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Water Modernity and Society in Linz, ca. 1700–1900

Abstract

This article investigates the transition to a modern water supply and sewage disposal system. By focussing on the of the Upper Austrian mid-size city of Linz in a long-term perspective from circa 1700 to 1900, we trace continuities and disruptions of existing solutions and question the narrative of modernisation. We research the actors involved in the decision-making and implementation processes, paying special attention to the so-far neglected group of city inhabitants and their motives. Finally, we raise questions of integration and exclusion with regard to water.

Key words: environmental history, urban history, urban environment, water infrastructure, sanitation

Introduction

The history of urban environmental issues before the 1850s has often been interpreted as a static period of prolonged problems without sustained efforts to solve them. This view has frequently been applied to the question of hygiene, but the fields of water supply and of waste water disposal have also been viewed in a similar way. Municipal governments have been depicted as reactive, solutions perceived as ‘primitive’ and

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insufficient, especially when compared to the large scale technical infrastructures that were established in Western European cities during the second half of the nineteenth century (a more balanced view is given by Tarr 1996 and Schott 2014). However, if we consider urban policies in relation to the actors and their motives, taking the variety and diversity of the actors (and their interactions) into particular consideration, a more differentiated picture becomes visible.

There are a number of studies that deal with the issue of water supply and of waste water disposal during the eighteenth and nineteenth centuries; most scholars, however, have tended to focus on the introduction of large-scale technical water infrastructure, which was established in many Western European cities and towns after the 1850s. This has meant that they miss the opportunity to link these changes to a longer-term development, which would help to identify change and continuity in urban water infrastructure (exceptions to this are Janssens, Soens 2019 and Tello, Ostos 2012; cf. Schott 2014: 109–123 and 215–252). Even those studies that deal with human actors have tended to focus exclusively on city governments and experts (technical as well as medical), largely overlooking other relevant actors, such as the inhabitants of cities. However, research on the implementation of urban infrastructure and on urban governance has shown that the process of decision-making was complex, extending beyond elected political representatives or the state government. Administrative elites, entrepreneurs, professionals and civil society actors interacted to deliver common goods such as water supply to the urban population (cf. Morris, Trainor 2007). This perspective also demands the consideration of a broader range of factors such as institutional and societal change and may enable us to question the straightforward narrative of modernisation, where technological and scientific development is seen as leading to progress in a rather linear way (Soens et al. 2019).

By using the city of Linz (Austria) as a case study, we will investigate at which point and why existing systems of water infrastructure were considered outdated.² Was this a linear transition or can it be interpreted as a gradual or even a partially regressive process? We will identify the actors involved in these transformations and establish what drove their behaviour and we will also consider the role of the city inhabitants who are generally neglected in this narrative. In particular, we will focus upon whether the infrastructures aimed at an inclusion or at exclusion.

² This case study relies on our recently published research: Pichler-Baumgartner 2020 and Stöger 2021.

Our longer-term perspective, which covers the eighteenth and nineteenth centuries, will allow us to identify areas of continuity and persistence as well as infrastructural change (cf. Janssens, Soens 2019: 90).

The nature of the surviving sources makes it difficult to take account of the actors who did not belong to the urban administration, especially members of the lower classes, who formed the majority of city inhabitants. In addition, records of conflicts and orders from above dominate the written documents, which hinders our ability to understand what constituted ‘normality’. For the eighteenth and first half of the nineteenth century, written documents from the city and the provincial governments, from urban institutions and feudal lords are used, as well as travel and topographic literature. Administrative sources such as city council proceedings (AStL, Proceedings) and accounts of the city council affairs (Accounts 1879–1910) are also considered, while petitions and newspapers offer a perspective upon the agency and experience of city inhabitants. Overall, the corpus of source material is slightly imbalanced, being much richer for the second half of the nineteenth century.

The Austrian city of Linz – the focus of the case study – is situated on a plain a few metres above the banks of the Danube River. It is surrounded by hills in the West and South-west. Based upon the modern city boundaries, the city had an estimated population of *circa* 24,000 inhabitants in the 1780s, 50,000 in 1869 and 84,000 at the turn of the twentieth century. In the eighteenth century, Linz was a regional centre of administration, trade, transport and the military. During the seventeenth century a woollen cloth manufacture was erected, followed by the establishment of modest textile and metal works from the 1830s onwards. In the 1880s several factories were established in the urban periphery, mainly in the former suburbs Waldegg (‘Obere Vorstadt’, i.e. upper suburb) and Lustenau (‘Untere Vorstadt’, i.e. lower suburb) south of the city centre, which had become a part of the city in 1873. Despite considerable industrial growth at the beginning of the twentieth century, during the period of this study the urban economy was mostly shaped by small scale businesses. Linz was hardly an industrial city before the twentieth century, but can be considered as a multifunctional regional centre of services, administration, military, trade and traffic (Stöger 2021: 47–52 and 57–60).

During the eighteenth century Linz was self-governed in similar fashion to other cities of the period. The city council of Linz was dominated by members of the urban elite; it had limited power, and its administration had a small budget and few responsibilities. In 1784, due to reforms within the Habsburg Empire, which also concerned other cities

in the empire, a new municipal administration (‘Magistrat’) was introduced. With the creation of the Magistrat, the state sought to introduce professionalization and exert greater influence, as it installed representatives and civil servants who sometimes remained in their positions for several decades. After years of conflict and economic hardship – the French Wars and severe economic crisis of the 1810s – the municipal administration began to realise numerous infrastructural projects, which included the pavement of streets and the building of sewers. From the mid-nineteenth century bourgeois groups began to gain influence within the urban administration and from the 1860s onwards they played a significant role in the renewed self-government of the city. During the last three decades of the nineteenth century the liberal city government expanded its responsibilities in a remarkable way and undertook large projects such as the modernisation of the water supply and the sewers, the building of bridges and other urban infrastructure (Stöger 2021: 60–63).

