 inch (838 mm.) diameter main along Hazra Road upto Russa Road.
4.2.2.2 Unfiltered Water

The supply of 'Unfiltered Water' in the city of Calcutta dates back to 1820. When the filtered water supply was found inadequate to meet the demands of the town, Clark proposed to economize its use by an extension of the unfiltered supply in 1871. The unfiltered water supply was mainly used for the purposes of watering roads and flushing of sewers and privies. The old pumping machinery at Chandpal Ghat was utilized for this purpose.

The transfer of the Chandpal Ghat Pumping Station site to the Port Commissioners followed the extension of the unfiltered water pipes from 1871. The Port Commissioners handed over to the Corporation a new site at Mullick's Ghat on Strand Road, south of Howrah Bridge approach. New pumping machinery was installed at this site in 1885, but, it made way in 1897 for the existing plant, which consisted of four 300 H.P. vertical triple expansion Worthington engines, each capable of pumping ½ a million gallons (2.273 million litres) per hour against a head of 120 feet (36.6 m.). Each engine was provided with a separate suction pipe laid in tunnel under the Port Commissioners' railways up to the retaining wall at the riverbank. This pumping station supplied all the unfiltered water required for the town area. The tunnels and the jetty were the property of the Corporation.

In 1897 another pumping station for unfiltered water supply was constructed at Watgunge, on the river Hughli near the mouth of Tolly's Nullah. Two horizontal pumping engines, each capable of pumping 300,000 gallons (1.36 million litres) per hour against a head of 120 feet (36.6 m), which were earlier installed at the Mullick's Ghat Pumping Station, were shifted and installed here. The two pumps drew their water from a common suction pipe laid in a tunnel from the station to a screw pile jetty that supported the pipe up to the water in the river. The Watgunge Pumping Station supplied water to District IV and the Maidan area. The supply of unfiltered water grew from a little over a million gallons (4.546 million litres) per day at Chandpal Ghat to 33 million gallons (150 million litres) per day from Mallick Ghat and Watgunge Pumping Station in 1921.
No further development works relating to water supply were taken up between 1936 and 1945 chiefly due to resource constraints and political upheavals.

The nature of expansion of water supply system in Calcutta is illustrated in Figures 4.4, 4.5, and 4.6 and indicates the number of houses connected to the different sources of water and amount of supply to them between 1870 and 1946-47.

Figure: 4.4

![Physical Layout of Water Pipeline in Calcutta](image)

Figure: 4.5

![Average Daily Water Supply in Calcutta](image)
Though there was an increase in the water pipelines for both filtered and unfiltered water in the city from 1870, the amount of filtered water supplied over the years increased at a comparatively low rate. The unfiltered water supply in the City increased rapidly during the first half of the twentieth century with the increase in the demand for water in Calcutta. Similarly, the numbers of house connections to different types of water supply in the city also show an increase over time.

### 4.2.3 Roads

The construction of roads and their maintenance is another important indicator of urban planning. It also indirectly affects the sanitation in a city. There were practically no roads in the villages that grew into Calcutta, as they were sparsely inhabited. The only pathway was the pilgrim path that led to the Kali temple. The English East India Company as well as the British Government, who took over the administration of the city of Calcutta in 1857, had constructed roads for their easy movement. Construction of roads in Calcutta falls under three periods\(^1\), viz.

1. Days of the Zamindar (1700 – 1793);
2. Days of Justices of the Peace (1794 – 1876); and,
3. Municipal Corporation (since 1876).
The East India Company initiated conscious efforts for building roads after their acquisition of the Zamindari rights of Calcutta. The survey of the three villages in 1707 showed that no more than 4 cottahs of land was devoted to roads in Sutanuti while, the other two villages, viz. Kolkata (khalkata) and Govindapur, were without roads. This resulted in the whole settlement being punctuated by cesspools. Calcutta had two streets in 1706:

1. Clive Street, (the highway that connected Old Fort with Jorabagan through Bara Bazaar), and,
2. Chitpore Road, (which connected Halisahar in the Barrackpore subdivision of North 24 Parganas district with Kalighat/ Pilgrim Road).

Table 4.1 gives the progress of construction of roads during the days of the Zamindar:

<table>
<thead>
<tr>
<th>Year</th>
<th>Streets</th>
<th>Lanes</th>
<th>Bye-lanes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1706</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1726</td>
<td>4</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>1742</td>
<td>16</td>
<td>46</td>
<td>74</td>
</tr>
<tr>
<td>1756</td>
<td>27</td>
<td>52</td>
<td>74</td>
</tr>
<tr>
<td>1794</td>
<td>163</td>
<td>520</td>
<td>517</td>
</tr>
</tbody>
</table>


The authorities constructed new roads from Fort William to Govindpur in 1721 for making the place healthier “by the wind’s free passage into the town”15. The construction of roads in Calcutta during the days of the Zamindar was primarily carried out by taking contributions from the merchants and local residents. The English Company encouraged voluntary contributions in labor and money for development works of the town. The Company was not authorized by the British Parliament to levy tax on inhabitants of Calcutta for effecting town improvements till 179416. The Circular Road (now called Acharya Prafulla Chandra and Acharya Jagadish Bose Roads) was the result of the voluntary efforts of the people of Calcutta.

