

RESEARCH ARTICLE

# Privatizing excrement: the management of organic waste and the cesspit companies in the late nineteenth-century Italian cities

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## Abstract

During the second half of the nineteenth century, traditional urban organic waste collection systems proved inadequate. In Italian cities, the alternative solution was found in the more hygienic system of ‘mobile sewers’. After its appearance in Milan in 1862, this system spread to many other urban centres on the peninsula. It encouraged the introduction of regulations for city cleaning and the emergence of private companies specializing in the use of mobile sewers and the transformation of organic waste into fertilizer or other by-products for sale. This article aims to investigate this evolutionary process prior to the construction of modern sewerage systems.

## Introduction

The problems posed by organic waste in European cities predate the industrial era. According to a cautious estimate, in eighteenth-century London, which had a population of over 750,000, more than 37.5 tons of human faeces every day required disposal, in addition to animal waste.<sup>1</sup> The expansion of cities in the nineteenth century, with the consequent increase in hygiene-related problems and crowding in unhealthy environments, led to problems with collecting and managing city waste.<sup>2</sup> In Vienna, for instance, between 1830 and 1910, the amount of human excretion to be disposed of daily rose from 420 to 2,600 tons.<sup>3</sup> The fear that the collection of piled-up

<sup>1</sup>F. Neumann, ‘The realm of Cloacina? Excrement in London’s eighteenth-century waste regime’, *German Historical Institute London Bulletin*, 43 (2021), 30–56; M. Allen, *Cleansing the City: Sanitary Geographies in Victorian London* (Athens, OH, 2008).

<sup>2</sup>R. Lopez, ‘Urban life and health in the nineteenth century’, in R. Lopez (ed.), *Building American Public Health* (New York, 2012), 9–24; M.V. Melosi, ‘“Out of sight, out of mind”: the environment and disposal of municipal refuse, 1860–1920’, *The Historian*, 35 (1973), 621–40.

<sup>3</sup>S. Gierlinger, G. Haidvogel, S. Gingrich and F. Krausmann, ‘Feeding and cleaning the city: the role of the urban waterscape in provision and disposal in Vienna during the industrial transformation’, *Water History*, 5 (2013), 219–39.

waste, in addition to being a source of foul-smelling emanations, might encourage the spread of diseases such as cholera or typhus forced the authorities to think about the measures to be taken to overcome the inadequacy of the facilities. Animals (horses, mules, cows, pigs, stray dogs) were commonly found in nineteenth-century cities, contributing to the accumulation of large quantities of excrement and organic waste, as well as dead bodies.<sup>4</sup>

In this period, the administrators of cities in the industrial age discovered that urban spaces were filling up with large quantities of rubbish and manure. Organic waste was gathered without any clear plan for disposal, and was piled up in open-air dumps, producing sewage and bad smells. The traditional systems of waste collection and management were not adequate.<sup>5</sup> However, epidemics and the consolidation of the 'Sanitary City',<sup>6</sup> driven by the expectations of a population eager to live in less-polluted surroundings, forced cities to find solutions to the environmental contradictions generated by growth.<sup>7</sup>

During the nineteenth century, innovative ways of eliminating organic waste were studied. First, the question arose as to whether the cleaning of cities should be a public or private task. Each city in Europe adopted its own system. In some cases, it was left to individual citizens to carry out the cleaning; in other cases, it was the public authorities that dealt with the problem, using contractors granted a specific licence.<sup>8</sup> In the cities, therefore, there was a plurality of professions engaged in the collection of human excreta, often with a precise distinction by function.<sup>9</sup>

The design focus was at first on the construction of sewers, which allowed for technical and engineering experimentation. However, the policy for the collection and management of urban organic waste progressed more slowly, as issues like the location of landfills resulted in numerous political and social tensions.<sup>10</sup> This disparity partly explains the differing levels of interest historians have shown in these two topics: while the efforts to provide cities with potable water and a functioning sewer system have been prioritized, aspects more closely related to the disposal of urban organic waste have attracted less attention, despite the existence of some

<sup>4</sup> Alongside animal waste disposal, the elimination of the bodies of dead animals also became an issue. On the history of the relationship between animals and the city, see P. Atkins (ed.), *Animal Cities. Beastly Urban History* (London, 2012); M.C. Shingne and L.A. Reese, 'Animals in the city: wither the human-animal divide', *Journal of Urban Affairs*, 44 (2022), 114–36.

<sup>5</sup> H. Mayhew et al., *The London Underworld in the Victorian Period: Authentic First-Person Accounts by Beggars, Thieves and Prostitutes* (New York, 2005; 1st edn, 1862).

<sup>6</sup> M.V. Melosi, *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Baltimore and London, 2000).

<sup>7</sup> The United States exemplifies the ways in which cities in the nineteenth century overcame many difficulties in order to develop environmental and sanitary policies that included urban waste disposal. S. Hunt Corey, *King Garbage: A History of Solid Waste Management in New York City, 1881–1970* (New York, 1994); A. Diamond, 'What a waste: municipal refuse reform and a century of solid-waste management in Los Angeles', *Southern California Quarterly*, 88 (2006), 339–65; G. Louis, 'A historical context of municipal solid waste management in the United States', *Waste Management & Research*, 22 (2004), 306–22.

<sup>8</sup> For instance, nightmen had been active in London since the eighteenth century, cleaning cesspools and transporting excrement outside the city centre. Neumann, 'The realm of Cloacina?', 42.

<sup>9</sup> In Victorian London, for example, there were scavengers or street collectors (bones, rags, excrement), street sweepers and sewer workers. Mayhew et al., *The London Underworld*.