The logic and practice of decentralised systems

In terms of water supply and sewage disposal, Linz was a fairly typical example of a mid-sized town in Central Europe. In the eighteenth century most of the water infrastructure was privately organised and managed. Some urban institutions, such as the castle or the ‘Landhaus’, the assembly building of the territorial estates, were supplied by a network of wooden water pipes, which transported water from the nearby hills to the city. A wooden water pipe, which stretched over approximately one and a half kilometres, was built in the late sixteenth century to supply fresh water to the ‘Landhaus’ and a nearby fountain. The water was not only used for drinking, but also for other purposes such as cleaning or to fill the fish tanks (Pichler-Baumgartner 2020: 44–47). As in other Austrian cities most urban households received their water for drinking and other purposes from groundwater wells, which were often situated in the gardens or courtyards of the buildings (cf. on Vienna and Salzburg: Brunner, Schneider 2005: 188–200 and Ebner, Weigl 2014). In addition, there were also some wells, which were maintained by the city government. After a fire in 1542, the city government built a wooden spring-water pipeline along the Danube riverbank to supply two public wells on the main square (Pichler-Baumgartner 2020: 44). But the number of public wells was, altogether, comparatively small: In 1816, the city government listed 17 wells, while a local topographer counted only 16 in 1837 (AStL, HS 859, after fol. 87; Pillwein 1837:

167). Unlike other larger cities as London, Paris or Vienna, there were no professional water carriers in Linz nor was the river Danube used as a source for drinking water (AStL, Materienbestand 25, Sch. 169, Dec. 1885; cf. Brunner, Schneider 2005: 193).

Likewise, until the introduction of a centralised sewer system, the disposal of sewage was a private obligation, and thus most inhabitants relied on the use of cesspools. Only some households – mainly those close to the Danube or the city moat – had private sewers. The city government only provided a rudimentary network of runlets for rain and waste water and a small number of underground sewers (e.g. AStL, HS 399, account book 1760, pag. 19; AStL, Proceedings, 27 Jul. 1797 and 9 Nov 1797). Mostly, the waste water seems to have trickled off into gardens, in ponds or in ditches, while faeces were collected in cesspools in the backyards or cellars. Disposal of sewage on the street, through runlets, or in the city moat was clearly not tolerated. Nevertheless, several examples of this practice can be found (OÖLA, Alte Registratur, Sch. 92 and Sch. 95). It is striking that even bigger houses had rather modest sanitary infrastructure: The estates building, for example, had only eight privies in the 1790s (LR, BIIA12, Reg. 13358); and a building plan from the 1740s for military barracks near the river reveals that only six ‘well-distributed’ privies were intended for this three-story building with a capacity for 1,300 people (LR, BIIA40, Reg. 19556). The flushing of sewers was difficult without a steady input of water, which might explain the reluctance of the city government to invest in sewers. These waterless sewers required periodic cleaning (as did cesspools), so the erection of cesspools was often seen as a preferable solution (OÖLA, Alte Registratur, Sch. 98). In 1809, after lengthy discussion, the city government built the first ‘main’ sewer, which was connected to the Danube. However, it primarily served the ‘private’ needs of institutions such as the military and the estates (see below). Subsequently – especially from the 1820s – there were further efforts to build sewers and to connect them to the main sewer (AStL, Altakten, Sch. 172; Pillwein 1837: 168) however, in 1869 850 of 1,460 houses (i.e. 60 percent) still had no access to sewers (AStL, Proceedings, 27 Oct. 1869). The construction of a systematic and centralised modern sewerage system, which covered large parts of the city, did not begin until 1876 (Accounts 1879: 75–77). Preceded by small systems of water supply for peripheral districts in the Western part of Linz (for the ‘Schullerberg’ in 1875 and alongside the Danube riverbank in 1886), the city’s ‘general water pipe line’ (‘Allgemeine Wasserleitung’) was finally opened in 1893. Its groundwater wells and the steam-powered pumping station were situated several kilometres

south of the city centre, in the suburban village of Kleinmünchen (Accounts 1879: 64 and Accounts 1887: 105; Pichler-Baumgartner 2020: 55–62); on these localities and the water infrastructure see Figures 1 and 2.

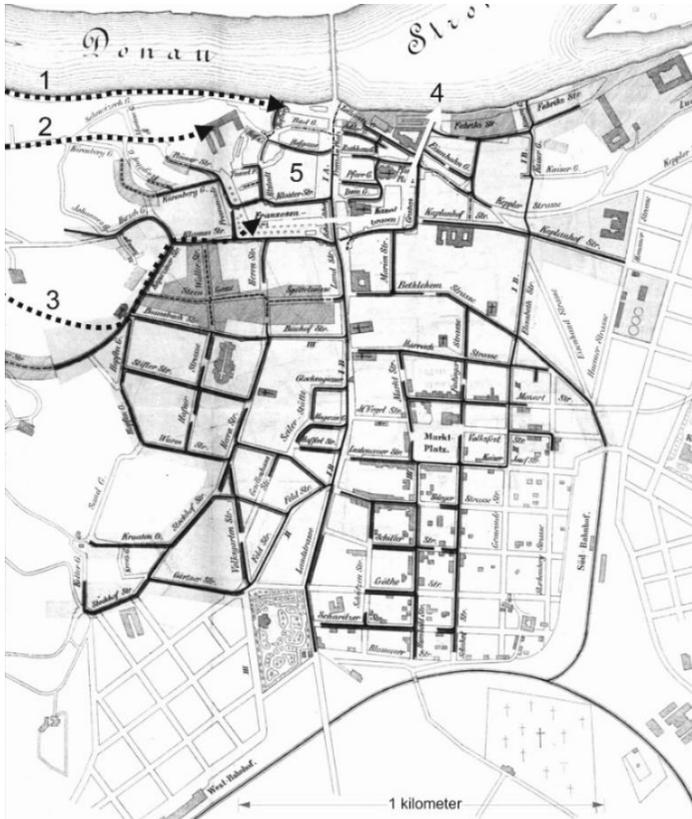


Fig. 1: The map shows the network of the older water pipes (dotted lines: 1 Danube riverbank, 2 Schullerberg, 3 ‘estates’ line), the ‘main’ sewer of 1809 (white line: 4) and the sewerage built since 1876 (black lines). No. 5 indicates the old town centre, while the darker shaded areas refer to existing sewers that were integrated into the new system (Based on a map published in Accounts 1882).

Ryc. 1. Mapa przedstawia sieć starszych rur wodociągowych (linie przerywane: 1 brzeg Dunaju, 2 Schullerberg, 3 „osiedla” linii), „główny” kanalizacji 1809 (biała linia: 4) i kanalizacji zbudowany od 1876 roku (czarne linie). Nr 5 wskazuje centrum starego miasta, podczas gdy ciemniejsze zaciemnione obszary odnoszą się do istniejących kanałów, które zostały zintegrowane z nowym systemem (Na podstawie mapy opublikowanej w Accounts 1882).

