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From well to tap: social and technical water innovations in nineteenth-century Budapest

Introduction

After years of political paralysis,[1] the 1867 Settlement between Austria and the Hungarian Kingdom made it possible for the latter to create a new capital city: Budapest.[2] With the administrative unification in 1873 of three formerly independent settlements (Pest, Buda, and Óbuda), the Hungarian government sought to create a national capital, a Central European industrial hub, and a Habsburg royal city comparable to Vienna. The metropolis in the making was suddenly shaped by a myriad of human activities and concepts, and this transformation deeply affected the perception of the borders of the city in relation to its natural environment as well. To understand how these new concepts affected nature–culture relations and the urbanites' attitudes towards innovation, this article examines conflicts related to the developing water infrastructure.

Infrastructures are both technical and social innovations that change our relationship to nature and require substantial mental adaptation to the individual's growing dependence on central supply systems.[3] In this article, I argue that the

1 The research on which this article is based was funded by the project of the Hungarian National Research Development and Innovation Office: NKFIH FK 142451 "Budapest – egy várostérség környezettörténete" [Budapest – the environmental history of an urban region].

2 The Settlement or, as it has often been called in the earlier secondary literature, the Compromise was a treaty concluded between Emperor and King Franz Joseph and the Hungarian ruling elites. It constituted the legal foundation of a state formation that is difficult to define in terms of political science, Austria–Hungary. The two parts of the state were granted autonomous home rule with shared foreign and military affairs, as well as the financial background of these two fields (the so-called common affairs). The most inspiring assessment of the dualist system created by the Settlement is Pieter M. Judson, *The Habsburg Empire: A New History* (Cambridge and London: The Belknap Press of Harvard University Press, 2018). More specifically on the countries of the Hungarian Crown see: Gábor Gyáni, ed., *The Creation of the Austro-Hungarian Monarchy: A Hungarian Perspective*, (New York: Routledge, 2022).

3 András Sipos, "Bevezetés [Introduction]," *Urbs. Magyar várostörténeti évkönyv* 2, no.1 (2007): 9–11.

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numerous conflicts around the construction of a waterworks system in Budapest shed light first on a major shift in perceptions and management of nature and, second, on the difficulties of adapting to this shift. Technical innovations, which in this case included pipelines, taps, sanitary fittings, and water meters, symbolized urban modernity and victory over the unpredictable forces of nature. At the same time, the introduction of these innovations also multiplied the city's bonds to its natural waters and was a clear embodiment of the state's growing control over the individual. Infrastructures, after all, are at the core of urban societies in both cultural and material terms, so they form an excellent subject of research for the larger project of linking the history of ideas (ideas about progress and nature) with the history of technologies.[4]

Pipeline water seemed to be the most urgent modernization challenge for the new capital's decision makers, first because it formed an integral part of the comprehensive development plan conceived by the newly activated national government and, second, because the municipality had to face its first devastating catastrophe, cholera, in 1873, the very year of its official creation.[5] The last very serious wave of the epidemic had made it clear that the neighborhoods which had tap water (the right side of the Danube, or what had formerly been the independent settlement of Buda) suffered far less contamination than the neighborhoods that relied on wells. It seemed that the principles of the development plan addressed practical urgencies in the early days of the new Hungarian capital. The plan stipulated that, in addition to creating favorable conditions for economic activities

4 As explained in detail by Dieter Schott, who focuses mainly on path dependencies created by urban infrastructures and is interested in the rise of the "networked city." Dieter Schott, *Die Vernetzung der Stadt. Kommunale Energiepolitik, öffentlicher Nahverkehr und die "Produktion" der modernen Stadt, Darmstadt – Mannheim – Mainz 1880–1918* (Darmstadt: Wissenschaftliche Buchgesellschaft, 1999). See also Martin V. Melosi, *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Baltimore: Johns Hopkins University Press, 2000).
5 This development plan was created as an official memorandum for the government by the Ministry of Public Works and Transport at the end of 1869. The document formed the conceptual foundation of the urban works of the following decades. Following the urban planning conception of the so-called haussmannization, the document aimed to create a city which could rival the appeal of Vienna, offer a model of comfortable urban middle-class lifestyle, and be without rival in southeastern Europe (regarded as Hungary's principal sphere of influence). As such, the city of Budapest was intended to have influence as an attractive cultural and economic center and thus to offer some counterweight to the competing regionalisms that were characteristic of the multiethnic Hungarian Kingdom. András Sipos, "'Világváros' Nyugat és Kelet határán? Várospolitikai törekvések Budapest nemzetközi vonzerejének erősítésére, 1870–1918 ['Global city' at the Borders of West and East? Urban Policies to Increase the International Appeal of Budapest, 1870–1918]" in *A "világváros" Budapest két századfordulón* [Budapest the Metropolis at Two Turns of the Century], ed. Barta, Györgyi et al. (Budapest: Napvilág Kiadó, 2010), 309–310.

(mainly by securing railway connections and providing flood protection for the industrial areas), the city's most important challenge was to create a "metropolis-like milieu" and a level of grandeur. The latter goal, however, was not narrowly understood as a matter of elegant or imposing architecture. On the contrary, the document stated that the envisioned grandeur stemmed "first and foremost [from] the city as a place of healthy living."[6]

It therefore seemed a pressing duty to build proper water infrastructure in Budapest in order to provide clean drinking water for every household. Once the decision was made, the capital city needed two decades for the completion of the so-called left-bank waterworks, which finally provided enough clean water for the growing city. This prolonged procedure was criticized as belated, but it offered an opportunity to learn lessons from cities that already had functioning water networks. More than any other city, Vienna provided a both desired and criticized model for Budapest. Vienna's experts had developed a water supply system in the early 1870s, a system that Carl E. Schorske described as "superb" and qualified as an extraordinary achievement of Vienna's liberal municipality.[7] However, as Gerhard Meißl, for instance, has shown, the Viennese system was characterized by significant spatial and social inequalities and permanent pressure to increase the scope of the service.[8] Budapest had an opportunity to design a system that *a priori* anticipated a demographic boom and the spatial extension of the city. Because these factors were taken into consideration, the plans created less tension between neighborhoods and social strata in general.