<sup>10</sup> For an extensive literature review, see M.V. Melosi, 'The place of the city in environmental history', *Environmental History Review*, 17 (1993), 1–23.

excellent syntheses.<sup>11</sup> The historiography of contemporary Italian cities has continued to focus on the supply of drinking water.<sup>12</sup> In recent years, however, with the growing relevance of topics related to the circular economy and the recovery of by-products, attention has shifted towards issues connected to industrial symbiosis, which involves integrating waste and scraps into the production cycle, an issue of great importance for the development of agriculture in countries with poor economies.<sup>13</sup>

We investigated the ways in which Italian cities addressed the management of organic waste of human origin in the second half of the nineteenth century.<sup>14</sup> We have divided our article into four sections. The first section presents the findings of public enquiries into sanitation in cities in the nineteenth century: problems were addressed by means of laws aimed at improving living conditions in densely populated cities. In the second section, we analyse the role of the city of Milan as a driver of change in sewerage in Italy. The third section examines the emergence – after the unification of the country – of private for-profit companies contracted to collect and recycle organic waste of human origin.<sup>15</sup> Alongside the stakeholders involved in finding solutions for urban waste disposal – including professionals like doctors, engineers and architects – economic actors also converted substances from cesspools and public latrines into fertilizer. The cesspit companies of Italian cities represented a form of public–private collaboration that spread to other countries during the late nineteenth and early twentieth centuries.<sup>16</sup> These companies were often also in charge of cleaning municipal slaughterhouses.

In pre-industrial cities, it was common for farmers to enter the city, especially at night, to obtain organic urban manure.<sup>17</sup> With the emergence of cesspit companies,

<sup>11</sup>M.V. Melosi, *Garbage in the Cities: Refuse Reform and the Environment, 1880–1980* (College Station, 1981); S. Barles, *L'invention des déchets urbains, France, 1790–1970* (Seyssel, 2005); A.P. Bortoletto, *Waste Prevention Policy and Behaviour: New Approaches to Reducing Waste Generation and its Environmental Impacts* (London, 2014).

<sup>12</sup>S. Neri Serneri, 'The construction of the modern city and the management of water resources in Italy, 1880–1920', *Journal of Urban History*, 5 (2007), 813–27; A. Bonatesta, *Acqua, stato, nazione. Storia delle acque sotterranee in Italia* (Rome, 2023).

<sup>13</sup>M.R. Chertow, 'Industrial symbiosis: literature and taxonomy', *Annual Review of Energy and the Environment*, 25 (2000), 313–37; S. Bhunia, A. Bhowmik and J. Mukherjee, 'Use of rural slaughterhouse wastes (SHWs) as fertilizer in agriculture: a review', in *International Conference on Energy Management for Green Environment (UEMGREEN)* (Kolkata, 2019), 1–6.

<sup>14</sup>E. Sori, *La città e i rifiuti. Ecologia urbana dal medioevo al primo Novecento* (Bologna, 2001). The role of municipal solid waste disposal in the socio-economic dynamics of cities has also been addressed in the context of theories of urban metabolism (UM): S. Barles, 'A metabolic approach to the city: nineteenth and twentieth century Paris', in B. Luckin, G. Massard-Guilbaud and D. Schott (eds.), *Resources of the City: Contributions to an Environmental History of Modern Europe* (London, 2016), 28–47. See also H. Landecker, 'A metabolic history of manufacturing waste: food commodities and their outsides', *Food, Culture & Society*, 22 (2019), 530–47.

<sup>15</sup>For the contemporary era, see G. Stokes, R. Köster and S.C. Sambrook, *The Business of Waste: Great Britain and Germany, 1945 to the Present* (Cambridge, 2013).

<sup>16</sup>This issue has also been investigated in Chinese cities: G. Wang, 'An alternative approach to municipalization: the transition of human waste disposal in Hangzhou, 1900s–1940s', *Journal of Urban History*, 51 (2024), 1053–69.

<sup>17</sup>On the waste cycle between city and countryside, see especially J. Tarr, 'From city to farm: urban wastes and the American farmer', *Agricultural History*, 49 (1975), 598–612; P. De Graef, 'Food from country to city, waste from city to country: an environmental symbiosis? Fertiliser improvement in eighteenth-century Flanders', *Journal for the History of Environment and Society*, 2 (2017), 25–61.

farmers were excluded from the 'free' supply of organic substances. Fertilizer became a commodity to be purchased. A substance that had traditionally been available to everyone was privatized. For smaller farmers who lacked financial means, the change in the system of collecting and selling manure represented an increase in production costs.

This article analyses the solutions adopted in Italian cities for the disposal of human waste, excluding the disposal of industrial and commercial waste. It focuses on the period between the unification of the country (1861) and the year in which the municipalization of public services was enacted by law (1903), an act which granted municipalities the power to take over the operation of public services, including buying them back from private operators. We analyse this significant aspect of the modernization of nineteenth-century Italian urban organization. Cesspool cleaning companies represent a transitional phase in the process. The collection of human and animal excrement was initially the responsibility of individual citizens; there were municipal regulations for cleaning the streets in front of their homes. The first decades of the twentieth century were marked by more public initiatives (modern sewers, public services for rubbish collection). The growth and social diversification of contemporary cities led to a different relationship with the production and disposal of organic waste.

### Hygiene in Italian cities in the second half of the nineteenth century

Before considering sanitation in Italian cities in the second half of the nineteenth century, it is useful to review national demographics.<sup>18</sup> In 1861, when the Kingdom of Italy was established, the population of the country was about 22 million people, of whom 68.5 per cent lived in rural areas. The population living in large urban centres was only 19.6 per cent and was concentrated in a dense network of medium and small cities with fewer than 20,000 inhabitants. The predominantly rural population was indicative of a national economy that was agricultural and less industrialized than many other European nations. Over the final third of the nineteenth century, following the economic growth of some northern centres, Italy's population grew to 32 million, of which 7.5 million (23.7 per cent) lived in urban centres. The population of the 15 large municipalities increased from 1.6 million (7.5 per cent of the total Italian population) in 1861 to nearly 5 million (13.1 per cent) in 1921.

Contemporary experts and elites became increasingly aware that sanitary conditions in Italian cities were very poor. Most of the dwellings, in addition to being unhealthy, lacked sewage disposal systems.<sup>19</sup> Traditional disposal methods continued to be used: in coastal cities, for instance, sewers discharged sewage and organic matter directly into the sea.<sup>20</sup> As a rule, solid and liquid organic waste from stables and farmyards was collected in channels made of stones stacked on top of each other without the use of lime. These domestic channels then converged with those in the streets, which collected rainwater and all the dirt that accumulated in the streets. These channels, many of them open-air, were permeable and the materials they carried ended up polluting the wells. The old sewerage systems contributed to the

<sup>18</sup>L. Del Panta, *La popolazione italiana dal medioevo a oggi* (Rome and Bari, 1996).