Private responsibility for the provision and maintenance of urban water infrastructure defined the pre-modern solutions of water supply

and waste water disposal (Janssens, Soens 2019). Households (house owners) or institutions were the central actors in this respect, while the urban authorities maintained a more passive role negotiating between conflicting parties or punishing breaches of acceptable behaviour. This resulted in a decentralised infrastructure, which is well documented in prescriptive and descriptive sources, as well as in building plans and account books (e.g. LR, BIA5, Reg. 6424). The supply of water from wells, dug in the gardens or backyards of houses, was facilitated by the topography of the town, as the groundwater was not far beneath the surface in the low lying part of the city. Yet the elevated peripheral parts of Linz – as the aforementioned Schullerberg – faced constant problems with respect to the everyday supply of water. Water was also taken from public or shared wells, which required inputs of human labour, often from domestic servants. As an everyday and unpaid task this practice is largely invisible in the sources and it only becomes evident through pictorial sources or incidental references, e.g. in the chronicle of a convent that ran a small infirmary records that until it built its own well in 1760, all water had to be drawn from a nearby well (LR, E1k, Reg. 6165). Similar solutions based on individualised infrastructure and not on central networks existed for waste water and sewage disposal.

How functional were the individual or shared responsibilities for water infrastructure in practice? (cf. Janssens, Soens 2019: 92–96). It is easy to find sources documenting malpractices and conflicts about, for example, overflowing cesspools (LR, BIIA41, Reg. 19899) or the lack of commitment of the private users with respect to the ‘main’ sewer (AStL, Altakten, Sch. 172), but the resulting picture seems biased. It is not plausible to assume ignorance or tolerance towards problematic issues – at least on this basis. Sources documenting everyday practice, such as account books, show that the cesspools at least were regularly emptied by contractors – and this private responsibility was often a part of rental contracts (LR, BIIA23, Reg. 16945). Even if the notion was widespread that there was a connection between stench or filth and disease (miasma – cf. Hamlin 1998: 4–8 and 60f.), some solutions just aimed at getting rid of waste water and faeces in a convenient and not too costly way: As plans were discussed in the 1780s to extend the military hospital, they included the reconstruction of a sewer, so ‘that the filth and stench could be led away from the building’ (OÖLA, Landschaftsakten, Sch. 955). Indeed the costs for water infrastructure seem to have limited the extent of investment: Water lines and sewers were costly infrastructure; apart from the building costs the frequent repair works required regular expenditure (OÖLA, Landschaftsakten, Sch. 443). In addition, the building

of infrastructure often affected property rights, which was a complex process and sometimes resulted in the payment of annual dues. Even the rather short private water pipe, which was built in the 1710s to connect a small spring from a nearby hill with a convent, required permits from several feudal lords (LR, E1h, Reg. 5233). There were recurrent problems with landowners when the estates' water supply system required maintenance. Only at the beginning of the 1840s and after lengthy negotiations did the estates finally secure the 'right of pipe laying' on these private properties (LR, BIIA24, Reg. 17329 and Reg. 17330). In contrast, groundwater wells had comparatively lower building and maintenance costs and they did not freeze over in cold weather.

The logic behind these private solutions can be summarised as follows: those who paid were allowed to use the structures (e.g. LR, BIIK2, Reg. 672; LR, BIIA36, Reg. 19118). The city administration seems to have followed this logic throughout the eighteenth century, as documented in its account books and in other sources (e.g. AStL, HS 389, account book 1750). Otherwise, as mentioned before, the actions of the city administration was limited to conflicts or notable incidents of disorderly behaviour. Where municipal investment in infrastructure did take place, it was usually *in response* to necessity. For example, the two public wells on the main square were built in the 1540s after a devastating city fire and in 1690 their wooden structure was replaced with marble. On the one hand, these wells served symbolic purposes, as the main square of a Baroque city could not be imagined without an impressive well. On the other hand, they had practical value: They supplied water for the households and enterprises in the vicinity of the square, as well as for the weekly and seasonal markets that were held there, and they provided water to fight fires (Stöger 2021: 76f.).

During the eighteenth century the perceptions and ambitions of the city's inhabitants started to change. These changes were probably inspired by attempts during the Baroque era to create representative spaces, which became visible in imperial or aristocratic and later bourgeois settings. This development is also reflected in travel accounts, which even in the first decades of the eighteenth century referred to Linz's well-built structure and its cleanliness. These traits became central reference points during the second half of that century. During the eighteenth century the discourse on how 'orderly' cities should look clearly intensified. This led to municipal efforts to 'regulate' public space in Linz, which also reflects discussions and developments in other Western European cities that functioned as role models, including Vienna and Paris. Initially these efforts towards improvement mainly concerned

visible aspects: the lighting of cities, the paving of streets and the ‘greening’ of public space, which became notable in Linz from the mid-eighteenth century onwards. This development gained pace by the 1780s, when enlightened (i.e. state-dependent and hierarchical) bureaucracy gained more influence in the city administration. However, neither city inhabitants nor city authorities seem to have questioned the nature of the water supply then, and, when it was discussed, water quality was not an issue. This is surprising, as the discourse on ‘healthy’ drinking and bathing water had started to intensify from the beginning of the second half of the eighteenth century and small health spas had been established in the hinterland by then (Stöger 2021: 85f. and 220f.). Discussions instead focused on sewage, which might be explained by the theory of miasma, by which filth and stench were believed to endanger health and the ‘urbanity’ of cities. A typical example from that period helps to illustrate this point. When the Pope paid a brief visit to Linz in 1782, it was ordered by the city government – among other measures – to clean the streets and to cover the ‘main’ runlet with wooden planks (LR, B2G/7, Reg. 4335). The aim was not a solution, but an improvement in the visible appearance of the city.