This being said, during the lengthy process of waterworks construction in Budapest, a prolonged lawsuit, press campaigns, a duel between two members of parliament, and the abdication of two waterworks' directors under pressure from the public indicated the seriousness and complexity of the difficulties of introducing new technologies and *modi vivendi.* First, as a prelude to this infrastructural innovation, there was a need for a change in theoretical approach and legal framework, specifically, the emergence of the notion of the public good, as opposed to private interest and state property. This notion and the codification of

6 Sipos, "'Világváros' Nyugat és Kelet határán? ['Global city' at the Borders of West and East?]," 309–310.

7 Carl E. Schorske, *Fin-de-siècle Vienna: Politics and Culture* (New York: Knopf, 1985), 60.

8 Gerhard Meißl, "Hochquellenleitungen und Unratsschiffe: Zur Geschichte der Wiener Wasserver- und -entsorgung vor 1914," in *Umwelt-Geschichte. Arbeitsfelder – Forschungsansätze – Perspektiven*, ed. Sylvia Hahn and Reinhold Reith (Munich: R. Oldenbourg Verlag, 2001); Gerhard Meißl, "Netzwerke oder Hierarchien? Zur Entstehung metropolitaner Produktionsräume im Spannungsfeld von historischer Einbettung und ökonomischer Rationalität am Beispiel Wiens im 19. und frühen 20. Jahrhundert," *Jahrbuch für Geschichte der Stadt Wien* 59, no.1 (2003): 197–217.

the term "public water" on a national level provided the theoretical and legal context of the shifts in urban water management. Second, an important consequence of the construction of the left-bank waterworks was the emergence of the need to measure water consumption. As it became possible to measure the water running from the taps, the leaders and the inhabitants of Budapest found themselves faced with important questions. Who, for instance, is responsible for the use of public goods? What are the appropriate uses, and what are the abuses of these goods? What are the individual, municipal, and national responsibilities related to water consumption? Who has the right or power to control the consumption of a public resource by others, and to what extent and by what means? How should the price of this public resource be set to motivate consumers to avoid waste without prompting them to return to using wells? The answers to these questions and others were shaped through intense negotiations between experts, policymakers, and urbanites, whose arguments tell volumes about clashes between teleologies of progress and, at times, unwanted modernities. In this chapter, I trace the path of these negotiations from the birth of the public water discourse through the controversies provoked by this technical and social innovation to the general acceptance of the new infrastructure as a "civilizing" achievement.

Prelude—a duel over public water

Both the shift in legal thinking (i. e. the acceptance of the category of public good) and the questions related to responsibilities brought about conflicts, even scandals. The first scandal broke out when it turned out that the ideal plot for the waterworks construction happened to be a parcel owned by a certain Count Sándor Károlyi (1831–1906), an agrarian politician and a man known as the father of the cooperatives' movement in Hungary.[9] Count Károlyi immediately gave his parcel

9 For a recent biography see: György Fehér, *A származás kötelez: gróf Károlyi Sándor, 1831–1906* [Origins Oblige: Count Sándor Károlyi 1831–1906] (Budapest: Gondolat Kiadó, 2019). The so-called agrarians and the cooperative movement shared a critical vision of capitalism. "Agrarian" in its first sense referred to all kinds of organized advocacy of agricultural interests. Károlyi's movement took shape as a modern conservative political party in the 1880s and 1890s. This party attempted to encourage mass mobilization, the introduction of protective tariffs in Austria–Hungary, and increased state subsidies for agriculture. András Vári, "Vízszabályozások, tulajdonjogok és gazdálkodás Magyarországon az 1820-as és az 1870-es évek vége között [Water Regulations, Property Rights, and Agricultural Systems in Hungary Between the 1820ies and the End of the 1870s]," in *A felhalmozás míve: történeti tanulmányok Kövér György tiszteletére* [The Work of Accumulation: Historical Studies in Honor of György Kövér], ed. Károly Halmos et al. (Budapest: Századvég Kiadó, 2009), 313–323.

to the municipality when asked (early 1893), as he did not want to hinder the undertaking, but he and the municipality of Budapest had very different ideas (to say the least) concerning the amount he was to be paid in compensation, as shown in the table below.[10]

Table 1: Compensation sums according to the parties concerned.

The sum offered by the municipality of Budapest:	140,000 Ft
The second and final offer made by the city:	800,000 Ft
The sum demanded by Count Károlyi:	2,172,118 Ft
The compensation ordered by the Supreme Court:	674,610 Ft (+ 5 % interest from 1893)

The significant difference in the appraisals of the plot's value and a quick glance at the contemporary press, which contained numerous newspaper articles accusing Károlyi of being a hypocrite, show that the issue was bigger than a simple conflict over an expropriation. One of the Count's co-deputies even provoked a duel in the Hungarian parliament when he interrupted a speech Károlyi was holding about the vices of economic liberalism. The assaulter claimed that the count should not speak about social injustice while he was neglecting his patriotic duties and forcing the municipality to pay an astronomical sum in compensation for the parcel he had lost (and after he had even been given and had accepted a decoration of thanks by the capital).[11] The public pressure on Károlyi was so weighty that the Count explained his position in several open letters, and in the end, he spent the money he had been given as compensation in deliberately noticeable ways on charity purposes.[12] The question arises: why did the public feel that Károlyi

10 Sources: *Budapesti Napló* [Budapest Journal] April 29, 1898, 7, and *Hazánk* [Our Homeland], October 20, 1899. 6. Concerning the lawsuit, we must rely on press accounts, as the trial went to the Supreme Court, the documents of which were destroyed in a fire during the 1956 Revolution in Budapest.