<sup>19</sup>C. Giovannini, *Risanare la città: l'utopia igienista di fine Ottocento* (Milan, 1996).

<sup>20</sup>A. Pongetti, *Società e colera nell'Italia del XIX secolo. L'epidemia di Ancona del 1865–67* (Milan, 2009). For details on waste disposal in pre-industrial Italian cities, see L. Sabbionesi, *Pro maiore sanitate hominum civitatis...et borgorum'. Lo smaltimento dei rifiuti nelle città medievali dell'Emilia-Romagna* (Florence, 2017).

pollution of rivers and seas and at the same time transformed the cultivated fields around the city into vast deposits of nauseating organic waste. In addition to the spread of unpleasant odours, this practice often led to poor sanitary conditions. The connection between bad odours and the spread of disease, which emerged from contemporary medical theories, also influenced the way public decision-makers framed the problem (and sought to solve it).<sup>21</sup> The poor sanitary conditions in which most of the urban population lived, especially the lower classes, encouraged the spread of infectious diseases; between 1865 and 1867, a wave of *cholera morbus* struck many Italian cities.<sup>22</sup> Municipal authorities therefore began to consider replacing the traditional sewers for collecting excrement.

Of the country's 8,258 municipalities, only 52.7 per cent provided urban sanitation services through contracts using municipal street cleaners. In 33.5 per cent of cases homeowners were responsible for cleaning the streets, and in 13.8 per cent of cases no one took care of public sanitation. As for areas used for waste storage, in 3,520 municipalities, landfills were located far from residential areas; in 2,283 they were close to people's homes; in 767 they were located in special enclosures within the town; in 254 they were inside stables and in 1,434 rubbish was left along the streets or in the courtyards of houses.<sup>23</sup>

At the time of the country's unification, 6,374 municipalities lacked any form of sewage system (about 15 million people); only in 541 municipalities were public streets equipped with modern sewers for the collection of rainwater and human waste. The sanitary conditions of homes were no better. Only in 908 municipalities with a total population of 4.2 million were all dwellings equipped with latrines; in another 3,636 municipalities (10.7 million inhabitants) the majority of houses did not have latrines, and in 1,286 (2.7 million inhabitants) latrines were lacking in almost all houses.<sup>24</sup> It was common practice to dispose of household waste along the streets and in courtyards, in the hope that wind and rain would disperse the organic waste. In only 3,520 municipalities were there designated waste deposits located far from populated areas. In half of the municipalities, a street cleaning service was in place, which in many cases was contracted out to private individuals or carried out by municipal sweepers, but in other cases the removal of waste was carried out by citizens or the waste remained out in the open in the absence of a garbage service.<sup>25</sup>

Another interesting case was Venice, considered the city which 'responded least to the needs of civilization' in terms of sewage. Houses were divided into two broad categories: those that had a *cloaca* to be expurgated and those that discharged faeces and liquids directly into the canals.<sup>26</sup> Until the middle of the nineteenth century, all

<sup>21</sup>See C. Hamlin, *Cholera: The Biography* (Oxford, 2009). See also D.S. Barnes, *The Great Stink of Paris and the Nineteenth-Century Struggle against Filth and Germs* (Baltimore, 2006); D.S. Barnes, *The Making of a Social Disease: Tuberculosis in Nineteenth-Century France* (Berkeley, 1995).

<sup>22</sup>P. Sorcinelli, *Miseria e malattia. I ceti popolari dell'Italia centrale fra tifo petecchiale e pellagra* (Milan, 1983).

<sup>23</sup>*Risultati dell'inchiesta sulle condizioni igieniche e sanitarie nei comuni del Regno. Relazione generale* (Rome, 1886), 101.

<sup>24</sup>This last condition was particularly prevalent in municipalities in southern Italy, the islands and Veneto. 383 municipalities removed excrement from the town centre using sewers; 622 removed it using barrels or closed containers; 5,780 used open containers; and in 797 municipalities, excrement was deposited in the streets and left to the wind, rain and pigs to clear away.

<sup>25</sup>*Risultati dell'inchiesta*, xciv–xcv.

<sup>26</sup>*La fognatura delle città*, in *L'Ateneo veneto rivista mensile di scienze, lettere ed arti* (Venice, 1894), 89.

buildings were equipped with *gàtoli*; that is, tunnels made of masonry that conveyed all sewage directly to the various canals. These tunnels led into a collector, generally lined with bricks and with a rectangular cross-section, which collected the wastewater from the Venetian sewers and rainwater. The level at which the *gàtoli* were laid was such that the tides periodically cleaned and partly disinfected the conduits. It was widely believed that brackish water helped to purify urban waste, rendering it harmless to health. However, judgments about the urban organic waste disposal system were overwhelmingly negative as the sewers had to be opened to be cleaned, and they gave off an unbearably smell. Venice was considered a 'public health hazard', shrouded in the gases produced by the putrefaction of the matter collected in the sewers and *cloacae*. In addition, there were 519 urinals distributed throughout the city, of which 87 were washed away by a continuous dousing with water.<sup>27</sup>

The traditional cleaning systems could not solve the sanitation problems generated by the demographic and economic growth of cities in the nineteenth century. It was not enough to entrust the task of collecting organic waste to farmers or to operators who were responsible for emptying the cesspits. Not surprisingly, one significant aspect was the ownership and management of landfills. Even if contemporary farmers and some experts appreciated the practice of dumping faeces on agricultural land to use as fertilizer, the population increasingly opposed the creation of suburban dumps, seeing them as a sign of degradation, a source of malodorous miasmas and a health risk, especially in big cities.<sup>28</sup>

City authorities had to identify locations for the collection and disposal of human excrement, but also to determine sites for the performance of economic activities deemed to be harmful, such as tanneries and abattoirs, or ragpicking. These considerations fuelled an intense political debate about ways to make the city space less polluted. It was difficult to eradicate solidly established practices, as can be seen from the measures taken to establish more efficient urinals. The issue led to long and heated debates. The more affluent citizens demanded that such facilities scattered throughout the city space be eliminated, as they were hotbeds of bad smells and immoral behaviour. The administrators were aware of the problems that urinals generated, especially since many of them were not equipped with running water and were not connected to the sewage system. While the political management of the city was aware that it had to arrive at a rational distribution of city urinals, it could not refuse the demands it received from the working-class sectors that now crowded the city centres.