By 1742, Calcutta had 16 Streets and 46 lanes. Few of the roads marked in Orme’s Plan of Calcutta 1742, lying within the Maratha Ditch, had received their present-day names - the ‘Avenue leading to the eastward’ (Bowbazar Street or Bipin Behari Ganguli Street); ‘Road to Dum Dum’, ‘Causeway’ (Manicktola Road, subsequently renamed as Sookea Street, Baranasi Ghose Street etc.); and ‘Road to Kalighat’. Captain William Holcombe’s report of 1742, contained references to a ‘Road towards Pennings’ – (Chitpur Road up to Baghbazar), and, an avenue towards the Water Side – (Nimtalaghat street).

A number of roads were also repaired by the Zamindars in 1749.

With the recapture of Calcutta from Siraj-ud Dowlah, in 1757, new roads were laid out in the Maidan in the early part of the nineteenth century. Englishmen, who were confined to their settlement at Tank Square, moved out to Chowringhee and the suburbs after 1760. The acquisition of the zamindari rights of the 24-Parganas in 1757 helped the Company to expand the limits of Calcutta from time to time.

The peace and prosperity following the Battle of Plassey induced people from the surrounding areas to settle in Calcutta. Kutcha roads in the new localities inhabited

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19 The roads included:
1. “The Road from the Dock Head to the Stable and down to the side of the Park” (Hare Street and road along Dalhousie Square to Vansittart Row);
2. “The Street from the side and back of Mr. Roopers House and down to Messrs. Noke’s and Lascelles’s House” = Mangoe Lane.
3. “The Road from Captain Lloyd’s house to the New Bazar, Chandpal Bazar” = Esplanade Row west.
4. “The Road from New Bazar to Barthola Bazar” = Chitpore Road;
5. “The Road from the Fort Gate to Mansingh’s Chowki, being 800 feet” = Lalbazar – Bowbazar Street;
6. “The Road from Chowrighee’s Chowki and Gushthulla Bazaar, 6000 feet”. = Bentinck Street – Chowringhee Road up to Park Street;
7. “The Street from Margass’s house down to the Powder House, about 5000 feet” = Council House Street;
8. “The Street from Purana Gunge to Govindpur Chowki about 6.00 feet”; = a road now merged in the Maidan;
by the natives were full of cesspools. Wealthier natives constructed roads leading to their houses in the town or suburbs\textsuperscript{20}. Most of the highways from Calcutta to the suburbs were constructed during the days of the Zamindar\textsuperscript{21}. Steps were also taken to construct bridges over Dullendaw, Manickchurn, Gopalnagar, Dum Dum, Barasat and Balliaghata Roads in 1766.

The Justices of the Peace for Calcutta relieved the Zamindar of his municipal duties in 1794 and were authorized to levy a 5 per cent surcharge on property tax for appointing scavengers, cleansing, repairing and watching the streets. They also took steps to metal the Circular Road in 1799. The limited resources placed at the disposal of the Justices did not permit them to take up large-scale development works like construction of new roads, bridges, etc., in the town.

The East India Company was always unwilling to part with their revenues for municipal improvements. Funds had to be raised from the public for development works. Lotteries came to the aid of the community from 1784 in the creation of public assets. It was the appointment of Wellesley’s Improvement Committee, later known as the Lottery Committee (1804) that took up the initiative to improve the public thoroughfares of the city. Calcutta owes some of its best roads to the labours of the Lottery Committee (1825 – 1836)\textsuperscript{22}.

A group of streets that commemorated the various titles of Lord Hastings and his wife, were also the work of the Lottery Committee, and were designed to afford access to the Panchkhotee, or five mansions\textsuperscript{23}. Thus credit goes to the Lottery Committee for reconstructing chaotic Calcutta into some orderly shape of a modern town. Circular Garden Reach Road, which was called “Strand New Road to Garden Reach”, was constructed in 1828, with contributions from 58 persons. As public

\textsuperscript{21} Following roads existed by 1766 : Shyambazar Road; Dullendaw Road (*Bhowanipur Road); Manickchurn Road = Manicktola street; Gopalnagar Road; Chitpur Road; DumDum Road = Belgachia Road; Barasat Road, and, Balliaghata Road. Refer Nair, P. T. (1989): \textit{op cit}; footnote13; p. 250.
\textsuperscript{22} \textit{Op cit}; footnote 3; p.252. The roads include Wood Street, Wellesley Street, Wellington Street, College Street and Cornwallis Street; Strand Road from Princep Ghat to Hatkhola; Amherst Street; Hare Street; Waterloo Street; Elliot Road; Short Street; and, Colotolla-Mirzapur Street.
opinion in England condemned the method of raising funds by lotteries for improvement of the town of Calcutta, the Directors of the East India Company in 1836 ordered their closure.