11 According to the parliamentary minutes (also published in the press), Sándor Károlyi was criticizing liberalism for its profit-maximizing character when deputy Ödön Gajári shouted his defamatory words. Károlyi was incredulous, but Gajári simply repeated the insult. *Pesti Hírlap* [Pest Newspaper] July 27, 1897, 3. The duel didn't result in serious injuries. The 72-year-old count regarded the insult as avenged. Among the personal papers of Sándor Károlyi, eight letters congratulating him on the successful duel can be found. MNL OL P 389 3. Central Archives of the Hungarian National Archives, Personal files of Count Sándor Károlyi.

12 "Az ujpesti liberalizmus. Károlyi Sándor gróf nyilatkozata [Liberalism in Újpest. Declaration of Count Sándor Károlyi]," *Budapesti Hírlap* (Budapest Newspaper), August 3, 1897, 4–5. He did not manage, through these efforts, to convince the public of his good intentions, as evidenced by

should have given his narrow, 3.5-kilometer-long parcel to the city for no or only minimal, symbolic compensation? [13]

The answer, I would argue, lies precisely in the abovementioned shift in legal thinking with the emergence of the notion of the public good and public water as part of this public good. In the decades preceding the outbreak of the conflict, the Hungarian Kingdom carried out the biggest water regulation undertaking in Europe, mainly river channelings and drainage works. Related to these undertakings, the state enacted a new law about water rights (Act XXIII/1885), which was based largely on earlier water laws in other European countries, such as France and Austria. The preparatory phase of the legislation process was led by a committee consisting of the most notable Hungarian engineers of the era, a couple of authoritative associations (such as the Tisza River Regulation Company, the Chamber of Trade and Industry of Budapest, and the Association of Engineers and Architects), and policymakers.[14] The committee met 33 times between December 14, 1882 and May 16, 1883, and the most vivid discussion concerned its very first agenda item, as a decision had to be made about whether a private or public water system should be developed. Based on a decades-long history of water engineering studies and on the theoretical backgrounds of various water legislation regimes in other countries, the committee unanimously opted for a public water system, in which all water (except for rainwater) was regarded as a public good.[15] Water is a gift of nature, the committee argued, so it should be available to everyone for use, regardless of the dimensions of the given body of water and whether it is navigable or not. The decision referred to previous legislative discussions concerning water in Europe during which the idea had already taken form according to which water

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the jokes printed about his alleged hypocrisy in the satirical press. E. g. *Borsszem Jankó* [Jack the Bean], November 19, 1899, 9.

13 The exact spot was chosen by water engineer János Wein, who had done promising exploratory drilling on the territory. In addition to the three test wells, which provided good quality groundwater, the area on the bank of the Danube River also contained three large gravel basins suitable for natural filtering, which was, according to Wein, the preferable technical solution for water purification. Despite the professional opinion of William Lindley, the renowned designer of the water and sewerage systems of Hamburg, who was invited to comment on Budapest's dilemmas and who preferred artificial filtration, the municipality opted for Wein's version. Budapest's drinking water has been naturally filtered through the gravel beds of the Danube River up to the present day. György Hajdu, "A főváros vízellátása [Water Supply of the Capital]," *Hidrológiai Közlöny* 53, no.7 (1973): 297–305, 298.

14 Irma Dobos, "Megemlékezés. A 100 éves vízjogi törvény [Commemoration: The Water Law is One-Hundred-Years Old]," *Hidrológiai Tájékoztató* 25, no.1 (1985): 8.

15 As opposed to both private and state property. *Pesti Napló* [Pest Journal], January 3, 1883, 7.

should be treated as a public resource, as this was essential (according to this theory) to a productive national economy.[16]

This developing discourse on water as a public resource had far-reaching consequences for perceptions of natural resources and property in general. Water regulations constituted both the context and the main catalyst for the transformation in property regimes and thus facilitated the emergence of new theoretical and legal relationships to the environment.[17] Although the notion of the public good referred originally to an economic consideration (namely, to the fact that private property is not necessarily the optimal legal framework for the use of natural resources), it placed the state in the role of the assigned manager of the natural environment, and this assigned manager then had to act in the service of the common good, as this was understood in the discourse widely disseminated by the press. [18]

The massive difference between Sándor Károlyi's evaluation of his parcel of land and that of the city originates in two different visions of property. The conflict of interests was rather a clash of two different property regimes. Károlyi acted like a traditional landowner, meticulously assessing the value of old feudal benefits, such as riverbed usage rights, fishing, milling, and mooring rights, etc., and then adding them to the amount he was to be paid in compensation. The municipality and the capital's public, in contrast, saw the parcel as a place where a natural resource, namely water was found which belonged to the public. Károlyi's behavior seemed hypocritical rather than simply outdated because he had been the president and energetic leader of the water law preparation committee and, therefore, a spokesman of the evolving discourse around public waters. This discourse made its way to the public, which increasingly regarded natural resources such as water as belonging to everyone (instead of belonging to individuals or the kingdom) and thus increasingly expected the state to fulfill a manager's role in the treatment of these resources.[19] When the citizenry of Budapest needed clean

16 As explained for example in the Austrian case by Corentin Gruffat, "The Beautiful Public Danube: Water Uses, Water Rights, and the Habsburg Imperial State in the Mid-Nineteenth Century," *Austrian History Yearbook* 54 (2023): 136–158. An interesting exception among the converging European regulations is the Italian water law, which, partly due to the *Risorgimento*'s already complicated legislative harmonization, maintained certain forms of private water property. Valenti, Salvatore, *Water in the Making of a Socio-Natural Landscape: Rome and Its Surroundings, 1870–1922* (New York–London: Routledge, 2023).