### Milan: the appearance of the first private cesspit cleaning company in 1862

In the case of Italian cities, the irregularity and scarcity of water typical of many Mediterranean rivers represented a major health problem. In contrast, in northern European cities urban waste was usually discharged into a large river or a network of canals.<sup>29</sup> In Italy, high summer temperatures transformed the almost dry waterways

<sup>27</sup>*Ibid.*, 111.

<sup>28</sup>In Paris, ordinances were published in 1867 and 1872, favouring the establishment of private garbage dumps. The Richer company, which was the concessionaire of the Lesage dunghill, was founded at the same time; in 1880, the *Compagnie Parisienne des vidanges et engrais* was established, and in 1883 the *Compagnie d'assainissement et de fertilisation*.

<sup>29</sup>V. Winiwarter, 'Where did all the waters go? The introduction of sewage systems in urban settlements', in C. Bernhardt (ed.), *Environmental Problems in European Cities in the 19th and 20th Century* (Münster,

used for organic waste disposal into breeding grounds for dangerous epidemics. The case of Naples, a city with more than 500,000 inhabitants, showed that traditional sewers were not the best solution to the problem because, in the frequent absence of rain, uncollected rubbish accumulated.

There were two systems that could be adopted to dispose of faeces: they could be collected in a cistern (cesspit or 'mobile sewer'); alternatively the excrement could be conveyed directly into canals rich in running water that transported them out of the city.<sup>30</sup> As demonstrated by the case of Milan (followed by other cities such as Turin and Verona), the solution adopted was not only to improve cesspools – with regulations governing their construction and emptying and the setting up of storage areas outside the city – but also to use so-called 'mobile sewers' in order to remove excrement safely and thus meet hygienic and agricultural requirements. These were hermetically sealed metal containers that could be removed and replaced. Metal barrels, usually made of cast iron, had the advantage of preventing decomposing products from penetrating the soil; they could be placed in suitable locations that were particularly well ventilated, usually in the common areas of courtyards of houses or large public buildings such as barracks, hospitals and schools.<sup>31</sup>

The construction of both waterproof channels and structures suitable for sewage treatment was very costly for many municipalities with limited financial resources. During the second half of the nineteenth century, a debate arose between those who favoured the English sewerage system and those who preferred the mobile sewer system. The former was widely regarded as being more suitable for large urban areas, while mobile cesspools were better suited to small towns. Mobile cesspools were not only popular in Italy: in Edinburgh in 1874, there were 14,319 mobile cesspools, while in Manchester in 1878 there were about 25,000.<sup>32</sup>

Milan was one of the first Italian cities to initiate reform regarding the disposal of excrement. Traditionally, the inhabitants of Milanese homes simply dug a pit in the ground to collect waste. As long as the population density was low and buildings were only a few storeys high, this rudimentary system seemed to work without causing obvious inconvenience: faecal matter absorbed into the soil and did not cause concern. However, with the increase in population, the construction of taller buildings and the growth of urban life, the need for a different disposal system became evident.

In the 1860s, the city had approximately 5,303 houses and 9,223 cesspools built under the soil of courtyards. In 1861, a municipal commission was appointed to study alternative methods to the then current system of cesspool emptying, which was considered ineffective and inefficient, following a political debate that had begun at the end of 1859.<sup>33</sup> The debate was about the activities of the so-called *navazzari*, who

2000), 105–19; A. Kohlbrenner, 'From fertiliser to waste, land to river: a history of excrement in Brussels', *Brussels Studies*, 78 (2014), 1–14; C. Deligne, 'Industrialisation, manure and water quality in the 19th century. The Senne River in Brussels as a case study', *Water History*, 8 (2016), 235–55; Gierlinger, Haidvogel, Gingrich and Krausmann 'Feeding and cleaning the city'.

<sup>30</sup>It is true, however, that at the end of the nineteenth century, many European cities still used sewerage systems exclusively to dispose of domestic wastewater and solid organic waste indiscriminately.

<sup>31</sup>'L'esportazione delle materie fecali e la fognatura all'inglese', *L'amico dell'artiere. Giornale dell'associazione triestina per le arti e l'industria*, 7–8 (1870), 114–19.

<sup>32</sup>L. Pagliani, 'Le fosse mobili', *Giornale della società italiana d'igiene*, 3 (1881), 159–77.

<sup>33</sup>Cittadella degli Archivi del Comune di Milano (CACM), *Atti del Municipio di Milano* (AMM) 1859, *Seduta del Consiglio Comunale di Milano* (SCC) 30 Sep. 1859; AMM 1861, SCC 24 Apr. 1861, *Regolamento per lo spurgo dei pozzi neri*.

were usually peasants taking the material collected from the cleaning of house cesspits to the countryside during the *ancien régime* (the *navazza* was the tanker barrel loaded onto the tank wagons in which the sewage was transported out of the city).<sup>34</sup> The owners of the wells received an income from the cleaning companies in exchange for exclusive management of the collected material.<sup>35</sup>

After realizing that Milan could not be kept clean by individual waste collectors, who lacked the right equipment, the city council approved new rules for building, maintaining and emptying cesspools in 1862: old cesspools had to be rebuilt, while new public and private buildings needed to have mobile sewers.<sup>36</sup> There were a total of around 8,700 cesspools, producing approximately 87,000 cubic metres of waste each year. From 1 January 1863, both owners and cesspool cleaners were prohibited from using traditional methods to empty cesspools.<sup>37</sup> All houses were required to have an adequate number of latrines. In order to make the mobile sewers waterproof, they had to be built using top-quality bricks, and the connection to the latrines had to be made using pipes made of cast iron or *terracotta*.<sup>38</sup>

The municipality of Milan thus sought to promote the creation of companies specifically for emptying cesspools, but at the same time opposed the formation of a system for collecting excrement dominated by a single entity capable of imposing a monopoly on the entire city. Before the end of the nineteenth century, there were 26 companies operating in Milan for the cleaning of cesspools.<sup>39</sup> Although the municipal authorities encouraged the creation of a market open to competition between multiple entities, the *Società anonima per lo spurgo dei pozzi neri di Milano* (Company for the Purging of Cesspools in Milan) founded in 1862 became the principal economic operator in the sector for many years. According to the statute, the company's objective was 'to extract, collect and transport faecal matter from private and public cisterns in the city... using the Chapusot barometric atmospheric system, mobile sewers, pumps or any other odourless means'.<sup>40</sup> The company had a warehouse for trading in faecal matter reduced to fertilizer (Figure 1). Under the terms of the agreement between the company and the municipality, the latter granted the company a loan of 100,000 lire in 1864 to expand the plant and purchase equipment and horses for transport.<sup>41</sup> After the company began operating, all new houses and most of the old ones stopped sending faecal matter to the city sewers. The company owned 51 barrels and claimed to own establishments for the conservation and practice of trading in faecal matter.