Ad hoc necessities and the absence of investments

At the end of the eighteenth and the beginning of the nineteenth century, urban investment in water infrastructure followed the logic of *ad hoc* necessity or patchwork rather than anticipatory investment. In 1773, when the estates asked the municipal administration for a ‘proper policy’ to drain the city moat, which at the time was serving as an overflow for some cesspools and had no run-off (LR, BIA1, Reg. 501), only cleaning and minor building work was done. The moat and its ‘pungent stench’ were discussed again at the end of the 1790s, but once more only cleaning was ordered (OÖLA, Alte Registratur, Sch. 95). When the upper part of the moat was filled in in 1801, the overflows were finally replaced with additional cesspools (OÖLA, Alte Registratur, Sch. 96). Why did the urban authorities act in this way? Several factors shaped such practices: On the one hand, there was the logic of a path. The city had (at least partially) functioning infrastructural systems (see also below) that were not the responsibility of the municipal administration, but rather of households or institutions. In financial terms larger-scale infrastructure projects had little hope of being funded in the eighteenth century. In 1700, the city administration recorded overall expenses of 45,000 fl

(*Gulden* – florins), in 1750 only 31,000 fl, and in 1790 46,000 fl. (AStL, HS 63, HS 70 and HS 111, account books 1700, 1750 and 1790). On top of this, during the first half of eighteenth century the urban administration suffered severe financial difficulties: taxes were discharged to higher authorities, there were large expenses for the military, and larger building projects had to be funded (LR, B2G/4, Reg. 2397). This limited the municipal agenda: in 1750, the municipal building department only spent 8,500 fl, which was mainly invested in *visible* infrastructure (AStL, HS 389, account book 1750).

By 1808, a shift in financial policy had become obvious: the expenses of the building department had increased to more than 20,000 fl. (AStL, HS 435, account book 1808). There was also more financial support by estates and by the regional (thus the imperial) government, which became crucial for the realisation of larger projects, as even smaller construction projects for the city's water infrastructure required large amounts of money. In 1800, the cost of an eventually unrealised project to drain the city moat and to build a sewer leading to the river was estimated at over 8,000 fl. (OÖLA, Alte Registratur, Sch. 98). A connection to the 'main sewer' required more than 4,000 fl in the 1820s – in that case, the costs were mainly covered by the regional government (AStL, Altakten, Sch. 172). This sum would have equalled 10 per cent of the annual expenses of the building department in 1816 (AStL, HS 436, account book 1816). In 1834, the regional government provided a loan of 20,000 fl CM for the building of sewers, which required yearly repayments of 1,000 fl plus 4 per cent interest (OÖLA, Landschaftsakten, Sch. 214).³ Furthermore, the regional administration provided technical expertise, mostly from military engineers, for these projects, which is reflected in the plans that have been preserved (OÖLA, Plansammlung [map collection]). However, the sewers built between 1800 and the 1820s were still ad hoc solutions, as no intention to establish a networked infrastructure can be discerned. The larger sewer that was built in 1809 – most literature on the history of Linz refers to it as the first 'main sewer'⁴ – first discussed in 1805 (LR, BIIA42, Reg. 20129) – served to convey sewage from the barracks to the river some 350 metres away (Figure 1) and to drain the ponds in the lower moat, which were unconnected to the river, but was not intended as a general or public

³ This should not be compared directly to the aforementioned sums because of a currency reform.

⁴ Often labelled as the 'Franzosenkanal' (French sewer), which hints at the occupation of the French army during that year.

sewer (OÖLA, Alte Registratur, Sch. 84). A sewer project from the 1820s reveals a similar logic: discussions referred to a general nuisance and to ‘foul odours’, but it amounted to little more than the drainage of another part of the former city moat by connecting it to the river (AStL, Altakten, Sch. 172).

The invisibility of sewage disposal probably prolonged the tendency to seek such partial solutions. Although the inner city sewer network expanded steadily from the late 1820s, in 1869 60 per cent of the houses still remained unconnected to any sewer (AStL, Proceedings, 27 Oct. 1869). The ‘regulation’ of public space, which intensified during the 1820s, mainly concerned the paving and rebuilding of streets, but it also included the building of runlets and sewers. Thereafter, sewers seem to have received more attention from the municipal building department, which is also reflected in the building regulations (‘Bauordnungen’) of the time, as in the regulation of 1846 for Linz und Salzburg that demanded connection of newly built houses to sewers. But this regulation still maintained the position that ‘every house [...] should have its own well’ (Linzer Zeitung, 13 Apr. 1846: 190–192). These developments were accompanied by other mid and longer-term changes: The population growth started to approach the limits of ‘traditional’, decentralised infrastructure, while scientific and technical expertise advanced. The discourse on hygiene and public health grew and the experience of cholera raised the level of awareness amongst local and regional authorities with respect to stench and filth. Linz escaped the cholera epidemics of the 1830s and 1840s, but during outbreaks in 1855 and 1866 a possible connection between disease and water quality was discussed – likewise in local newspaper press and in medical journals – more frequently (Stöger 2021: 93 and 263–267). The materiality of infrastructures changed as well: the wooden pipes of the estates’ water supply, for example, were replaced with lead pipes at the beginning of the nineteenth century, which reduced maintenance costs and allowed for higher water pressure (LR, BIIA42, Reg. 20088). The sewers discussed in the 1860s had little to do with the sewers constructed at the end of the eighteenth century or even those built in the 1840s, as the latter were built with stone, and not bricks and concrete pipes (Linzer Amtsblatt, 14 Mar. 1836; OÖLA, Plansammlung, VII/18). More and more private responsibilities became public: a shift that was promoted by the expanding municipal administration and based on a restructuring of the tax and fee system. This was reflected by the further expansion of the city’s budget, which was nearly 145,000 fl in the mid-nineteenth century (AStL, HS 191, municipal account book 1850). Likewise, the expansion of municipi-

pal responsibilities can also be observed in normative sources, such as the general municipal regulation ('Gemeindeordnung') of 1850, which simplified the taking up of loans by municipalities (Gemeinde-Ordnung für die Landeshauptstadt Linz 1850: 23f.).

New needs and new solutions

With the Austrian municipal reforms of the 1860s a vast body of responsibilities were delegated to urban authorities by the state, including public health agendas. Already during the 1840s and 1850s there was a lively discussion on the modernisation of urban water systems in Western Europe, which was triggered by the cholera epidemics, the English sanitation movement and the large-scale infrastructural projects in bigger cities like London, Paris and New York (cf. Schott 2014: 223–267 and Hamlin 1998: 217–280). Likewise the city of Vienna, which undoubtedly served as a role model for Linz, started to question its water supply during the 1850s and in May 1862 the city council decided to finance a costly water supply system, which used sources that were 80 kilometres away from the city (Brunner, Schneider, 2005: 192–199). In this climate of change the superior regional authority in Linz ('Statthaltereii') initiated discussions around the implementation of a modern water infrastructure, as – prompted by a Prussian enquiry – it asked the city council for its position on the utilisation of the contents of cesspools for agriculture. To address this issue, the city council constituted a committee of councilmen and external experts in late 1867. Early on, the committee assigned an engineer from the mid-size Austrian city of Graz to investigate health conditions in Linz and the option of using faeces in agriculture. In his survey the engineer depicted the current situation in Linz as highly problematic and 'unfavourable to sanitation' – the cesspools in particular were seen as a contaminator of the urban wells. The survey suggested the introduction of a 'barrel system', whereby the faeces would be collected in barrels that – unlike the cesspools – could be emptied in a more regular and hygienic way. The city council passed a resolution to introduce this system, but did not mandate it meaning that it was never implemented. Nonetheless, this episode advanced the city council's debate on sanitary measures in that sanitary grievances were systematically identified for the first time, and a connection between contaminated well water and cases of cholera and typhoid fever was acknowledged, although only on the basis of evidence from other cities (AStL, Proceedings, 6 Nov. 1867, 27 Nov. 1867, 8 Jan. 1868 and