17 Vári, "Vízszabályozások, tulajdonjogok és gazdálkodás [Water Regulations, Property Rights, and Agricultural Systems]," 323.

18 Gruffat, "The Beautiful Public Danube," 150.

19 Károly Mike et al., "Víz, ami összeköt. A történetírás és a közgazdaságtan együttműködésének lehetőségeiről [Water that Connects: About the Possible Cooperation between History and Eco-

drinking water, it hardly seemed appropriate for a prominent figure like Károlyi to behave like a landlord, and this shift in attitudes was due precisely to the mental shift shaped by the national water regulations and legislation promoted by Károlyi himself. In his person, a banal conflict between private and public interests became a conflict in roles, and this conflict was itself a consequence of a fundamental change in the ways in which nature and natural resources were perceived.

The struggle for the public's trust

These legal conflicts notwithstanding, the construction of the left-bank waterworks began in 1893. Mihály Kajlinger, a mechanical engineer and the main designer of the project (whose father happened to be an accountant on Sándor Károlyi's estates), faced various challenges.[20] Kajlinger was a passionate innovator, who fully internalized the nascent expert culture, and he fiercely argued in favor of rational, planned, and statistically justified measures in his field of expertise. His argumentation and measures were more than once questioned by decision-makers and the public, as he recounted in a both proud and bitter tone in his essay about the early history of public water in Budapest.[21]

As noted above, Budapest's water supply system leans on natural filtering carried out on gravel beds that lie on the banks of the Danube River. This technical solution was implemented in spite of the opposing recommendations by the invited scientific authority, William Lindley, and it was questioned by many.[22] Interestingly enough, the first major challenge that Kajlinger had to face occurred in relation to *artificial* filtering, which was used as a temporary means until the com-

nomics]," in *Víz és társadalom Magyarországon a középkortól a XX. század végéig* [Water and Society in Hungary from the Middle Ages to the End of the 20th Century], ed. Krisztián Gergely Horváth (Budapest: Balassi Kiadó, 2004), 13–36.

20 Kajlinger's life and work are summed up in a praiseful necrology: "Kajlinger Mihály," *Magyar Mérnök- és Építész-Egylet Közlönye* 58, no.17–20. (1924): 61. In addition to serving as the designer of the left-bank waterworks, he was also head of the Hungarian Association of Engineers and Architects (1909–1912, 1916–1919), and with a short interruption he served as director of the Budapest Waterworks between 1896 and 1923.

21 Mihály Kajlinger, "Budapest vízellátása az 1897–1900. évek alatt I [The Water Supply in Budapest in the Years 1897–1900 I]," *Magyar Mérnök- és Építész-Egylet Közlönye* 36, no.1 (1902): 33–49; Mihály Kajlinger, "Budapest vízellátása az 1897–1900. évek alatt II [The Water Supply in Budapest in the Years 1897–1900 II]", *Magyar Mérnök- és Építész-Egylet Közlönye* 36, no.2 (1902): 61–77.

22 See note 13.

pletion of the left-bank waterworks, which Kajlinger himself regarded as an acceptable stopgap measure.[23] However, the capacity of the artificial filtering system was insufficient, and every now and then, the drinking water had to be diluted with unfiltered water taken from the river. More and more complaints were made concerning insufficient quantities of drinking water and the poor quality of the available water, which at times seemed muddy or rusty on both sides of the river.

Considering that Budapest was one of the most rapidly growing cities in Europe at the time, the fact that there were supply problems should not have been a surprise.[24] Indeed, what perhaps is surprising is the extent to which the reactions of the city's inhabitants to these problems were intense, sometimes even hysterical. According to one anecdote, during a city council meeting, an enraged council member gave Kajlinger a bottle of watery mud and tried to make him drink it, claiming that ever since the new infrastructure had been under construction, the quality of the available water had been intolerably poor. When Kajlinger tried to defend his work and his colleagues' efforts, his adversary told him that he must have been drinking beer if he dared make the patently false claim that the water was drinkable.[25]

The man making the complaint clearly blamed technology for the poor quality of the water. He claimed that now the water was being brought into people's homes through pipelines that no normal citizen could examine. Before, he insisted, anyone could follow the path of the water from well to kitchen table, and the water supply had been more reliable. His lack of confidence in the new technology was not an isolated case. In 1897, another conflict broke out in the course of which similar arguments were made. That summer, Budapest had to face a rather serious wave of typhoid fever, and unfortunately, the intense spread of the epidemic overlapped with the installation of new artificial filtering basins. The coin-

23 Kajlinger, "Budapest vízellátása az 1897–1900. évek alatt II [The Water Supply in Budapest in the Years 1897–1900 II]," 61.

24 Budapest had roughly 300,000 inhabitants in 1870 and almost a million in 1913. Károly Vörös, "A világváros útján: 1873–1918 [Becoming Metropolis 1873–1918]," *Budapesti Negyed* 6, no.2–3. (1998): 106–172, 106.