Another cesspool company appeared in Milan: the Vespasian company. In contrast to European cities where many such enterprises had gone out of business, the

<sup>34</sup>E. Bignami, 'La pulizia stradale delle città', *Il politecnico: rivista dell'ingegnere architetto civile ed industriale*, 34 (1886), 239–47.

<sup>35</sup>CACM, AMM 1862, SCC 24 Apr. 1862.

<sup>36</sup>*Ibid.* 4 Apr. 1862.

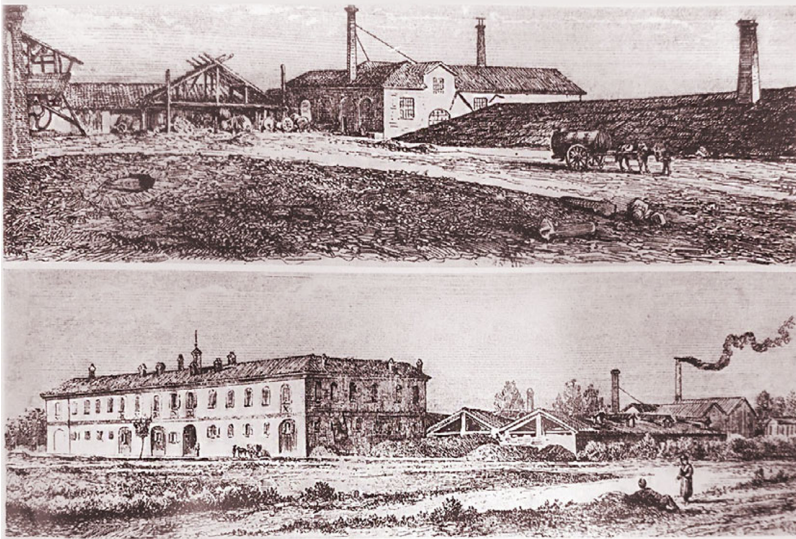
<sup>37</sup>P. Zocchi, *Il comune e la salute. Amministrazione municipale e igiene pubblica a Milano* (Milan, 2006), 154–60.

<sup>38</sup>*Raccolta degli atti ufficiali, delle leggi, dei decreti, delle circolari pubblicati nel Regno d'Italia nel primo semestre 1862*, 8 (Milan, 1862), 1255–60.

<sup>39</sup>Bignami, 'La pulizia stradale delle città', 239–47.

<sup>40</sup>*Statuto della Società anonima per lo spurgo inodore di pozzi neri riformata ed ampliata sulla già esistente società Donati e comp.* (Milan, 1861). For the Cremona company statute, see *Statuto della Società anonima Cremonese per la raccolta e smercio delle materie fertilizzanti* (Cremona, 1871).

<sup>41</sup>CACM, AMM 1862, SCC 11 Mar. 1864.



**Figure 1.** The building housing the Company for the Purging of Cesspools in the *Borgo degli Ortolani* district of Milan. Source: private collection of Luciano Maffi.

Vespasian company boasted many years of operation, and was one of the most prosperous in Europe. This company was dedicated to the reuse of urban organic waste, earning a strong reputation for its fertilizer products (powdered phosphates, peat, soot, urine-saturated ash, superphosphates).<sup>42</sup> By the 1880s, this company owned 5 large tanks and 30 smaller ones with a total storage capacity of over 120,000 hectolitres.<sup>43</sup> Its special *poudrette*, exhibited at the National Exhibition in Turin in 1884, was a powdered fertilizer, prepared by adding marl to the droppings, which were then dried and ground, in order to reduce the sanitary problem (the unpleasant and dangerous smelling emanations), and to counter the economic disadvantages by reducing the weight of the fertilizer and the high transport costs (due to the liquid form of the droppings).

In 1885, Milan had around 15,000 cesspools and the population of the urban agglomeration rose to 330,000 inhabitants – of these, approximately 30,000 had buildings with drainage into the Seveso Canal and other smaller canals – so the *Società anonima per lo spurgo dei pozzi neri* and other similar private companies had to provide for the removal of the waste of 300,000 people. Estimating production at approximately 1.3 litres per person, and adding the minimum amount of water per day per person of 1.7 litres, this results in a volume of 900,000 litres, corresponding to approximately 900 barrels of faecal matter to be removed every day.<sup>44</sup>

Despite the spread of mobile sewers managed by private companies, the city of Milan continued to use large cesspools, often built without masonry bottoms, through which liquids filtered freely into the ground. Building and health regulations concerning their construction arrived late and were incomplete, so that while other

<sup>42</sup> *La Provincia dell'Istria*, 8 Sep. 1881, 181–2.

<sup>43</sup> *Giornale della Reale società italiana d'igiene*, 1 (1879), 287–8.

<sup>44</sup> F. Poggi, *Le fognature di Milano. Studio generale delle canalizzazioni urbane con speciale applicazione alla Rete di Milano* (Milan, 1913), 38.

areas of urban construction were being perfected, cesspools remained insufficiently regulated. The consequences of this situation for public health were serious. The infiltration of sewage into the soil contributed to the contamination of groundwater, from which drinking water had long been drawn. In addition, the phenomena of capillarity and fluctuations in the water table made complete remediation of urban soil particularly difficult, if not impossible.<sup>45</sup>

Rainwater washed away excrement, which polluted the aquifers, thus creating a *hygienic short circuit*. As the case of Milan shows, the city's sewerage system was in such a poor state that it was unable to dispose of rainwater properly and could not dispose of sewage; the traditional cesspit system, which was hygienically defective (not waterproofed), no longer met the city's needs because it was impossible to empty it completely; finally, the existing canal network was insufficient to dispose of rainwater in the new neighbourhoods.