13 May 1868 – cf. Pichler-Baumgartner 2020: 52f.). At the beginning of the 1870s, the building of a sewerage instead of the ‘barrel system’ was eventually decided upon as a measure to improve public health. At the same time, the city council received several offers for the construction of a water pipeline by private companies. Possibly due to the older or ‘traditional’ logics (see above), but also because it was fairly inexpensive and risk free for the city, the council agreed upon this solution. Since there was no prospect of financial profit, no such offers were made with regard to the sewage system.

Unlike most German cities, which often built sewage systems only decades after piped water systems had been established by private companies, a sewer system was erected first in Linz. This was partly a result of the failed entrepreneurial efforts to establish a water pipeline and partly because priority was given to sewerage due to the influence of contemporary medical knowledge. Following Max von Pettenkofer, a hygienist from Munich, contaminated soil and ascending miasmas were held responsible for sanitary problems and polluted water in Linz (Münch 1993 and Vögele 2001: 274). When construction works started in 1876, Linz was among the early adopters of a centralised sewer system in the German-speaking countries alongside cities such as Frankfurt am Main (1868), Berlin (1872) and Nuremberg (1874; Vögele 2001: 256). The decision to build a centralised sewer was undoubtedly influenced by a determination not to ‘lag behind’ in respect to city development, even if doing so entailed a serious financial outlay, which was only possible through a new form of funding. Linz obtained a loan of 1 million fl from a local bank and thereby followed the model of other cities of the Empire such as Vienna, Graz and Brno. The loan, which still had to be approved by the federal authority (‘Landesausschuss’), also covered other projects of urban sanitation such as street paving (AStL, Proceedings, 11 Dec. 1872; Denkschrift 1874). It should be noted that the loan was three times the sum of the city’s total expenses and 18 times the sum of the expenses for sanitary measures in 1876. The loan period was 50 years, but in the 1890s two more loans of totalling 5.5 million fl were obtained to fund, among other projects, the construction of the ‘general water pipe line’ (Accounts 1879: 88–90).⁵ As the centralised sewer system was established, connecting the system to houses became obligatory. In the inner city a near-comprehensive sewer system was

⁵ Total expenses in 1876 were 353,000 fl., expenses for ‘Stadtconservation’ 56,600 fl. Further loans were taken up in 1890: 3 mio fl. and in 1897: 2.5 mio fl. – cf. Accounts 1892: 266–268 and Accounts 1897: 246f.

built within five years by 1881, with a few exceptions in peripheral or ‘unregulated’ streets. In the former suburbs, however, there were no sewers available until the beginning of twentieth century and their inhabitants thus still relied on decentralised systems (Accounts 1900, plan of sewer lines).

By choosing a particular infrastructural solution, the city council laid the path for future developments. It also functioned as a ‘technical innovator’ by choosing one system of water infrastructure while rejecting another. Before arriving at a final decision, it was therefore necessary to acquire state of the art technical knowledge, especially at a time when many systems were still in their trial phase (Wilding 1999: 248). To obtain the relevant information, experts were included in the decision-making process. The city council set up committees for specific topics, e.g. for the examination of materials to be used for sewer construction. These boards were constituted of councillors with knowledge of the respective area and of city employees, such as engineers from the building department. Renowned external technical experts were also included in the committees. Medical experts were not involved in discussions of the sewerage, but they did play an important role in the decision-making process for the water supply (see below). Another strategy to acquire knowledge was an inter-city knowledge transfer: cities that had already introduced a modern water infrastructure were asked for their experience with certain building companies or materials used for the construction (cf. regarding materials used for sewer construction: AStL, Proceedings, 15 Oct. 1873 and 11 Feb. 1874). Furthermore, deputations of councillors and city engineers were sent to relevant cities to obtain information on site. The deputations visited not only metropolises, but also smaller cities, presumably because their strategies were easier to transfer. These visits seem mainly to have focused on technical and on administrative aspects: In 1875, a deputation from Linz went to Heidelberg, Munich and Stuttgart to study the sewage system (AStL, Proceedings, 17 Nov. 1875), and more than ten years later, in 1888, selected councilmen travelled to Salzburg, Augsburg, Munich, Bratislava, and other cities to visit their water works (Accounts 1889: 166).

When the (first) entrepreneurial effort to erect a centralised water supply failed in the mid-1870s, the city council signed a contract with another company (Accounts 1879: 65).⁶ This time, the project met public resistance, which is evident in articles and letters published in the local

⁶ The new contract was made with the ‘Deutsche Wasserwerksgesellschaft’ from Frankfurt/Main.

newspapers. Amongst the opponents were a number of house owners who objected to the costs of the obligatory connection of houses to the sewage system. They argued that they did not want to pay for a commodity that had so far been free. In addition, some did not see the need for a new piped water system, as they believed the sewerage system had already improved the water quality of the wells. Their opinions seem to have been influenced by a newspaper controversy on the necessity of a centralised water supply between experts from the political and medical sphere (e.g. *Linzer Tagespost*, 21 Jul. 1876; *ibid*, 14 Jan. 1877; *ibid*, 28 Jan. 1877; *ibid*, 25 Jan. 1877). When the city council was handed a petition for the postponement of the project signed by 460 house owners (out of approximately 1,600), it felt obliged to investigate the matter from a ‘scientific’ point of view. The project was suspended and in 1877 a physician from the Federal Sanitary Commission (‘Landessanitätsrat’) was assigned to examine the project. His survey was only finalised in 1881, and was in favour of a central water system (cf. *Linzer Tagespost*, 9 Mar. 1877 [supplement] and Schiedermayr 1882). But even before the results were presented to the city council, it had already commenced negotiations with yet another private company that offered to build a water supply network.⁷ Again, a chorus of protest hit the urban authorities. ‘Resolutions’ were sent to the council by bourgeois clubs, and another petition was signed by 900 house owners. During council meetings, the conservative councillors – who then held just 9 out of 36 council seats – gave strong support to the initiatives of the house owners (*Accounts* 1882: 80; *Linzer Volksblatt*, 25 Jan. 1881 (supplement) and 26 Jan. 1881 (supplement)). The opponents’ arguments remained the same as in previous years, yet with the backing of the survey, which pointed towards the necessity of a centralised water supply, the Liberal majority of the city council decided upon a contract with the water company (*Accounts* 1882: 71). Within two years the project failed, as the company was not able to find a suitable water source and its representatives suggested that the ‘negative atmosphere’ within the city had contributed to the failure (*Accounts* 1884: 89). But the issue was not put to rest: In 1883/4 an association of Linz physicians, the local military commander, and the superior regional authority demanded a centralised water supply for public health reasons. Eventually, both large scale water infrastructure projects were financed by the city and attempts to find private or entrepreneurial solutions were given up (*Accounts* 1884: 91f.). There was no public opposition thereafter, but it took almost ten more