25 István Horváth, "Erre beszéljen Kajlinger uram! A főváros vízellátása a századfordulón [Let's Talk about this, Mister Kajlinger! Water Supply of the Capital at the Turn of the Century]," *A Magyar Hidrológiai Társaság XXIX. Országos Vándorgyűlése* 29, no.1 (2011): 1083–1089, 1087. The indignant council member's words are in fact an example of untranslatable word play, as he cited a Hungarian saying referring to hypocrisy, "He preaches water while drinking wine," in a distorted form. The man claimed that Kajlinger was preaching water while drinking beer, and beer was considered a less noble (and not a biblical) drink than water. This thus added to his satirical tone.

cidence provided fertile soil for speculation about the filtering system as the root cause of the problem. The public's concerns rapidly escalated to panic when the city's Chief Medical Officer, Adolf Schermann, also agreed that pipeline water might be responsible for the spread of the disease and ordered a two-day stop in the water supply (which, on hot summer days, obviously only aggravated the situation). Alongside Schermann and the broader public, the City Council also was not free of superstitious fears, and it ordered a thorough examination of the water system. Furthermore, it entrusted a newly established committee with the task, which consisted of renowned foreign experts, like Otto Lueger, a technical college professor from Stuttgart. Lueger assured the Council that the pipeline water had been of better quality at each sampling point than the water from the wells, and he also expressed his deepest conviction that "the actual directorate of the Budapest Waterworks proceeds according to appropriate principles. Each of its measures is profoundly meditated, its newest constructions are essentially carried out in a flawless and elegant manner." The professor showed collegial solidarity with his expert confrères and insisted that in questions concerning the city's water supply, "Budapest can rely on the directorate with complete confidence."[26]

As director of the Budapest Waterworks, Kajlinger found himself in the middle of a crisis of confidence and controversies between experts and the public, which was, furthermore, something inconceivable for him. His statistics clearly showed that there was no relationship between the filtering methods and the spread of the epidemics, and Kajlinger expressed his irate astonishment over the fact that people were not convinced straightaway by data. On the contrary, as he wrote, "Dread invades the citizens, they withdraw their confidence from the waterworks to such an extent that even the construction of the left-bank waterworks, which were considered so urgent, has been suspended, [the public] demands investigations and relies on the opinions of foreign experts."[27] Kajlinger perceived the episode both as a personal affront and a general crisis of rational thinking. He was shaken to see that facts and scientific results can be overridden by fear, and he arrived at the embittered conclusion that "this is what awaits every technician who builds and manages water infrastructure these days."[28]

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26 His letter is cited in Lipót Vedres, "Kájlinger Mihály élete és szerepe Budapest ivóvízellátásában [Life and Work of Mihály Kájlinger in the Water Supply of Budapest]," *Hidrológiai Közlöny* 46, no.12 (1966): 574–579, 576.

27 Kajlinger "Budapest vízellátása az 1897–1900. évek alatt II [The Water Supply in Budapest in the Years 1897–1900 II]," 61.

28 Kajlinger "Budapest vízellátása az 1897–1900. évek alatt II [The Water Supply in Budapest in the Years 1897–1900 II]," 61.

The insightful use of rumor theory by historian Irina Marin in her research on peasant protests in Romania in 1907 offers a useful tool in a discussion of the fears of the citizenry of Budapest and the fake news they spread about dangers of the pipeline water as a cause of typhus and the alleged betrayal they had suffered at the hands of the authorities, who had been perfectly willing to let them drink contaminated water. Marin shows that even if rumors or misunderstood realities seem completely irrational, they shed light on a strategy to use pieces of information to serve the interests of the peasants, or in this case, the interests of the citizens of Budapest. These mythologies, Marin argues, facilitated coping and control in situations of extreme vulnerability.[29] The Budapest urbanites, who had lost control over their autonomous ways of accessing drinking water, had suffered what to them was a similar trauma, and they saw the (to them) invisible supply system as a source of danger. Their desire to go back to the use of wells seems nostalgic and reveals that modernities were sometimes unwanted, or at least they forced people to accept a certain loss of personal control over their lives.

Kajlinger, his colleagues, and the investigating committee cleared the Budapest Waterworks' name relatively quickly, but another, eerily similar conflict broke out in 1902. This time, the concerns had nothing to do with an epidemic, but the expertise of the engineers was again contested by the public and several prominent politicians, much as had happened in 1897. During the hot summer days of 1902, water consumption suddenly increased manyfold. The abrupt growth of pressure in the tubes dislodged the debris that had formed in the pipelines, resulting in a sudden and spectacular deterioration of water quality. Kajlinger and the directorate of the Budapest Waterworks decided to lower the water pressure, while the City Council insisted on the necessity of increasing water pressure to clean the tubes. During a tumultuous session of the City Council, various politicians and even the mayor accused Kajlinger of being incompetent and of refusing to take responsibility for the calamity. The debate went so far that Kajlinger, who "felt like a hunted animal," tendered his resignation, which was in turn refused. In the end, the Council gave Kajlinger a chance to prove his point while still hanging on to some doubts. Kajlinger was given two days to address the problem by lowering the water pressure, with the stipulation that after the deadline had passed, the opposite solution would be used.[30]

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29 Irina Marin, *Peasant Violence and Antisemitism in Early Twentieth-Century Eastern Europe* (London: Palgrave Macmillan, 2018).