### The private management pattern: the spread of the cesspool companies in Italian cities

The collection of organic remains stimulated technical solutions with the invention of new devices, including special metal cisterns. In 1866, the municipality of Florence authorized the emptying of cesspools, only adopting systems that did not produce bad odours or liquid leaks. To this end, a grant of 10,000 lire was approved to encourage the establishment of a company guaranteeing the use of barometric emptying mechanisms instead of traditional barrels.<sup>46</sup> Even at the end of the nineteenth century in Italy, the system of connecting latrines to sewers or canals with running water was not widespread on account of its excessive cost, as it meant that cities had to have a regular water service, and it was difficult to manage water laden with faecal residues. The most suitable solution appeared to be mobile latrines, made of metal, hermetically sealed and easy to position and clean, and which were used in many European cities (Copenhagen, Stockholm, Edinburgh, Birmingham). Around the 1860s to 1870s, commercial companies were set up in Italian cities, especially in the north central area of the peninsula, to collect, process and market human excrement.<sup>47</sup>

In Florence, the *Società anonima Fiorentina* factory, constructed in 1871, was located three kilometres from the town centre; the building occupied an area of 14,000 square metres and bordered on the railway line, so that 200 barrels of faecal matter of 10 hectolitres each could arrive every day. As a rule, the storage facilities were located outside the built-up area, and appropriately equipped railway wagons were used to move the goods because of the need to avoid sewage spillage. As the engineers and specialists called upon by the city authorities to design waste disposal systems understood, it was necessary to adopt the solution best suited to the geographical conditions of each city, as demonstrated by studies of the construction of sewers in Palermo and Naples.<sup>48</sup>

<sup>45</sup>E. Bignami-Sormani, E. Paladini and G. Tagliasacchi, 'Relazione prima sulle condizioni generali delle fognature in Milano', in Reale Società Italiana d'Igiene, Collegio degli Ingegneri ed Architetti di Milano (ed.), *Relazioni delle Sotto-Commissioni. Commissione per lo studio delle fognature di Milano* (Milan, 1886), 3–31.

<sup>46</sup>*Atti del consiglio comunale di Firenze dell'anno 1865–66* (Florence, 1872), 544–5.

<sup>47</sup>*Statistica ed elenco generale degli istituti di credito e della società nazionali ed estere esistenti nel Regno al 31 dicembre 1876*, Tipografia eredi Botta (Rome, 1877), 90–4.

<sup>48</sup>*Giornale della società italiana d'igiene*, 2 (Milan, 1880), 556–62.

The system functioned properly if the demand from agriculture allowed the holding tanks to be emptied regularly. Otherwise, a contraction in demand could lead to immense open cisterns overflowing with nauseating organic substances; these were common by the end of the nineteenth century with the arrival of chemical fertilizers and oilseed cakes. A similar situation existed in Perugia. In the buildings of the 'cesspit cleaning company', the transformation of human excrement into fertilizer was carried out.<sup>49</sup> Faecal remains appeared particularly suitable as fertilizers because they had a low water content, so if they were well preserved, they could remain in use for a long time. In order to solve the problems arising from the cleaning of cesspools, the company installed in the city metal 'mobile cesspools', which had to be collected, emptied and put back on site after sanitation.

According to municipal regulations, the new houses' cesspools were not to be deeper than 8 metres, with a capacity proportional to the number of residents in the houses; they were to be built with bricks throughout in order to avoid leaks. The wagons used to transport the barrels had to be clean and solid. Once the wells had been emptied, the collected materials were taken with the utmost care to be stored outside the city walls, no less than 300 metres from houses. It was forbidden to dump the organic remains in canals and watercourses.

In many cities, the danger of cholera attacks accelerated changes in the collection and disposal of organic waste, even when hygienic conditions were maintained around the houses. In Gorizia in the 1870s, 700 houses out of 900 within the urban perimeter had no cesspools. In 1873, the municipality promoted the introduction of a pneumatic odourless system of emptying.<sup>50</sup> In 1875, an agreement was signed between the municipality and the company for the odourless emptying of cesspools, which committed the latter to using a pneumatic system to empty the containers.

The system of mobile sewers was successful in Italy and represents a form of hydraulic and hygienic engineering frequently used in barracks, hospitals, schools and other crowded buildings, as the abundant advertisements of companies specializing in the construction of mobile sewers demonstrate.<sup>51</sup> In Verona, the Limited Company for the Emptying of Cesspools began operating in 1891.<sup>52</sup> Italian companies diversified their activities during the final decades of the century. The Luigi Fino and Co. Cesspool Society of Turin specialized in fertilizers for cereals, vegetables and flowers. The Giuseppe Borella company of Novara processed blood, bones, urine and sulfur to produce albumin, glue, ammonium sulfate, various types of fertilizers and antiseptic and enological powders.<sup>53</sup> The Massa Solari company in Genoa processed thawed, pulverized bones, vine fertilizer, guano phosphate, powdered and dried blood, powdered nails and superphosphate. The nitro and chemical factory in Vigevano (Pavia) produced antiphylloxera sulphocarbonates. The Gambini Polenghi e C. manufacturer's exhibition in Lodi produced chemical fertilizer based on superphosphate and rendered materials suitable for fertilization such as fish powder

<sup>49</sup> Archivio di stato di Perugia, Archivio della Società economico-agraria, Fondi aggregati, *Società anonima per lo spurgo dei pozzi neri in Perugia*.

<sup>50</sup> P. Bresadola, *Questioni di ingegneria sanitaria applicate alla città di Gorizia* (Gorizia, 1890), 23–4.

<sup>51</sup> Pagliani, 'Le fosse mobili', 170.

<sup>52</sup> For cities in Veneto, see M.L. Ferrari, 'Trasformazioni urbane e igiene nell'industrializzazione ottocentesca di Verona, Vicenza e Padova', in G. Corona and S. Neri Serneri (eds.), *Storia e ambiente. Città, risorse e territori nell'Italia contemporanea* (Rome, 2007), 55–85.

