

The development of the sewerage system in Copenhagen

Rasmus Rosengaard & Nils Raahauge

Institute of History, University of Copenhagen

Planning of a centralised sewer system started early in Copenhagen (1840) and represented very modern thinking. The sewerage system was to conduct wastewater outside of the city and into the sea. The main construction period was 1860-1880, but before the work was started hygiene activists were demanding the introduction of sewers to improve health. Later, when the sewers were laid, additional demands were made to develop the system and extend the sewer outlets further offshore due to the introduction of water closets.

We aim to answer following questions. Why was the sewerage system planned and built at that time, and why was it modified later? Where did the inspiration come from, and which arguments were presented during the discussion of the introduction of a sewerage system?

Poor sanitary conditions raise a debate

Research in England revealed how poor the sanitary conditions were in major cities and how they affected the public health. These discoveries inspired a debate on the sanitary conditions in Copenhagen in the early 1840s¹. The population of Copenhagen was growing faster than ever before, increasing from 102 147 in 1800 to 129 300 in 1845, mainly due to migration from rural Denmark. The city could not expand because the growth was limited by ramparts defending the city. Eminent citizens, including the medical doctor Emil Horneman and the engineer Fredrik

Christian Kabell, published a report on the miserable state of the sanitary and hygienic conditions of the city. Something had to be done.²

Following studies on the sanitary conditions it was decided in 1847 to make a plan for sewerage, water supply and gas networks. In December 1847 a committee was appointed to work on the project.³ The mayor, the chairman of the city council and officials of the departments of road construction, waterworks and gasworks were appointed as members of the committee.

The first task was to find experts to design a complete network system. To this end an international competition for engineers all over the world was organised. In 1851 the winners were chosen and the first prize was shared. Two plans, one by the Danish engineer P. M. Lindberg and another by a French engineer named Marillier, were regarded the best ones. Marillier's plan was far-sighted, because it included a sewer outlet extended into the open sea.⁴

Nevertheless, neither of the winning proposals fulfilled the high standards set by the city council. Thus the plans were combined and further developed. The result was an ambitious plan that envisioned two separate sewer systems, one for ordinary household wastewater and gutter water, which were to be lead into the canals and the harbour, and one for human waste that would lead into the open sea from the Amager Island. With such a system, the most modern at that time, it would have been possible to introduce water closets in the city and to make Copenhagen a much healthier place to live.

The construction of the sewerage system raised criticism. It was very expensive and skeptical opponents pointed out the lack of knowledge and experience available from abroad. Even though similar but smaller networks had been built elsewhere, there was no precedent for such a complete system.⁵ Luckily, recent experiences of the sewer systems built in England at that time blunted the skepticism.⁶

The main opponents of the sewer system were the mayor of Copenhagen Michael Lange, and the civil servant A. S. Ørsted. They criticised the high costs, stating that the human waste could be removed in closed barrels and sold as fertiliser. They also thought that digging sewer lines in private lots would constitute a violation of private property rights.

The opponents were elderly men who had been ruling the city for many years. In addition, they did not understand the demands of a growing industrial city. It could be said, however, from our point of view, that their opinion was environmentally sound, as they wanted to recycle human waste instead of flushing it all into the sea. But due to the fact that the effects of sewage on the open sea were not studied until the 20th century, it should be noted that their environmental thinking was purely coincidental.

Mayor Lange's objections were unable to prevent the city council from deciding to build the sewerage system. In January 1853 the testing and planning was completed, and all that was needed before the building could commence was the green light from the government.⁷

Meanwhile the government had resigned because of a crisis caused by a disagreement about who should succeed to the throne, and a temporary government was nominated. Ørsted was named Prime Minister and Minister of the Interior. Suddenly one of the main opponents of the sewer plan had the final word.

Although the majority in the city council continued to support the sewer plan, Ørsted chose to overrule it by claiming that there had been a disagreement concerning the plan, referring to the dispute started by mayor Lange and his supporters. Ørsted approved the construction of only the water and gasworks⁸: after six years of planning, the sewer system that had been approved by the city council of Copenhagen was rejected by the government.