30 "Az állandó vizvezetéki bizottság 1902. évi junius 9-én tartott ülésének jegyzőkönyve [Minutes of the Permanent Water Supply Committee's Session on 9 June 1902]," *Fővárosi Közlöny* 13, no.47 (1902): 777. It is worth emphasizing that no scientific argument was presented in support of the

On this occasion, Kajlinger openly expressed his view that the public needed to be educated about the appropriate uses of infrastructural technologies and resources. He claimed that the citizens should have reported the problems they were experiencing directly to the waterworks, much as they would call the fire brigade, and not the press, if their houses were on fire. He angrily noted that he had warned the public many times that turning to the press wouldn't solve their problems, and the press should not overestimate its role when discussing questions that required expertise.[31] In an offended tone, Kajlinger insisted that living with new infrastructural resources was indeed a learning process, and this process had to be carried out under the scrutiny of a turbulent public sphere. He also referred implicitly to a hierarchy when it came to resource management and to the relationship with the forces of nature. In this hierarchy, the Budapest Waterworks' professionals should lead the way.

These conflicts shed light on a period when experts, especially engineers, became the central figures of nature–non-nature relations. Society saw these experts as agents whose task was to tame and control nature through technology and human labor. However, precisely because these experts were the embodiment of this modernizing fever, they easily became scapegoats or targets of hostility. As James C. Scott argues in his seminal *Seeing Like a State*, in the eyes of the public, experts often embodied the perceived arrogance of modernizing campaigns, and at times, this perception of the expert as an unacceptably haughty figure even contributed to the failure of ambitious nature transformation projects.[32] Recent historiography has finetuned this consistently negative portrait by emphasizing the social embeddedness of experts and their role in making the borders between nature and civilization permeable and blurred.[33] In the case of the construction of Budapest's water infrastructure, one encounters this at times ambivalent perception of the roles of experts. Kajlinger had a long career as a decision maker. He was decorated by different government institutions and by King

opposite procedure (flushing the tubes with high quantities of water at high pressure). This idea was based merely on an appeal to "common sense," as was noted more than once during the session.

31 "Az állandó vizvezetéki bizottság 1902. évi junius 9-én tartott ülésének jegyzőkönyve [Minutes of the Permanent Water Supply Committee's Session on 9 June 1902]," 778.

32 James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*, Veritas paperback edition, Yale Agrarian Studies (New Haven: Yale University Press, 2020).

33 For a summary of this historiography see: Gatejel, Luminita, *Engineering the Lower Danube: Technology and International Cooperation in an Imperial Borderland.* (Budapest: Central European University Press, 2022), 16.

Franz Joseph himself.[34] Yet at the same time, more than once, he was put under investigation and even assaulted.

As far as the citizens' ability and willingness to adapt to the new supply system is concerned, several cases of crises of confidence indicated that the previous, autonomous ways of attaining water represented a lower level of vulnerability to a central supply system, even if the quality of well water was less reliable and the water sold from the Danube River was unreasonably expensive and also unreliable.[35] Technical innovation was not accepted as good *per se*, but was rather the subject of criticism and doubt. Moreover, uncertainties about the beneficial nature of the technology were amplified by another source of hostility: aversion to (state) control.

Ways of measuring water consumption—and resistance to them

The control of water consumption was a central legal and practical question concerning the nascent infrastructure. In legal terms, the problem refers back to the newly formed notion of the public good. If the natural resource belonged to everyone, who had the right to control its uses and abuses? On a practical level, the Budapest Waterworks wished to set prices that would discourage consumers from wasting water while still being fair to every customer.

In nineteenth-century Budapest, water consumption of a given household was not measured by a water meter. The water bills were determined by a calculation based on the characteristics of a given consumption site (such as the size of the property, the number of water-consuming facilities, whether the household had a garden or a greenhouse, whether it included horses or other animals, etc.). Kajlinger was genuinely unsatisfied with this system, as flat rates left people more likely to waste water and, therefore, money and resulted in neglected pipes and sanitary fittings. He did research, collecting data from all over Europe on water

34 He received the Officer's Cross of the Imperial Order of Franz Joseph and later was appointed to Court Councilor for designing the water supply system of a newly constructed neighborhood in Budapest, the so-called Wekerle estate (Wekerletelep). "Kajlinger Mihály," *Magyar Mérnök- és Építész-Egylet Közlönye* 58, no.17–20 (1924): 61.

35 Dunavizes [Danube-water seller], *Vasárnapi Ujság* [Sunday Paper], January 29, 1865, 52–53. Water from the Danube River was used for purposes other than drinking, such as washing or irrigation. Its price generally grew when purchased farther from the river or on an upper floor. Water from the river was brought to people's households by different means, most often by water carts.

consumption in cities in which citizens paid flat rates (like in Budapest) and in others where water was meticulously measured by water meters. The results were striking from two perspectives. First, Budapest was among the most wasteful European cities, with an average daily water consumption of 206 liters per capita (as opposed to, for instance, Berlin, where this figure was only 77.8 liters per day per person). Second, there was no connection between the volume of water consumption and overall health conditions or mortality rates.[36] The meticulous examination of water use in the two cities led Kajlinger to the conclusion that the almost threefold difference between the two cities was due almost entirely to leaking pipes and sanitary facilities, or in other words, waste.

As in principle the controllers of the Budapest Waterworks went around the entire city over and over again to check the facilities, reporting leaks and levying fines on the consumers for having neglected their estates, the following conclusion was natural: the controlling system was not effective enough, and the Waterworks should have made it more rigorous.[37] Except that, according to Kajlinger, this intensification of control would have been impossible for decidedly psychological reasons. "Human nature," he warned, "does not endure permanent oversight and the consequence [of this kind of oversight], the constant threat of reprisal." He also noted that the Budapest Waterworks had difficulty finding an adequate labor force to fill the controller positions, given that "this activity is one of the most obstructed and thankless jobs ever."[38]

In Kajlinger's eyes, the only logical solution was the introduction of water meters. The City Council turned again to foreign authorities. The water meter committee of fifteen experts agreed with Kajlinger on the necessity of introducing water meters. Interestingly, the City Council refused to proceed accordingly based on a

36 Kajlinger, "Budapest vízellátása az 1897–1900. évek alatt I [The Water Supply in Budapest in the Years 1897–1900 I]," 35.