<sup>53</sup> *La Provincia dell'Istria*, 8 Sep. 1881, 181–2.

and blood. Ercole Candiani from Sesto Calende (Milan) processed equine waste (fat, gelatine, blood, bones). Cavalca Martinotti from Casalmonferrato (Alessandria) specialized in processing guano. Carlo Rossi of Turin produced a fertilizer that was also an insecticide. The Italian company for exportable latrines in Florence manufactured fertilizers. The Fiumi company in Naples had a speciality: Neapolitan guano. Inson of Mantua produced artificial fertilizers based on faecal matter and dead animal remains.<sup>54</sup>

However, there was some mistrust of the idea of urban excrement being used for fertilizing fields: first and foremost, it was feared that disease could contaminate plants, especially vegetables that were eaten raw. Although books on agronomy assiduously emphasized the organic properties of urban waste as a source of essential nutrients, the need to exclude excrement from civilized city life became a pressing societal issue. The result was the breaking of the link that had hitherto held together the rural world and the countryside through the recycling of organic waste. Alongside the revolution in chemical and organic fertilizers that occurred during the second half of the nineteenth century, a social and cultural change took place which imposed a different way of understanding the role of urban excrement in society.<sup>55</sup> Traditionally, waste materials were considered a useful resource for agriculture and therefore essential for ensuring food supplies for cities, but they subsequently became a problem to be eliminated using disposal systems that removed excrement from people's lives.<sup>56</sup>

The consolidation of the 'Sanitary City' took place in the wake of this cultural change; it was based on the enactment of national and local regulations governing waste disposal and raising the standard of public hygiene. The Italian government began to implement measures to make the major urban centres safer and cleaner. Inspired by legislation enacted in other European countries (such as Ireland, England, France and Prussia), several regulations were applied to Italian cities such as Rome, Florence, Naples, Milan and Bologna. Law No. 2892 of 1885 for the redevelopment of the city of Naples was enacted following a severe cholera epidemic that struck the city as a result of overcrowding and poor sanitary conditions.<sup>57</sup> The law allowed the city's mayor to order the closure or rehabilitation of unhealthy housing and the elimination of dangerous wells or cisterns.

Sanitation in Italian cities was significantly improved by the law of 14 July 1887, which granted municipalities subsidized loans for the construction of works which

<sup>54</sup>*Ibid.*

<sup>55</sup>L.B. Nelson, *History of the U.S. Fertilizer Industry* (Knoxville, 1990); M.W. Dixon, 'Chemical fertilizer in transformations in world agriculture and the state system, 1870 to interwar period', *Journal of Agrarian Change*, 18 (2018), 768–86; S. Barles, 'History of waste management and the social and cultural representations of waste', in M. Agnoletti and S. Neri Serneri (eds.), *The Basic Environmental History. Environmental History*, vol. IV (Cham, 2014), 199–226; V. Winiwarter, 'History of waste', in K. Bisson and J. Proops (eds.), *Waste in Ecological Economics* (Cheltenham, 2002).

<sup>56</sup>For pre-industrial cities, see R. Magnusson, 'Medieval urban environmental history', *History Compass*, 11 (2013), 189–200; P.D. Boudriot, 'Les égouts de Paris aux XVIIe et XVIIIe siècles: les humeurs de la ville préindustrielle', *Histoire, économie et société*, 9 (1990), 197–211; J.P. Leguay, *La pollution au moyen âge: dans le royaume de France et dans les grands fiefs* (Paris, 1999); A. Corbin, *The Foul and the Fragrant: Odor and the French Social Imagination* (Cambridge, MA, 1988); Z. Gille, *From the Cult of Waste to the Trash Heap: The Politics of Waste in Socialist and Postsocialist Hungary* (Bloomington, 2007).

<sup>57</sup>F.M. Snowden, *Naples in the Time of Cholera, 1884–1911* (Cambridge, 1995); R. D'Arienzo, *Métabolismes urbains. De l'hygiénisme à la ville durable: Naples 1884–2004* (Geneva, 2017).

enhanced the living conditions of citizens. It is not surprising that projects for the construction of sewers were drafted after this date. In Milan, the first municipal plan for the construction of a sewerage system dates back to 1888, with a final plan in 1890 based on the principle of receiving and disposing of domestic water, rain and black water at the same time, a criterion that would become the main model from the end of the nineteenth century onwards.<sup>58</sup>

At the end of the nineteenth century, two additional laws concerning hygiene and public health – No. 5849 of 1888 and No. 7045 of 1890 – required municipal administrations to undertake significant initiatives within urban spaces.<sup>59</sup> Special attention was given to newly constructed buildings. Mayors had to ensure that the buildings complied with regulations concerning wastewater disposal before granting them occupancy permits. Specifically, new houses were required to have latrines and waste outlets that did not cause foul smells or seepage. Wastewater discharge could not be conducted through channels that led directly into lakes and rivers. It was not easy for municipal administrations to implement what the law required. Between the end of the nineteenth century and the first decade of the twentieth century, there was a proliferation of cases where municipal administrations, even in smaller towns, issued tender specifications for the management of public sanitation.<sup>60</sup>

In addition to the usual problems of lack of funding, the application of sanitary laws highlighted a number of deep-rooted contradictions. In the central districts, the measures were easily applied; in the peripheral districts, public health came second to other interests such as industry.<sup>61</sup>

In the city of Turin, equipped since 1726 with a network of primary and secondary canals, the need to modernize the collection of water, both clean and black, began to be discussed in the late nineteenth century. A debate arose at municipal level about which sewerage system should be used (single or double sewer). Opinions were divided; those who supported the solution of the single sewer championed the idea of using the excavation of the sewer channels to facilitate both the passage of telegraph and telephone wires and drinking water pipes. In Naples, the intense political and technical debate on the disposal of organic substances at the end of the 1870s brought the theory of continuous circulation to prevail among the proposals in the field (cesspools, mobile sewers, pneumatic systems), with the use of faecal water to promote the irrigation of large agricultural areas around the city of Campania.<sup>62</sup>

<sup>58</sup>E. Bignami and G. Tagliasacchi, 'Studio sulle fognature di Milano', *Il politecnico: rivista dell'ingegnere architetto civile ed industriale*, 34 (1886), 438–45; *Atti Primo congresso degli ingegneri ed architetti italiani* (Milan, 1875), 167–76.