Lord Auckland (1836-1842) appointed the Fever Hospital Committee to carry on the work of the Lottery Committee. But the new committee was more concerned with community health than with roads. The Committee reported that the streets in the native part of the town were narrow and haphazard without any free circulation of air. They were always covered with filth, dust, mud or offal that were rarely cleaned by the scavengers leading to pestiferous air

_Bustees_ were cleared by the Justices of Peace between 1854 and 1876 for the construction of Halliday Street, Free School Street, extension from Corporation Street to Dharamtola Street, Clive Row extension, Beadon Street, Beadon Square, Grey Street, Allen Square, Outram Street, Grant Street and Victoria Terrace.

Construction of new roads and maintenance of the existing ones were within the exclusive jurisdiction of the Municipal Corporation of Calcutta from 1876 to 1911. The Corporation mostly cleared or improved the bustees to build roads in the town.

The Calcutta Improvement Act of 1911, created a board of trustees charged with the duty of “opening up congested areas, laying out or altering streets, providing open spaces for ventilation or recreation”. The Calcutta Improvement Trust opened up a north south and an east-west corridor (Central Avenue and Rashbehari Avenue) and many other roads in Calcutta.

The completion of the underground drainage and water supply schemes resulted in the construction of the Suburban High Level Sewer Road and the conversion of many open drains or ditches into narrow lanes. The implementation of the Canal Area (between Circular Canal and Upper Circular Road) Drainage Scheme in 1907 resulted

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27 Preamble to the Bengal Act, V. of 1911. (The Calcutta Improvement Act) published in the Calcutta Gazette; 20th September, 1911.
in the construction of 11,596 feet of roads, 60 feet in width, and 13,970 feet of new roads, 40 feet in width, in addition to the widening of the existing ones.

4.2.4 Removal of Solid Waste

Littering of garbage and refuse is the greatest source of pollution in an urban areas leading to rapid spread of various infectious diseases mostly fatal in nature. Not a single visitor to Calcutta in the seventeenth and eighteenth centuries has said a good word about the conservancy system in the city.

It is stated that by 1780, “Calcutta was little better than an undrained swamp in the immediate vicinity of a malarious jungle, the ditch surrounding it was, as it had been for 30 years previously, an open cloaca, and its river banks were scattered with the dead bodies of men and animals”29.

The account of Grandpre in 1789, described the canals and cesspools of the city as completely filled with dead and decaying animal matter, the streets as awful and infested with swamp of flies, and the crowd and flocks of animals and birds acting as scavengers30. William Mackintosh, writing from Calcutta in 1799, stated: “The very small portion of cleanliness which Calcutta enjoys is owing to the familiar intercourse of hungry jackals by night, and ravenous vultures, kites and crows by day”31.

The sanitary condition of Bhowanipore in 1868 was described as follows: “The general sanitary condition of Bhowanipore is not good; there are many places which are not passable on account of the stink of dung, urine, and human filth. The roads are not clean. The drains are deep; the refuse water of the house is emptied into them and stands there without the least notice being taken by the road overseers. Many small lanes become inaccessible in the morning on account of the excrement being found strewed on them. The situation worsens in rainy season. Most of the roads are

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30 Ibid; p.152.
in very bad repair; dead dogs, cats, rats and the bodies of other decomposed animals are always found on the sides of the streets"32.

The condition of the thickly settled area around the famous shrine of Kali was also awful. Hundreds of goats and buffaloes were sacrificed daily, and the blood remained for hours and then decomposed. The place was rarely washed and the refuse water was drained into a pond that is called a ‘Koondoo’, which made it dirty and filthy. The entrails of the sacrificed animals were thrown indiscriminately about the place; some were pitched into the river, and others into the surrounding drains and ponds33.

Some kind of an informal arrangement for removing garbage/refuge from the city existed from the day Calcutta was founded. An entry in the Company Accounts for October 1703 shows that sweepers had been engaged to clean the White Town. As early as 1704, fines were levied upon the ‘black inhabitants’ for misconduct, and the amount was spent in filling up the foul pits and ditches that abounded the settlement. A scavenger was appointed for Calcutta in 1782 and elaborate regulations were made for the removal of garbage in 1785 by dividing the town into 31 Police Stations.

