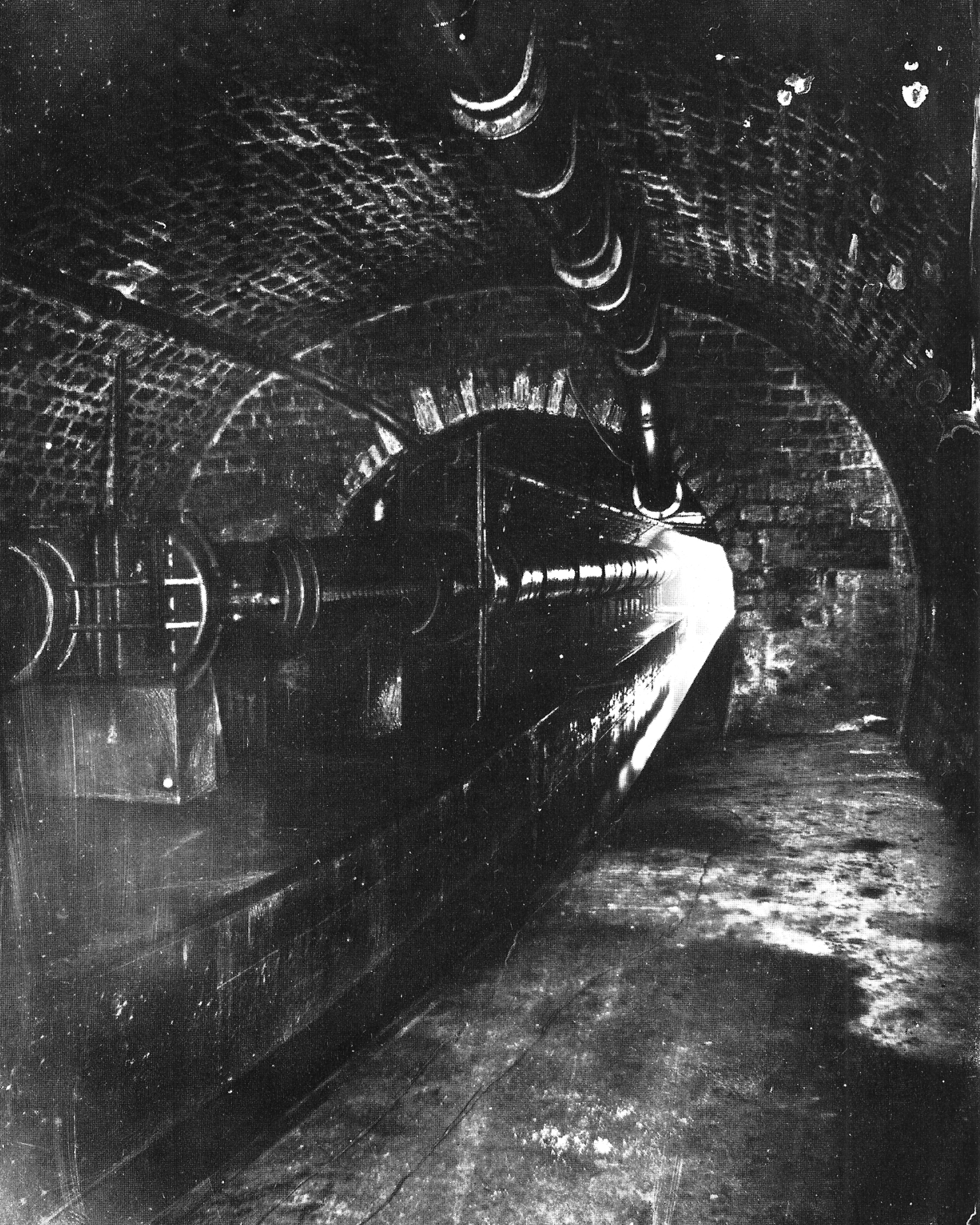


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Paris Sewers: A 19th Century Heritage to Be Adapted to the Challenges of the 21st Century

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Abstract
The Parisian sewer system was designed and built primarily in the nineteenth and early-twentieth century. Today, the responsibility of the City of Paris is to maintain these 150-year-old structures, which are still in operation, and at the same time adapt this system to today's environmental challenges. When the sewer system was first established, the improvements it made to Parisians' comfort, health and quality of life were readily apparent: The sewers were part of the Hausmann plan, which modernized and beautified Paris, both above and below ground, bringing drinking water to homes and removing wastewater from the streets. At the time, Parisians were very aware of this new public service because it changed their lives, and they had the chance to visit the sewer as early as 1867. Today the situation is quite different: It is now a hidden, little-known part of the city, transformed to meet the challenges of preserving rivers and turning wastewater into a resource. However, the goal of making it possible to swim in the Seine has shed new light on the Paris sewer system and its catchment area.