<sup>59</sup>M.P. Di Simone, 'Politiche sanitarie in Italia da Crispi a Giolitti: percorsi di ricerca nelle carte nell'Archivio centrale dello Stato', *Popolazione e storia*, 1 (2002), 143–56.

<sup>60</sup>Comune di Firenze, *Capitolato d'appalto per la nettezza pubblica* (Florence, 1897); Municipio di Livorno, *Contratto e capitolato per l'appalto della nettezza pubblica e della vuotatura inodora dei pozzi neri* (Livorno, 1903); Comune di Lugo, *Capitolato per l'appalto del servizio della vuotatura a sistema inodoro delle latrine ed orinatoi in Lugo* (Lugo, 1909). See also the early twentieth-century archive documentation produced by the municipality of Ravenna relating to the purging of cesspools. Archivio Storico Comune di Ravenna, *Buste speciali, Espurgo pozzi neri*, bb. 82/I and 82/II.

<sup>61</sup>For Rome, see S. Valenti, *Water in the Making of a Socio-Natural Landscape. Rome and Its Surroundings, 1870–1922* (New York, 2023), 140–1.

<sup>62</sup>During the nineteenth century, Italian medical and hygiene treatises regularly dealt with the question of the elimination of human excrement. In his treatise of 1870, the Neapolitan physician Francesco Roncati

Northern Italian cities (Milan, Turin, Vicenza, Bergamo, Reggio-Emilia) with an abundance of available water resources adopted the Chadwick method for the setting of the sewage system, which required a constant and regular flow of water. This situation was similar to that which prevailed in Germany, where 279 towns and cities were cleaned between 1900 and 1907 by adopting essentially dynamic sewers based on circulating water. That method was difficult to apply in the southern Italian cities because of the lack of sufficient water resources. The only solution proposed was to use wells and impermeable pits, or, as in Catania, to use the force of gravity to drain the solid and liquid remains. Simple wells or non-impermeable pits dug in the earth used to collect organic waste did not prevent liquids from seeping into and polluting the water table and the soil. There is a possibility that this transitional phase in the settling of the urban sewerage system was also characterized and influenced in Italy (at least in large northern cities) by a growing liquefaction of human waste, similar to the situation in Paris as described by Sabine Barles.<sup>63</sup> This hypothesis merits future research.

Ultimately, in the wake of the construction of underground sewage plants in Italian cities (through which the organic waste was discharged in sewage farms), the operating space reserved for companies to clean cesspools and sell excrement was reduced. Within a few years, and especially in cities, many of these companies went out of business, because administrations chose to build the sewers underground. Organic fertilizer of human or city origin (including the excrement of draught animals) was no longer needed as much, owing to the increasing spread of chemical fertilizers.

## Conclusions

In the nineteenth century, the increase in sanitation issues and overcrowding in unhealthy environments consequent to the expansion of cities made it necessary to address the problem of collecting and managing the rising tide of city waste. Street urinals, cesspools, sewers, as well as animal excrement and carcasses were significant factors contributing to the degradation of the urban ecosystem in European cities. The fear that the collection of piled-up waste, in addition to being a source of foul-smelling emanations, might encourage the spread of diseases such as cholera or typhus forced the authorities to start thinking about the measures to take to overcome the inadequacy of the facilities. For public authorities, driven by the need to make cities cleaner and more hygienic, the sanitation of urban spaces became a priority (the political goal of building a 'Sanitary City'). National enquiries and the extensive legislation enacted during that period were used to address the health emergency, particularly following the outbreak of the cholera epidemic in Naples in 1884. In Italy,

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emphasized the convenience of creating underground sewers. In his opinion, however, the use of sewers implied the existence of large quantities of running water, a factor that made it impossible to use faeces and urine as fertilizer. F. Roncati, *Compendio d'igiene per uso dei medici* (Naples, 1870), 449; M. Turchi, *Sulla igiene pubblica della città di Napoli* (Naples, 1862). For a more general overview of recycling theories in Europe, see E. Mårald, 'Everything circulates: agricultural chemistry and recycling theories in the second half of the nineteenth century', *Environment and History*, 8 (2002), 65–84; C. Hamlin, 'The city as a chemical system? The chemist as urban environmental professional in France and Britain, 1780–1880', *Journal of Urban History*, 33 (2007), 702–28.

<sup>63</sup>Barles, 'A metabolic approach to the city: nineteenth and twentieth century Paris'.

the epidemic diseases of the late nineteenth century led to a turning point in the management of urban organic waste.

In this article, we have examined a transitional process lasting decades, marking the shift from an initial situation dominated by cesspools to an environment dominated by municipal sewerage systems. The intermediate phase, representing the attempt to manage the problem of human waste disposal through private systems, provided the time frame.

The transitional phase examined here highlights the significant role played by private commercial enterprises. For the cesspool companies, which emerged primarily in the cities of northern Italy, the goal was to acquire a valuable raw material that, when properly converted, could be reintegrated into the production cycle, thereby meeting the growing demand for organic fertilizer.<sup>64</sup> Some misconceptions in the abundant agronomic literature have been addressed: the results of the project were unsatisfactory because, during the nineteenth century, urban populations refused to consume crops fertilized with human excrement. Human or animal waste needed to be removed from central urban areas and transported to the countryside or working-class neighbourhoods. Furthermore, the concentration of large quantities of decomposing organic matter in a single location within the city or its suburbs contradicted the very laws that mandated the elimination of risks to the health of the population. Despite these setbacks, the involvement of private entrepreneurial initiatives accelerated the search for new technical solutions for the treatment of urban organic waste.

**Acknowledgments.** The authors would like to thank the two anonymous reviewers and the editor for their input and their valuable comments.

**Competing interests.** The authors declare none.

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<sup>64</sup>G.A. Barton, *The Global History of Organic Farming* (Oxford, 2018); M. Larramendy and S. Sdoneski (eds.), *Organic Fertilizers – History and Applications* (London, 2019).

**Cite this article:** Vaquero Piñeiro, M., Maffi, L. and Mazzotti, O. (2026). Privatizing excrement: the management of organic waste and the cesspit companies in the late nineteenth-century Italian cities. *Urban History*, 1–15, doi:10.1017/S0963926826101059