4.2.4.1 Night Soil

Initially, all large houses, European and Indian, possessed private privies and were provided with a receptacle from which night soil was collected manually early in the morning, and taken to large public depots situated throughout the town. At night the contents were removed by bullock cart to the edge of the town and thrown into the river. The stenche from these carts, as they passed through the city, was sickening and were widely regarded as a hazard to health. But, the night soil system served a small minority of Calcutta’s population. The majority, consisting of the poorer classes who lived in huts, had to resort to communal privies, which were shared by the inhabitants of several huts. These ‘mehtar tatties’ or public necessities were built and managed by private enterprise, instead of the Municipality.

33 Op.cit; footnote 32; p.11.
The night soil was collected from private privies by *mehtar* (scavengers), who were paid fees by the occupiers of the premises, and conveyed by ‘*tollah mehtars*’ to depots at convenient places. It was then removed to the night-soil *ghat* on the riverbank near the Mint and subsequently carried down-stream in boats hired by Municipality and finally thrown into the river. The evidence taken by the Fever Hospital Committee shows that the ‘*mehtar tatties*’ were usually a grave nuisance, the excreta was sometimes thrown into any neighbouring tank or pool, or placed in a narrow trench or even ‘scattered over the adjoining spot and left to remain there for ever to be dried by the sun’. The public drains of this time were rarely built of masonry and had no proper flow. In 1864 some experiments in dry conservancy, i.e. burying the night soil in trenches were made at Dhapa. The embankments of the Salt Lakes were, however, levelled by the great cyclone of that year, and the ground became inundated and impregnated with saline matter and lost its deodorizing property.

The municipality provided a small number of public latrines, but they seem to have been unpopular with the majority of Indians. The Commission also maintained a conservancy establishment for street sweeping and the removal of trade refuse, the latter being charged directly to the proprietors.

### 4.2.4.2 Garbage and Other Refuse

In the early days of Calcutta it had been easy to find convenient dumping grounds for the town refuse. Bullock-carts were used to carry the garbage. Commonly, the ditch to the east of the old Fort, where the bodies of the victims of the Black Hole had been thrown, provided the ideal place to dump the refuse of the town. But this ditch was filled up in 1766. Later, the Mahratta Ditch provided the dumping ground for the city until 1780. Often, the road *sirkars* and overseers dumped the refuse in tanks or depressions on private lands in the city. The Strand Bank had its formation in the same process. The growth of population of Calcutta after 1757 and the expansion of the “city of palaces” after 1794 necessitated finding out places for dumping garbage outside the town.
As the volume of refuse increased and the limits of the town extended, the scavengers were sent further into the countryside to the new localities selected for the final deposit of refuse. Some part of the refuse was thrown into the river from the northern part of the town limits, while the refuse from the southern quarter was removed to Ballygunge. In 1859 the Commissioners, in their report complained that ‘these localities were already beyond convenient distances from the town, especially during the rains, when, owing to the nature of the ground, carts sink right up to the axle-tree in the mud’.

The Corporation acquired in 1864, a square mile of land at Dhapa in the Salt Lake area for garbage disposal and constructed a railway line from Theatre Road to Dhapa. The construction of the railway was taken up in stages from 1867 to 1911. The bullock-carts used to empty the garbage into railway wagons at certain platforms. The Refuse Railway was divided into 2 main sections, the one running from Theatre Road to Bagh Bazaar Street along Circular Road; and the other running the line of the main outfall and high-level sewers to convey the refuse to the square Mile, the dumping ground situated in the Salt Lakes.

Cranes were originally used for lifting the refuse from carts into the wagons but proved unsatisfactory, and were replaced by the platform system in 1868, which is still in use. Six large loading platforms were constructed along Circular Road. The railway was originally 8 miles in length. Its length increased to 12 miles in 1877 and in 1910–1911 another 3 miles of line was constructed i.e. the total mileage increased to 15 miles.

In 1906–07 the site of one of the platforms was absorbed in the extension of the Campbell Hospital. This closed down two other southern platforms and led to the construction of a new platform with adequate accommodation near Karya, a little east of Circular Road. The railway removed on an average over 1000 tons of refuse daily from the Circular Road platforms to the dumping-ground at Square Mile. The carrying capacity of a wagon may be placed at 10 tons, and a single bullock cart carried half a ton of refuse and a double bullock carried two tons of refuse.34 The

34 Administrative Reports of Calcutta Corporation.
following figures, gives an idea of the steady increase in the quantity of refuse removed in Calcutta.

**Incinerators:** It is generally agreed that the most clean and sanitary method of disposing city refuse is an efficient system of incineration. The adoption of this method for the refuse of an eastern town is beset by special difficulties owing to the low calorific value of the materials of which it is composed, which include large quantities of silt from the sewers and much moist vegetable matter. Dr. Simpson, trained in England in 1890-91, was a strong advocate of incineration in Calcutta, but the means adopted to burn the evil-smelling unconsumed gases from the furnaces were not successful and even Dr. Simpson finally ceased to recommend incineration in any crowded or important locality.