KEYWORDS
modernity
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WATER ICONS



Policy Recommendations

- Ensure wastewater management that preserves natural environments and all living organisms (the return of urban swimming is indeed beneficial for the population).
- Move towards more environmentally friendly solutions such as on-site rainwater infiltration (the objective of the Paris-Pluie plan).
- Transform wastewater into a resource (thermal energy for renewable energy production, use of urine as fertilizer).

< Fig. 1 Égouts de Paris (Source: Gaspard-Félix Tournachon, 1861. Public domain, via Wikimedia Commons).

Introduction

Regardless of whether wastewater is ordinarily visible or not, we are reminded of its existence when problems arise. In Paris, such problems have included the devastating epidemics that took place until the end of the nineteenth century, and the pollution of natural environments that continues to occur in the twenty-first century. By inventing – or reinventing – its sanitation system, Paris has adapted to the needs of each of those eras, and it tells that story through a one-of-a-kind museum.

The Construction of a Sewer System: A Public Health Concern

According to engineer-turned-historian André Guillerme (1993), the more foul-smelling a city, the more prosperous its reputation. Paris fit that pattern under the Ancien Régime and even before that, as population density went hand in hand with an increase in waste and sludge. A few kilometers of sewers, attempts to create integrated systems – like the flush tank designed by Turgot in 1737 in the Chaussin d'Antin neighborhood – and authorities attempting to impose obligations on landlords did not eliminate the nuisances (e.g., stench, filthy gutters) caused by wastewater. Then, along came hygienists and Napoleon III. The former revealed the connection between dirty water, lack of sanitation and outbreaks of disease, while the latter launched Paris on a process of radical modernization and beautification.

The transformation of the city, above and below ground, was driven by Baron Haussmann, who in 1854 enlisted Eugène Belgrand, graduate of the engineering school École Nationale des Ponts et Chaussées and tasked him with distributing safe water throughout Paris, as well as organizing its drainage after use. Belgrand's integrated vision of the water cycle led him to design the entire system, which was a remarkable innovation at the time (Belgrand 1869; Reid 1991).

For sanitation, he designed a network of underground galleries operating as a hydrographic, gravity-fed system. A slope of 2 to 3 per cent eased the flow of water in small channels and collectors, while urban sewer sludge was evacuated partly by the strength of water through the use of flush tanks and partly by manpower. By studying the Seine's ability to carry waste, Belgrand solidified this water management model, which would become known as "*tout-à-l'égout*" (everything to the sewers) – collecting the entire mix of solid matter, wastewater and running water from the roads. The strength and intensity of the flows would ensure the purge and evacuation of the mix to the outlets.

Although in the first decades of its operation, the system mainly received runoff and domestic water, it was nevertheless designed to accommodate possible population growth and the collection of all wastewater. The size of the underground tunnels earned Belgrand the support of his contemporaries, who attributed to him a certain delusion of grandeur. After numerous debates between engineers and doctors, the *tout à l'égout* (sewer system) finally became mandatory in 1894, and cesspools eventually disappeared. The saturation of the Parisian sewer network today occurs during periods of heavy rainfall. A plan to disconnect rainwater from the system is being sought, at a time when the population of Paris is experiencing a decline.

Drinking water eventually made its way into the domestic sphere, and with it, sanitation. Paris became healthy, clean and navigable in all

weather. The sewers gained respect and admiration, with the first tours offered as part of the Exposition Universelle of 1867, testifying to the modernity and progress brought by this major work, which needed to be seen. Socialites were guided through the system by sewer workers, their immaculate white work coats symbolizing cleanliness. Ladies and gentlemen dressed in their finest attire rushed in. Victor Hugo, undoubtedly the author most inspired by the sewers, wrote an almost nostalgic description of the former cesspool of the first half of the nineteenth century (Hugo 1969):

> *Aujourd'hui, l'égout est propre, froid, droit, correct. Il réalise presque l'idéal de ce qu'on entend en Angleterre par le mot "respectable". Il est convenable et grisâtre ; tiré au cordeau ; on pourrait presque dire à quatre épingles. Il ressemble à un fournisseur devenu conseiller d'État. On y voit presque clair. La fange s'y comporte décemment.*
>
> [Nowadays, the sewers are clean, cold, straight, correct. They almost embody the ideal of what is meant in England by the word "respectable." They are fitting and greyish; laid out in perfect straight lines; one might almost say, neat as a pin. They resemble a supplier turned state councillor. One can almost see clearly in there. The mire behaves itself decently].

Tours of Paris's sewers have continued in various, more or less baroque forms: tours by "wagon-vanne" (valve-carts) in the early twentieth century and by boat until the early 1960s, before finally settling at the current Pont d'Alma site in 1975 under the name "Public Visit to the Sewers." At this focal point of the network, every type of chamber can be observed, from the smallest (the "elementary sewer") to the largest ("the emissary") as well as every type of equipment in the network, including automatic valves, stormwater outlets and floodwater



^ Fig. 2 Paris Sewer Museum's dry gallery (Source: Olivier Placet/Ville de Paris, 2021).