⁷ It was the company ‘Corte & Comp.’ from Prague.

years until the new water supply was operational (Figure 2). In contrast to the sewerage system, the connection to the central water supply was voluntary: by 1900, about 60 per cent of all houses were connected, but even in those houses not all inhabitants had access (Accounts 1901: 421). Public and private wells continued to be of great importance for a large proportion of the city inhabitants. In 1895, there were still 30 public wells available that provided – contrary to water from the pipe line – water that was free of charge (Pichler-Baumgartner 2020: 190–192).

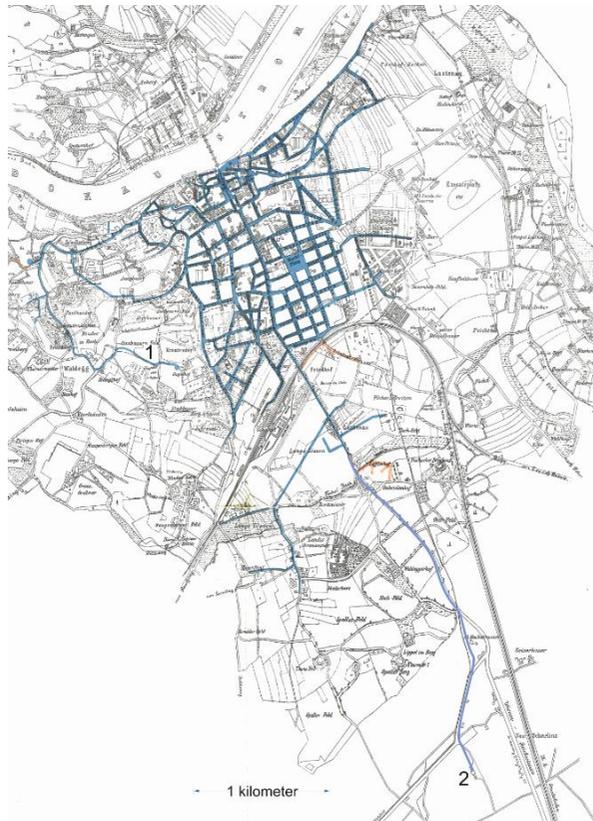


Fig. 2: The network of the ‘general water pipe line’ (‘Allgemeine Wasserleitung’) in 1899. No. 1 in the Western part of Linz refers to the former ‘Schullerberg’ water line, which by then had become part of the centralised system. No. 2 indicates the location of the pumping station and the wells in Kleinmünchen South of Linz (Based on a map published in Accounts 1900).

Ryc. 2. Sieć „ogólnej linii wodociągowej” („Allgemeine Wasserleitung”) w 1899 r. Nr 1 w zachodniej części Linzu nawiązuje do dawnej linii wodnej "Schullerberg", która do tego czasu stała się częścią systemu scentralizowanego. Nr 2 wskazuje lokalizację przepompowni i studni w Kleinmünchen Na południe od Linzu (na podstawie mapy opublikowanej w Accounts 1900).

Integration and exclusion by water infrastructure

It is obvious that urban water infrastructure had a socio-spatial dimension: access to the amenities of water was not equally available to all residents. It has been assumed by different scholars that, especially with the erection of centralised water supply networks during the second half of the nineteenth century, wealthy city districts benefitted from these systems earlier (Vögele 2001: 264 and Mohajeri 2005: 67f.). More recent research literature has raised questions of social and environmental inequality in the city and therefore focused on who had access to the systems or was (intentionally) excluded (Massard-Guilbaud, Rodger 2011 and Pichler-Baumgartner 2015: 472–491). These issues are difficult to trace through the sources for Linz, but they are sometimes observable. Three examples dealing with the issue of access will be analysed below: the pre-modern water pipe line of the estates, the ‘Schullerberg’ district water pipe line (1875), and the connection of the former suburbs to the ‘general water pipe line’ (1893).

The estates’ water supply, which was built in the late sixteenth century, can be seen as a semi-private infrastructure: principally, it restricted the use of the water supply to the institution itself. Other users were only permitted in exceptional cases, especially when an ‘upstream’ use was concerned. This was only granted to religious or charitable institutions. They did not pay for the water received, but the permission to use – often labelled as ‘water of grace’ (‘Gnadenwasser’) – was revocable. The Capuchin convent is one example: it was established at the beginning of the seventeenth century near the pipe line of the water supply and it was much closer to the spring than the estates building. In the 1710s, the convent stated that it had ‘ever since’ used the piped water (LR, BIIA23, Reg. 16936), and in 1825 the building of another pipe branch for the Convent’s deaf-mute school, which was situated nearby (OÖLA, Landschaftsakten, Sch. 582), was allowed. Apart from that, some members of the estates also privately drew from the pipe line. In 1708, a neighbouring house, which was owned by a noble family, was allowed to use ‘surplus water’ (‘Überwasser’ – LR, BIIA23, Reg. 16923). Still in the 1830s, as an impressed Viennese visitor noted, this house had ‘one pump in each of the three storeys’ (Krickel 1831: 190), which would not have been possible without the connection to the estates’ pipe line. The use of this ‘surplus water’ was unsurprisingly less restrictive than the direct outtake upstream (LR, BIIA23, Reg. 16936), but it was only possible for users close to the infrastructure. The water from the estates’ pipe line also fed a marble fountain in the inner court of the estates building. This