<table>
<thead>
<tr>
<th>Year</th>
<th>Town Refuse</th>
<th>Year</th>
<th>Town Refuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>1877</td>
<td>73430</td>
<td>1901-02</td>
<td>343360</td>
</tr>
<tr>
<td>1878</td>
<td>72840</td>
<td>1906-07</td>
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<td>1879</td>
<td>79810</td>
<td>1910-11</td>
<td>139374</td>
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<td>1880</td>
<td>91550</td>
<td>1918-19</td>
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<tr>
<td>1881</td>
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</tr>
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<td>1882-83</td>
<td>169480</td>
<td>1921-22</td>
<td>4814640</td>
</tr>
<tr>
<td>1883-84</td>
<td>134330</td>
<td>1890-91</td>
<td>218990</td>
</tr>
<tr>
<td>1891-92</td>
<td>61568</td>
<td>1929-30</td>
<td>515580</td>
</tr>
<tr>
<td>1896-97</td>
<td>303470</td>
<td>1930-31</td>
<td>485068</td>
</tr>
<tr>
<td>1890-41</td>
<td>739629</td>
<td>1931-32</td>
<td>556501</td>
</tr>
</tbody>
</table>

*Source:* Extracted and compiled from the Reports of Corporation of Calcutta for the periods concerned. *Note:* For many years the street sweepings were largely used for filling tanks until it was condemned as insanitary in 1889.

In 1863 an attempt was made to incinerate refuse in a kiln, built 3 miles from the heart of the town, on a plan that had worked successfully at Karachi. The process however was both costly and slow. In 1864 a cremator designed by the Health Officer, Dr. Fabre Tonnerre, was erected at Dhappa to burn carcasses and offal removed from the streets of Calcutta. The experiment appears to have met with some measure of success; 6 to 8 cartloads of animal refuse were destroyed daily at a trifling cost. In
1888, Mr. B. R. Harrington, Chief Engineer, offered to construct 3 incinerators, which would destroy the entire refuse of the town.

Under arrangements made in the following year, Mr. Harrington erected an 8-cell incinerator on a site immediately south of the Campbell Hospital in Circular Road. This commenced in May 1890. It was successful in destroying all the refuse put into it, but was considered a serious nuisance because of the smoke emitted from it. Another cremator was constructed, but this was also unsuccessful. This plant was sold in 1892 after experiments for burning night soil in it had also failed. A second incinerator was erected in 1892 in Goragatcha. It was opened in August 1892, and daily destroyed 11 truckloads of about 110 tons of refuse. In 1913-14 over 41,000 tons of refuse were destroyed.

No further progress was made with refuse incineration during the next decade but in May 1902, after a prolonged discussion with the Government, who pressed for the removal of the refuse platform No.4 from the neighborhood of the Campbell Hospital, the Corporation entered into a private contract for the construction of an incinerator which was intended to serve as a substitute for the objectionable platform, and which was erected on the site previously occupied by Mr. Harrington’s plant. This was a 9-cell incinerator of the Baker type, capable of incinerating without nuisance 135 tons of wet refuse in 24 hours of continuous working. It was taken over by the Corporation in 1905. It however, consumed a large quantity of coal and its cells could not be cleaned separately. It was closed in October 1908, as upon the conclusion of a new agreement for the square mile, under which the refuse wagons were unloaded free of charge.

Table 4.3 shows the amount of refuse destroyed in different incinerators or dumped in the City during the early thirties of twentieth century.
Table: 4.3 Nature of Disposal of Refuse in the City of Calcutta
(In Tons)

<table>
<thead>
<tr>
<th>Incinerators</th>
<th>1890-91</th>
<th>1906-07</th>
<th>1919-20</th>
<th>1929-30</th>
<th>1930-31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kiln in Dhapa</td>
<td>3620</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Entally Incinerator</td>
<td>77644</td>
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<tr>
<td>Goragatcha Inc.</td>
<td>72082</td>
<td>115</td>
<td>44895</td>
<td>31906</td>
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<table>
<thead>
<tr>
<th>Dumping Grounds</th>
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<th></th>
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</tr>
</thead>
<tbody>
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<td>Dhapa</td>
<td>218990</td>
<td>618626</td>
<td>1163</td>
<td>408106</td>
<td>363450</td>
</tr>
<tr>
<td>Mudiali</td>
<td></td>
<td>45</td>
<td>5792</td>
<td>30640</td>
<td></td>
</tr>
<tr>
<td>Cossipur-Chitpur</td>
<td></td>
<td></td>
<td>28185</td>
<td>29685</td>
<td></td>
</tr>
<tr>
<td>Manicktolla</td>
<td></td>
<td></td>
<td>19345</td>
<td>19350</td>
<td></td>
</tr>
<tr>
<td>Garden Reach</td>
<td>9257</td>
<td>10037</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


As the agencies for disposing of refuse became more satisfactory the feasibility of regulating the disposal of refuse from private premises into public streets assumed importance\(^{35}\).