^ Fig. 3 The Bercy bathing area in the 12th arrondissement of Paris (Source: DPE/Ville de Paris, 2025).

plants. The collectors have been adapted to facilitate walking alongside the basins and the tour site has been known as the "Paris Sewer Museum" (Musée des Égouts de Paris) since its most recent renovation (2018–2021).

However, people no longer visit the Paris sewers for the same reasons they once did. People tend not to marvel at running water and wastewater disposal as examples of incredible progress. As the convenience gradually came to be taken for granted, public awareness of how these systems operate diminished and became part of the city's hidden side. Sewer workers, well-known figures to Parisians of past centuries and often caricatured, became men of the shadows (the profession just recently started seeing women join its ranks and only marginally).

For those of us who work at the Paris Sewer Museum, beyond offering the thrill still to be enjoyed by descending into the sewers, opening our galleries to users, tourists and the many school groups that visit mainly stems from a desire to explain how the city functions and a sense of mission to raise awareness about new challenges.

Sanitation, an Environmental Service

What visitors get to see at the museum – which remains an operational site, unlike what its name suggests – is the great paradox of the Paris sewers: a work inherited from the prodigious civil engineering of the nineteenth century, which must now meet contemporary

environmental challenges. In 1911, of the 2,500 km sewers Paris has today, 1,214 km of sewers had been built, amounting to nearly 50 per cent of the network. These kilometers of galleries, over 100 years old, are still in operation and conform to the three main principles that apply to almost the entire network: unitary, accessible and gravity-fed. The Service Technique de l'Eau et de l'Assainissement de Paris (Technical Service for Water and Sanitation of Paris) is responsible for the conservation of these works while they still fulfill their original function.

The Asnières collector, the main artery of the system and over 160 years old, has never been dry since its construction. It will undergo its first renovation in 2026. Other major historical works beneath the Seine's riverbed are the siphons: using gravity they carry water from the left bank of the Seine to the right, and every 10 to 15 years they are taken out of service for inspection.

In addition to fulfilling its maintenance responsibilities, The Service Technique de l'Eau et de l'Assainissement de Paris is striving to correct the main flaw of Belgrand's system. When the system becomes overloaded during intense rainfall events, the process of discharging into the Seine both wastewater and run-off water, collected together, becomes overloaded. A modernization plan launched in the 1980s has made it possible to automate the regulation and storage of wastewater. Equipment connected to and remotely controlled from a continuously operational control center is distributed across the network. Therefore, the network is now described as "regulated," since it has switched from simply collecting waters to managing fluxes and closely tracking meteorological events. The Gestion Adaptative des Ouvrages (Adaptive Infrastructure Management; GAO) commissioned in 2025 reinforces the network's resilience by anticipating rainfall events: automatic instructions follow predictive scenarios for those events instead of reacting to ongoing situations. Discharges into the Seine have been reduced tenfold from 1980 to 2000, thanks to the regulated networks, despite their representing only 3 per cent of the sanitation system.

We can now glimpse the possibility of an ecological revitalization of the river, and a swimmable Seine has become an attainable dream. The river's ecosystem restoration can be tangibly observed, as in the return of over 30 species of fish to the Seine in Paris. Meanwhile the Olympic and Paralympic open-water trials held in the Seine in 2024 served as a formidable catalyst for public action to improve the quality of both the Seine and Marne Rivers (Paques 2024). Once again, an assertive political vision set in motion through proactive public policies is enabling the city's transformation. Bathing in the Seine in Paris during a major heat wave is nothing short of a major transformation, as there is no greater cool oasis. In this sense, the idea of a swimmable Seine once again shines a light on the fundamental role of sanitation in people's everyday lives.

Sanitation can provide other strategic environmental services, such as the production of either heat or cold through the recovery of heat or cooling capacity from wastewater, whose temperature remains constant between 15 to 17 degrees Celsius throughout the year. In Paris, several public buildings are already partially heated or cooled in this way, and in the future, the brand new Grange aux Belles neighborhood in the 10th arrondissement will also draw on this energy source. Wastewater thus has become a resource that supports Paris's goals for local renewable energy production. Likewise, the planned large-scale separate col-

lection of urine in the future Saint-Vincent de Paul neighborhood in Paris's 14th arrondissement assigns new value to human excreta, with collected urine being used to fertilize the city's green spaces.

Conclusion

The strength of Paris's sanitation system lies in its ability to combine an infrastructure inherited from the nineteenth century, which could be described as "low-tech" and as historical heritage, with a state-of-the-art management system comparable to artificial intelligence. The former proved its resilience in a harsh environment, harnessing the strength of the elements, while the latter provides an answer to the need to safeguard ecosystems and life in general. Sanitation remains essential to urban operations, but it is increasingly perceived as an environmental service and an integral part of cities' adaptation to climate change.

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