was regarded as – and probably was also intended by the estates to be – a place for the public to get fresh water, which seems to have been quite significant for the inner city residents (Pillwein 1837: 167). How widespread was this free use of water? It seems to be impossible to provide an estimate for Linz, but there are references to such practices in some sources, mostly in contracts. Sometimes they explicitly refer to the provision of water for the ‘needy’, which might also have derived from older rights of use. In a contract from 1753, it was specified that ‘in respect to the water’ the buyers of the house would have to permit poor people the use of the well (OÖLA, *Landschaftsakten*, Sch. 576). Usually, the houses’ wells or water taps were not open to public use, and even fire regulations did not demand that (LR, BIIA36, Reg. 19274). The 1808 fire regulations only listed 18 ‘public water intakes’ for the city, including the two wells on the main square and several ponds on the urban periphery (Feuer-Ordnung 1808). Thus, the majority of the inhabitants were excluded from such infrastructure – either for spatial or financial reasons.

In the early 1870s, the lack of water was deeply felt in the hilly district of Schullerberg, in the western periphery of Linz. Schullerberg, which was mostly inhabited by lower social classes, had been supplied by a public fountain fed by a water pipe from the 1830s onwards, but this was obviously not an adequate solution (OÖLA, *Plansammlung*, VI/23).⁸ In the 1870s, following petitions from the volunteer fire brigade and several house owners, which presented vivid pictures of the water shortage, of private wells having dried out, and of their need for a sufficient supply, the city council decided to build a new water pipe line for the district, even though a private company had already been assigned to set up a water supply network for the whole city. The council chose this individual solution in acknowledgement of the immediate need for a water supply; epidemics and fires that could reach the city centre were to be avoided (AStL, Mat. 25, Sch. 166; AStL, *Proceedings*, 13 May 1874). When the water pipe, fed by a source from the city’s sand deposit (Sandstätte), was opened at the end of 1875, district inhabitants could draw water from three public pumps (cf. Figure 2). Thereby, they finally got similar conditions of access to water as the rest of the city residents, who obtained water from public and private wells in their vicinity. The inhabitants of Schullerberg no longer had to draw water from wells in

⁸ Probably the fountain was then no longer in operation, since the fire brigade only mentioned a public draw well from the 1850s that was open one hour per day – cf. AStL, Mat. 25, Sch. 164.

the low level districts and carry it uphill to their houses (Accounts 1879: 63f.). Soon, house owners on streets close to the new pipe line petitioned for the erection of public wells in their neighbourhoods. Initially, it was mostly house owners from the Schullerberg district, but within two years of the opening of the pipe line, house owners from the level city districts were also asking for public fountains. They complained about the lack of water or the water quality of their house wells, and some demanded the same treatment as other streets that had already received a public well (e.g. AStL, Mat. 25, Sch. 166). Altogether, the number of petitions indicates that access to spring-water supplied public wells was a deeply felt need among many house owners and possibly many residents. The demands of the petitioners were sometimes delayed – but seldom refused – by the city council since there was still surplus water going unused. The network was continuously extended until the capacity of the source was exhausted at the beginning of the 1890s (Accounts 1892: 157). The question of extending the water pipe line was brought up in the beginning of the 1880s, as the regional superior authority in Linz requested access to the water by a house connection (AStL, Mat. 25, Sch. 166). The request was accepted, since the city council considered the source's capacity to be sufficient. A precedent was established and the city council opened the water line for further private connections. Interested parties had to apply for permits and pay for all expenses related to the house connection as well as for the amount of water received (Accounts 1882: 70). Within ten years, more than 40 houses were connected. Not all of them were situated along the water pipe line; thus, new branches had to be built. Among the houses connected were several semi-public buildings such as banks, military barracks, and the theatre, but it was mostly houses of the urban elite on the main square and in the main streets that received in-house access to the water supply (cf. Accounts 1882: 91).

It was never the intention of the city council that the 'Schullerberg' water pipe line should supply the whole city, as the council was aware of the limited capacity of the source. But given that attempts by a private company to build a central water pipe line had failed, and, as described above, it took almost a decade for the municipal scheme to reach completion, the 'Schullerberg' water line was continuously extended until the capacity was actually exhausted. By the time that the 'Schullerberg' branch was integrated into the central water supply in 1893, more than 30 public fountains and 45 house connections had been established. Not only the inhabitants of the Schullerberg, but also those of the inner city (the 'old town') and some of the Eastern city districts on the Danube

riverbank, had access to this water supply. While it could be argued that the city council tried to integrate as many areas of the city into the network as possible, it seems rather to have been a ‘first come, first serve’ policy, which included private house connections. There was no general plan that suggested which districts or streets should get access; the city council decided ad hoc on the basis of petitions received. When the capacity was exhausted, eligible requests for public fountains, for example from streets with sanitary problems, were turned down (cf. AStL, Mat. 25, Sch. 168). The initial project to supply a dry, hilly district on the city’s periphery with water eventually also became the means through which wealthy citizens of the city centre obtained comfortable access to the new amenity. At the same time, a huge part of the population – especially all residents of the Southern districts – were still reliant on private groundwater wells. The unequal access to water was acknowledged not only by house owners and entrepreneurs who requested access, but also by city councillors.⁹ In the mid-1880s two councillors stated that it was unjustifiable that all tax payers had to pay for the erection and extension of the water supply while not all could benefit. They demanded the establishment of a central water supply (Accounts 1884: 97f. and Accounts 1885: 95). It seems that the house connections were regarded as less of a problem – maybe because some councilmen benefited from them – than the fact that in general some residents had access to spring water while others did not.