In the following years the discussion on a sewer system was launched anew when the citizens again made complaints about the filthy conditions of the city. However, there was

neither money nor good will to start such a big enterprise again. By that time the construction of the water and gas networks had begun. A scaled-down system was built in 1857-1860 and was later gradually expanded. As this sewer system was only for ordinary wastewater, the human waste had to be collected and transported out of Copenhagen.

Construction years-1880's: The Construction Years

In 1881, shortly before the sewerage system was completed, the city engineer Charles Ambt stated:

Downgrade, dimensions, and profiles of the sewers are determined by the construction principle enabling that they should be capable of removing the daily waste water in such a way that artificial cleaning is not needed and that the sewers are able to drain off the amount of water flowing during the heaviest rainfalls in Copenhagen.⁹ All sewers are self-cleaning, except some pipes which are to be rinsed because of the lack of necessary decline.¹⁰

The sewer outlets ended either in canals or in the harbour, and the resulting accumulations caused a great nuisance to the citizens. The sewage load increased with the population: in 1860 150 000 people lived in Copenhagen, but by 1890 the number had doubled.

Sea outlets-1903: Out to Sea

In 1886 the City entrusted the city engineer with the task of elaborating a combined sewer plan and moving the sewer outlets. Construction of a free harbour had begun in the northern part of the city with the purpose of making Copenhagen an important port in the Baltic Sea region. In

the southern part of the city the sewer outlet had to be moved because a new central train station was to be built.

All the northern sewer pipes were combined and directed into the deep waters north of the free harbour. After the southern sewerage system had been completed, it was suggested to connect the two sewerage areas.

Ambt planned to combine all the sewer outlets and conduct the wastewater via a main pumping station far into the sound. This plan was presented to the City Council in 1893 and unanimously accepted. Originally, the plan was to be carried out simultaneously, but the construction progressed step by step.

In the 1890s there was sufficient political will to finally see the completion of the sewer system. The horrible stench from harbour and canals was unbearable, especially in the summer time. City council member Lange stated that a latrine system was not up-to-date in such a large city. It was difficult to find such a large city north the Alps where the air was as dirty and suffocating as at certain times in Copenhagen.¹¹ The hygienic state of Copenhagen was embarrassingly poor. The solution to the problem was to move the sewer outlets in order to be able to install the desired water closets.

The debate on the sewer outlet extension turned into the water closet question: whether to allow water closets in the city. Ambt's plan did not include installation of water closets. Mayor Øllgaard, who was a member of the joint committee, sought to fend off the opposition to the water closets on the part of those who wanted to use human waste as fertiliser, stating that the plan did not presuppose water closets.

There is no doubt that the opportunity to introduce the water closets had a major impact on the process of extending sewer outlets. After the completion of the northern sewerage system in 1893 it did not take long before permission was granted to install water closets. As a

compromise, an installation fee of 100 crowns per water closet was introduced to prevent an excessive load of human waste entering into the sewers. The whole system was completed in 1903.

The debate of the 1890s was not very aggressive. Hygienic arguments were presented, but they did not have a high priority. There were persons who doubted the unhealthiness of the water in the harbour and the canals, although nobody disagreed that the water was disgusting. The main motive for the majority of the politicians was the opportunity to introduce water closets on a large scale.

¹ The inspiration for the debate came from Chadwick's article on hygiene published in 1842.

² KABELL, FR. CHR. : *Detalleret forslag til en forbedret vandforsyning for Kjøbenhavn*. Copenhagen 1845;

HORNEMANN, E. : *Om adskillige mangler ved den offentlige renlighed i Kjøbenhavn*. Copenhagen 1847.

³ Transcripts of the meetings of the city council (TMCC) 17 December 1847.

⁴ TMCC 14 August 1851.

⁵ TMCC 16 August 1849 and 14 August 1851.

⁶ TMCC 12 July 1852.

⁷ TMCC 12 May 1853.

⁸ TMCC 20 February 1854.

⁹ Ambt, Charles: *Beskrivelse af de i Kjøbenhavn og nogle fremmede Hovedstæder udførte Kloakanlæg*. Kjøbenhavn, 1881. p. 2 , paragraph 1, lines 25-31.

¹⁰ Nobel, O.K.: *Kjøbenhavns Nyere Kloakanlæg*, 1903

¹¹ Borgerrepræsentationens Forhandlinger, Vol. 54. p. 284. ls. 10-14.