It was suggested in 1837 that refuse carters should be provided with bells, on hearing which the inhabitants should ‘bring out’ their refuse to deposit in the carts. *Act XIV of 1856* authorized the Commissioners to prohibit the deposit of refuse in the streets except at certain hours, but at the same time required them to provide convenient places for its deposit. Commissioners could impose penalty on any person-depositing stable refuse in any other place than that prescribed. The authorities arranged for the removal of the refuse of extensive stables at the cost of the owners. *Act IV of 1876*, re-affirmed the Commissioners’ right of prohibition.

The *Army Sanitary Commission*, in reviewing the Municipal Report for 1877, recommended the use of dustbins, but the measure in the northern part of the town had its drawbacks. The cost of a sufficient number of dustbins was high and there was a possibility that their use would merely effect a concentration of the nuisance. It was also difficult to find suitable sites in the crowded quarters in the city. In the

southern division these difficulties were not insurmountable, and in 1883 fixed hours of depositing refuse (midnight to 7 a.m.) were prescribed.

The special Conservancy Committee appointed in 1883 recommended that fixed hours, viz. midnight to 8 a.m. and midday to 2 p.m. should also be introduced for the northern division. The adoption of this proposal marked a real advance in the connection of civic duty. From 1882 the provision of refuse bins on private premises was encouraged in the European quarter of the town, although it was not prescribed by law in the more densely populated Indian quarter because here few premises could furnish the necessary space. It was also difficult to find an unobjectionable site for public dustbins in the narrow streets of northern Calcutta.

4.2.4.3 Human Dead Bodies

Another repugnant practice in old Calcutta, as in India, was the consignment of dead-bodies to the Ganga / Hooghly. Owners of riverside villas had to employ 'Doms' to keep the bodies away from their ghats; the Government also employed boats to float corpses that got stuck or entangled. The establishment of municipal and other burning ghats for the Hindus, burial ground and cemeteries for the Muslims and Christians came as an untold boon. The Nimtala burning ghat dates back to the 1820s. The Sahanagar (Keoratala) ghat, originally leased by an individual, was handed over to the municipality in 1872. Privately run Kashi Mitra burning ghat dates back to 1774. A large number of cemeteries and burial grounds were closed in 1901 because they posed a danger to public health.

The Corporation approved for the acquisition of a large land for a city cemetery in 1902. 10 Bighas of land was purchased for the extension of the existing city cemetery on Lower Circular Road. Another new site of 200 bighas was chosen near Jadavpur Police Station. During the same year the Corporation provided 2 new burial grounds for Muslims in the north and the south of the City. An area of 22 bighas was also acquired at Bagmari and 29 bighas at Gobra.

36 Administrative Report – Corporation of Calcutta – 1901-1902. South Park Street Cemetery; North Park Street and Mission Cemetery; Tiretta Cemetery; Portuguese Church Cemetery; Boytakkhana Church Cemetery; Greek Church Cemetery at Amratollah Street; and; Mosque Burial ground at 86 Nimtola Ghat Street.
4.3 Sanitation in Britain with Special Reference to London

It would be interesting to compare the developments in Calcutta with those in London, as they were the two largest cities of the British Empire. The sanitary reforms in Britain developed alongside the growth and expansion of towns during the first half of the nineteenth century. The towns had multiplied in number and grown several times as the factories expanded. Hundreds of new hands were required by these factories, this resulted in waves of in-migration to these cities. The labour was accommodated in one room back-to-back tenements with very poor and deteriorating sanitary conditions. The inefficient water supply and the breakdown of existing sanitary arrangements led to outbreaks of Cholera and a rise in mortality rates which peaked in 1831-32, 1848-49, 1854, and in 1867.

London was honeycombed with cesspools some of them were like 'lakes'. In 1838 the Poor Law Commissioners under the inspiration of Chadwick had ordered an investigation into London sanitary conditions and the results stirred Parliament to a spate of legislation, including Acts for town improvement, waterworks, cemeteries, and town police. The most important were the “Public Health Act” and the “Nuisances Removal and Disease Prevention Act”, of 1848, but the former, astonishingly, did not apply to the area of the Metropolitan Commissioners of Sewers. Only after 1848 could owners be compelled to connect house drainage to sewers. In 1855 the “Metropolis Management Act” was introduced in London.

The first important task to be accomplished was the building of a grand system of sewage disposal. This consisted of 82 miles of main intercepting sewers, four great pumping stations, and outfall works north and south of the river. Two large reservoirs were also constructed. The system was capable of disposing of 400 million gallons of sewage a day that was then thought to be sufficient for the future needs of London. It was completed in 1865. But still, until 1864, the sewage of London was emptied
directly into the Thames and its tributaries and ditches. To get rid of the foul mud banks of the river, embankments were built and much land reclaimed\textsuperscript{37}.