Even with the introduction of a centralised water supply system for the whole city, the question of its spatial diffusion is valid. In many cities, it took several more years or even decades until universal access was achieved – assuming it was intended in the first place. Private water companies in Berlin and Graz, for example, agreed by contract that they would only supply water to certain city districts; the Swedish towns Norrköping and Linköping did not include their suburbs into the water network (cf. Mohajeri 2005: 63 and Massard-Guildbaud, Rodger 2011: 151f.). When planning the ‘general water pipe line’, the city council of Linz sought to integrate the whole city including the former suburbs Waldegg and Lustenau into the network (Heller 1894: 71). Yet, if the network plan of 1899 is considered (cf. Figure 2), it becomes evident that, apart from several connections to factories in the former suburbs,

⁹ The owner of a sawmill at the Danube riverbank in the Eastern part of Linz asked for a connection to the water line in 1891 to be able to supply his workers with fresh drinking water. The access was denied because of the exhausted capacity of the source – cf. AStL, Mat. 25, Sch. 168.

hardly any branches were laid at the urban periphery, while the inner city was already comprehensively connected (Accounts 1900, network plan). So, were the former suburbs excluded after all? Although the same general water tariff was imposed on the house owners of Lustenau and Waldegg as on those of the inner city districts, a house connection was generally harder to come by (Accounts 1893: 178). In most cases a connection was only considered if a sufficient number of houses participated in each street, which presented challenges in sparsely populated and poorer areas of the former suburbs. At the turn of the century, the city council partially changed its policy: a systematic extension of the pipeline network was started in a designated area of the former suburbs close to the Vienna-Salzburg railway line, and it was financed by the municipality. This more populated area was presumably considered for city development, because it was closer to the inner city districts, as it was separated only by the railway track (Accounts 1900: 173–175 and 280f.; Accounts 1901: 184; Accounts 1903: 176f.).¹⁰ This shift was accompanied by tax increases in the former suburbs in 1899 and 1902. With the incorporation of the suburbs into the city at the beginning of the 1870s, it had been agreed that the taxes should be lower than those for the rest of the city residents, since the inhabitants of Waldegg and Lustenau could not (yet) benefit from certain amenities. The higher taxes then obviously served partially to offset the costs for the extension of the pipeline network and other measures of city development, such as the construction of sewers, the pavement of streets or the expansion of street lighting (Pichler-Baumgartner 2020: 217–228 and 245–255). The tax increase was followed by requests from house owners who wanted access to the amenities and who demanded equal treatment with the inner city residents now that they paid the same taxes (AStL, Mat. 22, Sch. 145).

At the beginning of the twentieth century a number of town inhabitants still depended on individual or on public wells: In 1910 27 percent of the houses were not connected to the general water pipe line. For financial reasons the city council aimed at having as few public wells as necessary, and they were only deemed necessary in districts with sanitary problems or poor inhabitants. In 1909, the city council decided to disable 16 of the 29 public wells then in existence. Among others, the financial argument emerged once again: the city council objected to the fact that some city inhabitants could take water free of charge from wells while others had to pay for water from the central

¹⁰ In 1887 a map for the general city development ('Generalregulierungsplan') was issued – cf. Stöger 2021: 50.

supply line. This decision was met with protest from a number of house owners, but it was not reversed (Accounts 1910: 202f.; cf. AStL, Mat. 25, Sch. 174 and Pichler-Baumgartner 2020: 192f.).

Conclusion

In Linz – as in many other cities during the pre-modern period – the urban water infrastructure was based on individual and mostly private solutions, which were shaped by centuries of practice. From the late eighteenth century changing standards of urbanity led to efforts by the city government to improve street cleaning and to expand the modest public water infrastructure. The fear of cholera, which surfaced in Linz after the 1840s, led to the questioning of the existing solutions for water supply and for the disposal of waste water and faeces; likewise other cities that invested in more comprehensive sewer and water supply systems served as role models. Especially in smaller cities as Linz a constant fear of ‘lagging behind’ evolved, which put pressure on local governments to imitate the developments in other places (cf. Janssens, Soens 2019: 94 and 103). In addition, new financing possibilities, new technical expertise and new materials made available more forms of water infrastructure than ever before.

In Linz the transition to a centralised water infrastructure was a slow process, which was preceded by intermediate solutions as smaller water supply lines. In the case of the sewerage system the transition was quicker, as its necessity was not disputed. The implementation process of the ‘general water pipe line’ was significantly slower: It was discussed at the end of the 1860s, but opened only in 1893. This delay was the result of the initial efforts to establish a water infrastructure via public-private cooperations, which all failed. Subsequently, there were repeated political disagreements on the financing of the project: a group of conservative house owners tried to hinder the public funding, but by this time – the mid-1880s – the urban elite and other local stakeholders had already agreed on the necessity of a central water supply. However, in Linz, as in other cities, the replacement of existing infrastructure was not a straightforward process, as wells and cesspools were still used in peripheral parts of the city; in addition, public wells – now connected to the new water line – persisted into the early twentieth century.

During the eighteenth century the water infrastructure was largely a private responsibility; there was only limited investment by the city of Linz until the second-half of the nineteenth century. Thus, the city inhab-

itants can be seen as the central actors during this period. From the end of the eighteenth century the ambitions and powers of the city government started to grow and this affected water infrastructure. But even when the central water infrastructure was established, the city council was not the sole decision-maker: local stakeholders as house owners or physicians and supra-regional experts were important actors as well.

The ‘pre-modern’ water infrastructure did not aim at the inclusion of all city inhabitants: if there was access to wells, water supplies or sewers, it had to be granted by the individual owners, who were reluctant to do so or demanded payment; the ‘public’ infrastructure was rather modest and limited to certain areas of the city. Even the modern, central infrastructure partially excluded inhabitants from access: yet, this was less an intentional political decision than a consequence of pragmatic economic reasoning, as supplying the sparsely populated peripheral parts of the city would have resulted in higher construction and operating costs. Therefore, not only the former suburbs, but even some streets of the inner city, had to wait longer to be included in the network.

The case of Linz makes clear that the implementation of a ‘modern’ urban water infrastructure has to be seen as complex process, which requires a longer-term perspective, when researching it. It also implies, that on the one hand the story of specific changes in a specific place cannot be told without considering simultaneous developments in other places; on the other hand one should not overlook the distinctiveness of an urban entity in respect to its socio-natural contexts.

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Modernizacja infrastruktury wodnej i społeczeństwa w Linzu w latach 1700–1900

Abstrakt

Celem artykułu jest prezentacja procesu przejścia na nowoczesny system zaopatrzenia w wodę i odprowadzania ścieków na przykładzie średniej wielkości miasta górnoaustriackiego – Linz w perspektywie długoterminowej od około 1700 do 1900 r. Autor prezentuje proces transformacji. Omawia ciągłość i zakłócenia istniejących rozwiązań, kwestionując narrację modernizacji. Badane są podmioty zaangażowane w procesy decyzyjne i wdrożeniowe, ze szczególnym uwzględnieniem dotychczas zaniedbanej grupy mieszkańców miasta. Artykuł podnosi też kwestie integracji i wykluczenia w odniesieniu do polityki wodnej.

Słowa kluczowe: historia środowiska, historia miast, środowisko miejskie, infrastruktura wodna, kanalizacja