37 However, the Budapest City Archives contains hundreds of pleas to exempt consumers from paying these fines, these are also published in the Minutes of the of the City Council of Budapest 1873–1949, accessed 21 June, 2025, https://library.hungaricana.hu/hu/collection/mltk_bfl_bpszkj/.

38 Kajlinger, "Budapest vízellátása az 1897–1900. évek alatt I. [The Water Supply in Budapest in the Years 1897–1900 I.]," 33; The problem was discussed in City Council sessions as well, where the town councilors suggested that a pay rise could contribute to the solution. We can refer here to the incident concerning water quality. The same intruder who wanted to make Kajlinger drink muddy water expressed his indignation about the urban presence of the Waterworks' controllers. He was infuriated by the fact that Kajlinger had "eight controllers a day coming and going, examining the water everywhere and finding it everywhere good." He was frustrated mostly by the automatic acceptance of their accounts. Vedres, "Kájlinger Mihály élete és szerepe [Life and Work of Mihály Kájlinger]," 576. This episode sheds light on how citizens' lived experiences were ignored or pushed into the background when they contradicted findings of the experts.

similar argument that Kajlinger had used in relation to the Waterworks' controllers. Although they agreed that in principle those who consume more should pay more, the councilors claimed that in practice, the abolition of "free water use" of citizens would engender strong reactions or even complete resistance, and the measure would "make the citizens nervous more than necessary."[39]

Resistance was also palpable among the town councilors. In November 1897, only one of them voted in favor of the committee's proposal, while another, Miksa Kurfürst, was indignant even at the debate. He did not see the sense of negotiating a "stillborn" motion and proposed introducing "word counting meters instead of water meters" to avoid superfluous talk about the issue. The only benefit, he claimed, of the long discussion was that, hopefully, the capital would be "left alone for a while" with the question. Other councilors, if less fervently, argued that water meters were not reliable, as the various meters in use, which were mechanically not the same, had given different readings during the testing period. These councilors did not reject the idea of measuring individual consumption completely, but they authoritatively claimed that the appropriate technical solution was not yet available.[40] They also mentioned psychological concerns. One of them, a man named Gyula Steiger, asked his confrères if they "should really regard the citizens as enemies and commit such cruelties against them." Steiger emphasized that the actual situation was, if not ideal, at least tolerable, and it would be a mistake to fiddle with it by forcing poor people to think about water consumption when drinking or showering. Steiger's final argument, which met with loud applause from fellow councilors, was that "the people cannot be deprived of the most essential [natural] element." Limiting water consumption, he insisted, could not be justified, neither by social nor by public health-related arguments, and he went so far as to claim that "he personally would rather not use pipeline water and reopen his well than expose himself to such bullying."[41]

Thus, the first attempt to introduce water meters in Budapest failed, as did many others later. Kajlinger resigned from his position as director of the Water-

39 "A fővárosi vízvezeték [The Waterworks of the Capital]," *Gazdasági Mérnök* 11, no.28. (1887): 111. The decision was made not only in spite of the experts' standpoint but also despite the explicit demand of the incumbent interior minister.

40 "Nem lesz vizmérő óra [There won't be Water Meters]," *Pesti Hírlap* [Pest Newspaper], November 12, 1897, 5.

41 "Nem lesz vizmérő óra [There won't be Water Meters]," 6. The engineers were represented in this debate not by Kajlinger but, this time, by Dezső Nagy, a professor at the Technical University of Budapest. He was barely capable of pronouncing a couple of words partly due to his astonishment and partly because the councilors howled him down. He made a short allusion to civilizational hierarchies when he exclaimed, "But all of Europe is backing us [the experts' committee] up! Where are we, are we in Asia?"

works following one of these attempts for a short time in 1909, and he succeeded in implementing the mandatory use of water meters only in 1921, after a history of restrictions during World War I and under a completely different political regime, which no longer considered political and economic liberalism its unquestioned foundation.[42] The fact that it took so long for these measures to be taken clearly shows that attitudes towards water use did not change overnight. Much as it had taken a considerable amount of time for the population to accept that wells, over which people had some control, were being replaced by a central water supply system engineered and managed by the state, the process of defining responsibilities for the use of public goods was also lengthy. These responsibilities were expressed in numbers at a time when quantifying everything, including the daily, weekly, or monthly use of clean water, was once again a bureaucratic practice of a controlling and centralizing state that was perceived with hostility by many. The City Council meeting makes clear that the introduction of water meters was regarded as an attack on freedom that even some politicians found intolerable. This particular freedom was the right to use natural resources quasi without constraint. People's hesitancy to surrender this freedom indicates a partial refusal on their part of the state's role as the assigned manager of these resources. However, their willingness, eventually, to comply indicates the influence of the increasingly prevalent notion of the public good as the most important responsibility of the state.

Conclusion

In summary, Budapest's new water infrastructure generated several conflicts, some of which were intense. Count Sándor Károlyi's struggles were rooted in his outdated attitudes towards water and property, while the difficulties encountered by engineer Mihály Kajlinger originated in his modern, technoscientific view of urban infrastructures. This simple dichotomy can be developed further, and it can be stated that the conflict-ridden history sketched above sheds light on four developments. It illuminated the transformation of attitudes towards natural resources and the way a certain teleology of modernity was contested and negotiat-

42 At this point, the use of water meters was mandatory in industrial facilities (which complained a lot about being forced to use and pay for filtered water for industrial purposes), but flat rates were still in use for households. Kajlinger's name was linked to malfeasances concerning the implementation of meters, and he was accused of promoting water meters for personal gain, which he denied. He returned to his position approximately a year later and stayed there until 1923. Vedres, "Kájlinger Mihály élete és szerepe [Life and Work of Mihály Kájlinger]," 576.

ed. Zooming in on water meters, one of the important technological innovations in this context, made visible the specific features of the modernizing campaign that irritated the public, namely the intensification of central control and the state's insistence on its prerogative to measure and monitor the citizenry's consumption of a natural resource.