There was no system of \textit{refuse collection or disposal} in London. The sanitary conditions disclosed in the Report of the Royal Commission on the Health of Towns and Populous Places, issued in 1844-45, and those of the Select Committee and the Poor Law Commissioners were too terrible and menacing to be neglected. It was shown that houses, courts and alleys were without privies or covered drains, but the fluids lay stagnant in open surface gutters. Houses were dirty beyond description and extremely overcrowded. A large proportion of the working population was housed in “dark, damp, confined, ill-ventilated and dirty” cellars, whilst “heaps of rubbish and refuse, vegetable and animal remains, lay at the bottom of close courts and in corners”. Two attempts at legislation failed before the Nuisance Removal and Diseases Prevention Act was passed in 1846.

In the following year the Towns Improvement and the Police Clauses Acts consolidated certain provisions generally required in local Acts for various public purposes. In \textit{1848 the first Public Health Act}, was passed which created “the groundwork of our sanitary legislation”, and set up a General Board of Health with power to create local sanitary districts with local boards of health either on petition by the rate payers or compulsorily when the death-rate reached 23 per 1,000\textsuperscript{38}. The dead were buried in over crowded grounds surrounded by houses.

Between 1856 and 1889 (when the London County Council was created) the Board made 22 housing improvement schemes and 7400 insanitary dwellings were demolished. Some 260 blocks of dwellings (for 27500 persons) were constructed to meet the requirements by companies and trusts to whom the board sold its land. In addition 60 blocks of dwellings (for 10,000 persons) were put up for the displaced by street improvements. In 1888 there were 2600 acres of open spaces under the Board’s control.


Generally, the water supply to the majority of the larger towns during the first half of the eighteenth century was pumped from wells; but in some cases, and especially in London, it was drawn from a river near at hand. The amount of water, which could be pumped up from underground sources, was, in most areas only sufficient to supply a limited number of people. The need for additional sources of water was, therefore, strongly influenced by the rapid rise of population during the whole of the nineteenth century. London’s problem was particularly acute. Within recent times underground water was never sufficient for the needs of more than a fraction of the population of the Metropolis, and it had been customary during most of London’s long history to draw water from the Thames. A large number of water companies, which in some areas were in active competition were involved in supplying water to London. There was, of course, no supervision of the quality of the water. Mention may be made of the Lambeth Company and the Southwark and Vauxhall Company who supplied water from different parts of the river leading to severe cholera outbreak in London in 1854-55. The supply of water by profit oriented private companies was customary throughout England well until the middle of the eighteenth century. The General Board of Health in a report issued in 1850 advocated the principle of public ownership of the means of water supply and distribution. The report alleged that the existing supplies were of inferior quality, and the water was so hard that it was unfit for domestic purpose\textsuperscript{39}. It generally contained an excess of organic matter and was polluted by the sewage of the Metropolis. Apart from the quality of the water, the Board criticized the intermittent method by which supplies were distributed. Adequate provision either for extinguishing fires or for the surface cleansing of houses and public ways was also not made.

Nevertheless, in spite of the criticism, the water companies continued to supply the London areas for another 50 years, and the London County Council found this one of their most difficult problems when they took over the burden of office in 1889. Several Bills that were presented to Parliament by the Council failed to make progress, and it became evident that public opinion was in favor of an ad hoc water supply.

authority for the Metropolitan area. The Royal Commission under the chairmanship of Lord Llandaff recommended in 1900 that a water board should be set up for London and that the supply should be taken from the Thames. Delays of various kinds still occurred, and it was not until 1902 that the Metropolitan Water Board was founded.

4.4 Conclusions

The analysis in this chapter indicates that:

- The East India Company had no interest in its initial years, to provide improved civic amenities. They only imposed taxes, levied duties and issued licenses. The developmental activities included clearing of jungles, bridging watercourses and surveying lands and other such affairs. By 1703 the Europeans had engaged some sweepers to clean the White Town. In the ‘native town’ no such measures were taken. The Calcutta Police was set up to check the misconduct of the local inhabitants and levy fines on them. They were later also entrusted to maintain law and order.

- Various travelers who visited the city during this period made comments on the then existing unhygienic condition of the city. With the growth of the population and unhygienic habits of the native population, the streets and roads had become filthy with overflowing cesspools, decomposing animal matter, and scattered dead bodies. Contemporary London was no better.

- Provision of civic amenities became the responsibility of the Municipal Administration in 1727 and the first scavenger in Calcutta was appointed in 1782. In 1785 the Commissioner of Police issued a notice and divided the town into 31 divisions or thanas and bullock carts were commissioned to remove garbage.

- Lord Wellesley initiated major steps to improve the sanitary conditions in the city in 1803. It was under his initiation, that an Improvement Committee was set up in 1804 to make sanitary improvement in the city. This committee was later known as the ‘Lottery Committee’.
Until the late eighteenth century, the common people of Calcutta applied very rudimentary methods for disposing off dirty water, garbage, refuse and dead bodies of both human beings and animals. The most important aspect of health, i.e. drinking water also depended upon its natural supply i.e. on the river, rain and the tanks. Night soil from all European and rich ‘native’ houses was collected manually and moved in carts and baskets early in the morning and deposited in depots located in various parts of the city. It was dumped into the river Hooghly at night. Most of the native population in the city used common privies that flowed into the open drains causing nuisance on the streets. Various plans were made to drain the northern and central part of the city with ‘underground drainage system’. The ‘Water Carriage System’ for the city of Calcutta was finally sanctioned in 1859. This scheme covered a total area of 4730 acres and it took 16 years to complete the main sewers. By 1875 only 38 miles of brick and 37 miles of stoneware pipe sewers were constructed with pumping station at Palmer’s Bridge in the eastern part of the city. The main drainage works of the southern division were completed by 1878. By 1881-82, the numerous canals of the city were legally banned to be used as a part of the drainage system causing difficulties in the flow of the sewerage from the city towards the Salt Lake area. The main sewer lines ran from the Hooghly River to the circular road.

The ‘added’ and fringe areas of the city were incorporated in the main town in 1889 and the improvement of these areas was entrusted to the Suburban Improvement Committee. Between 1891 and 1906 some of the new areas developed and the drainage was pumped to the Salt Lake area through new pumping stations at Ballygunge and Topsia. The drainage of the new areas was divided into 3 blocks.

A number of wells and tanks were constructed by the Improvement Committee in the town mainly along the arterial road of College Street/Wellington Street/Wellesley Street. It was only in 1820 that a small pumping plant was set up at Chandpal Ghat for lifting river water into open masonry
aqueducts. It was distributed by gravitation over a small portion of the 'white town'. The first water works for the supply of filtered water to Calcutta was built at Pulta with pumping stations at Pulta, Tallah, and Wellington Square between 1867 and 1870. All the principal streets and lanes were piped and supplied with filtered water. Even with the growing consumption of filtered water, the supply did not increase till 1872. Considerable extensions of filtered water mains were carried out between 1891 and 1900. The supply of filtered water increased manifold as pipelines were extended to supply filtered water to different parts of the city between 1922 and 1936. The supply of 'unfiltered water' in the city began in 1820. This water was mainly used for watering roads and flushing of sewers and privies.

- Garbage of the city was dumped near the Writer's Building before 1766 and the Maratha Ditch before 1780. It was also dumped in many tanks and ditches in the city. In 1864, the Corporation acquired a square mile of land at Dhapa in the Salt Lake area for garbage disposal and constructed a railway line from Theatre Road to Dhapa between 1868 and 1911. Incinerators were also constructed to destroy the refuse and garbage near Dhapa.

- Municipal burning ghats, burial grounds and cemeteries came into existence in the city in the late eighteenth and early nineteenth century.

- The contemporary scene in England was no better. The British Government gave little attention towards better sanitation and water supply system in England as they were engaged in expanding their markets. Development of piped water supply system in London was initiated only during the mid nineteenth century. The sanitary condition of London was extremely bad till the nineteenth century. The city was honey combed with cesspools, some of them like lakes. The sewage of London was emptied directly into the River Thames until 1864. It was only in 1847 that Legislation was passed on Adoptive Acts for town improvement, water works, cemeteries, town police and other issues. In 1855 the Metropolitan Board of Works was set up in London and by 1865, 82 miles of main intercepting sewers were constructed
and four pumping stations and outfall works were constructed at the northern and southern parts of the river.

- It was only in the second report of the Royal Sanitary Commission in 1871 that supply of wholesome and sufficient water for drinking and washing, provision of sewerage and the utilization of sewage, removal of refuse, provision of burial for the dead without injury to the living and regulation of markets were given due attention. The River Pollution Acts were passed in 1876. The Housing Act of 1890 raised the housing standard and gave local authorities the power to recondition the existing houses and to clear the slums.

- Water supply in majority of the cities in Britain during the first half of the eighteenth century was obtained from wells or from nearby rivers. London faced an acute water problem during the eighteenth and nineteenth century. Underground water was never sufficient to meet the need of the growing population in the city. Water was therefore drawn from River Thames. But the supply was made to limited households that had pipelines. Private and competing water companies supplied water in the city. Quality of water was never tested and this led to the cholera outbreak in the city in 1854-1855. No steps were taken to meet the acute water problem in the city. The Metropolitan Water Board was formed only in 1902 to carry out further developments in water supply in the city.

- These improvements in London were almost as inadequate as those carried out in Calcutta. As far as the sanitary conditions were concerned, the Imperial metropolis and the colonial capital city were no different from each other.