Attitudes towards nature were transformed first by the introduction of the new legal category of the public good and were then further changed when experts became the assigned managers of natural resources. In the urban context, the emphasis was not really on taming nature's forces but on channeling them into a form that was appropriate for the improvement of an increasingly "civilized" society, in this case through the creation of an infrastructural network. Thus, together with street lighting and the sewerage system, pipelines marked the boundaries of the "civilized" world. In a contradictory manner, however, they also constituted an entity that was both manmade and natural at once, a hybrid phenomenon, or, to put it differently, a socio-natural site.[43] Innovations in water management seemed to challenge the nineteenth-century assumption that urban development should further the separation between nature and culture, environment and civilization. With the words of Maria Kaika, we can state that "although the programming vision was to render cities independent from nature's processes, the materialization of this vision was predicated upon establishing intricate networks and flows of natural elements, [...], which, in fact, not only did not separate nature from the city but instead wove them together more closely into a socio-spatial continuum."[44] In the case of Budapest, this meant that the boundaries of the city were strictly drawn by the endpoints of the water system infrastructure, but in the meantime, this same infrastructure brought groundwater into every household.

The creation of socio-natural sites was led by the vanguard embodiments of modernity: experts. A great deal has been said about the nascent expert culture of late nineteenth-century metropolises, and Budapest was not an exception to the rule: the city entrusted engineers with control over the forces of nature. As several examples show, the experts' credibility was also defined by civilizational hierarchies; that is, when problems arose, experts were invited from Western Europe and more specifically from Germany, the home country of engineering expertise according to the technical intelligentsia of the Hungarian Kingdom. In spite of the fact that experts seemed to dominate discourses about the environment and its

43 Winiwarter and Schmid, "Socio-Natural Sites."

44 Maria Kaika, *City of Flows: Modernity, Nature, and the City* (New York–Oxford: Routledge, 2005), 5.

uses, the present case study enumerated episodes when their credibility and position were contested. The experts reacted with stupefaction, and they defended themselves from behind the ramparts of rationalism, trying to discredit their adversaries as irrational, but these conflicts still clearly show that progress was not accepted as automatically beneficial and was sometimes critically assessed by the public. This adds to our understanding of popular perceptions of modernity.[45]

Citizens also refused a certain level of institutional control. The placement of a technical device in their households seemed to be the boundary not to be violated. The at times violent resistance to the introduction of water meters shows how repulsive the centralizing state was in the eyes of some of the public. Water meters came to symbolize increased dependencies, which are inherent characteristics of infrastructural networks,[46] as much as intrusion into the private sphere. When city councilors spoke of people taking showers in their bathrooms or drinking a glass of water in their kitchens, they were conjuring scenes in which, in the eyes of the broader public, state administration had no place. Adaptation to new elements of infrastructure and the process of learning how to use these elements meant accepting what at first may have seemed unacceptable.

There are various ways of exerting control, and measuring things is one of them. Historiographical evidence shows that the act of requiring or taking measurements often met with hostility, to which we can now add the use of water meters.[47] Words applied to the use of these devices (e.g. cruelty, attack, or bullying) indicate the intensity of emotions related to measuring practices as well as the perfectly accurate perception that measuring things is a form of practicing power. It took a great deal of trust to convince the people of Budapest to let the state exercise power in this form in their very homes, and trust was sorely lacking during this period of consecutive crises of confidence. Experts were astonished that the public could not grasp that these devices could help the city arrive at more precise figures and thus further the emergence of a more just society. Yet the public may well have understood this. It may simply have prioritized autono-

45 Modernity and modernization are frequently regarded as extremely complex phenomena that could be grasped exclusively by high intellectuals, if ever. I am interested in cases when popular perceptions of modernization can be understood, for instance Veronika Eszik, "Rural Reactions to Modernization: Anti-Modernist Features of the 1883 Anti-Hungarian Peasant Uprising in Croatia," *Hungarian Historical Review*, 12, no.1 (2023): 37–65.

46 As described in relation to the electrical grid in Alain Gras, *Grandeur et dépendance: Sociologie des macro-systèmes techniques* (Paris: PUF, 1993).

47 In addition to the countless case studies on violent reactions to surveying, for a thorough analysis of the hatred of the meter system, see: Ken Alder, *The Measure of All Things: The Seven-year Odyssey and Hidden Error that Transformed the World* (New York: Free Press, 2002).

my over precision and liberty over social justice. As Ken Alder puts it, "Our methods of measurement define who we are and what we value."[48]

The history of the creation of urban water infrastructure in Budapest, a process which involved decades-long preliminary studies, negotiations concerning legal, administrative, technical, and political decisions, and a lengthy process of mental adaptation by the public, brings environment, technology, and social development into dialogue. It shows that infrastructure is not only a material consequence of a monumental modernizing project but also a catalyst of transformations of ideas about nature, modernity, expert culture, state control, and measuring practices. As such, it forms an excellent subject for research that seeks to connect social history with urban environmental history and the history of ideas. Seen from the intersection of these fields, Budapest shows a different face than what we have seen before.

48 Alder, *The Measure of All Things*, 14.