HANNAH STROTHMANN

Changing currents: Industrialising water and hydrosocial experiences in nineteenth-century Berlin

Water remains chaos until a creative story interprets its seeming equivocation as being the quivering ambiguity of life.

—Ivan Illich

Water is in everything, and waters are many. Water fills metaphors, rivers, oceans, policy papers, and books alike. Despite the proliferation of discourses on water and the extensive research conducted across disciplines, the topic of water remains ambiguous. As the philosopher Ivan Illich observed, "water is a shifting mirror. What it says reflects the fashions of the age; what it seems to reveal and betray hides the stuff that lies beneath."[1] Geographer Jamie Linton adds another layer to this discourse by emphasising the often-overlooked bio-physical nature of water in favour of its social dynamics. Linton's concept of the "social nature" of water posits that every significant instance of water is imbued with human ideas, meanings, values, and potentials.[2] This paper delves into the evolving social nature of water and its effects on urban spaces, focusing particularly on Berlin in the nineteenth century—a period of profound transformation in urban water environments due to industrialisation and urban growth.

In the nineteenth century, Berlin experienced a significant shift in its socio-natural relations and urban water environments. Industrial production and the capitalist political economy demanded new uses and volumes of water, thus conceptualising water as an industrial resource. Water, which had always been integral to city-building, faced unprecedented demands that necessitated the creation of large-scale infrastructures and a reorganisation of water management as a facet of urban governance. Flowing rivers were engineered for efficiency, embodying what historian Eva Jakobsson describes as the "industrialization of rivers,"[3] a process that commodified water flows for industrial purposes. Jakobsson's framework is useful in exploring how the concept of "modern water" emerged in tandem with industrial and urban processes. Expanding this concept to the "industrialization of water" allows for a comprehensive understanding of the multifaceted effects of industrialisation on various bodies of water, such as rivers, canals, and new water infrastructures.

This paper examines the emergence of "modern water" and how this abstraction facilitated the industrialisation of urban waters. These industrialised waters, in turn, transformed urban spaces and societies, giving rise to new urban

"hydrosocial" experiences. The term "hydrosocial" encapsulates the complex interplay between water and social forces, highlighting their mutual constitution rather than treating them as separate entities.[4] Nineteenth-century Berlin serves as a lens to illuminate how the social nature of water and its associated meanings evolved alongside urban development and industrialisation processes. The focus is on the river Spree, particularly its eastern stretch known as the Oberspree, which by the late nineteenth century had become both an industrial hub and a site for urban leisure and recreation centred around water. Anchored in long-standing fishing traditions and increasingly integrated through railway connections, the Oberspree emerged as a key site of Berlin's hydrosocial transformation—home to the city's industrial core, its first waterworks, and a burgeoning culture of water-based sports and recreation.

Modern water and its industrialisation

Water was conceived as "a clear liquid, without colour or taste"[5] by nineteenth-century Western thought. For centuries, the understanding of water was not that of a homogeneous chemical entity; instead, it encompassed a multiplicity of forms—"waters"—each characterised by unique local traits and cultural meanings. For example, Roman aqueducts, emblematic of imperial power, transported waters from diverse sources across vast distances, yet they were referred to "in terms of the different waters they carried, not in terms of the structures that carried them."[6] Similarly, springs and wells were often imbued with sacred significance, reflecting the cultural and spiritual beliefs of their communities. Thus, "premodern" waters were articulated in the plural, signifying their heterogeneity shaped by geographical, cultural, and spiritual contexts, as Linton argues.[7]

Social conflicts about the management or control of these waters—particularly regarding access rights and the construction of distribution networks—had always existed. In this context, reframing the social natures of waters to assert ownership has historically served as a means to consolidate power and accumulate capital. The commodification of water, therefore, was not a modern invention. As such, the discursive shift from "holy waters" to "mineral springs" in sixteenth-century Europe was initiated by spring owners who began to compete in a growing market for an increasing number of paying clients.[8] As the eighteenth century progressed, the scientific examination of water intensified, leading to drastic changes in its valorisation. Chemists began to articulate water in terms of an H_2O molecule, while hydrologists produced diagrams that depicted its circulatory nature. Waters were intellectually abstracted from their cultural contexts to become one: waters became water, a deterritorialised, dematerialised chemical substance that Linton calls "modern water."[9] This epistemological reconception of waters into water enabled the perception of a seemingly homogeneous resource, and, as such, took part in intellectual efforts to separate the natural and the social worlds.[10]

However, the emergence of modern water was not solely a product of scientification; it was also intertwined with the processes of urbanisation and industrialisation. As architect and geographer Maria Kaika notes, these transformations were characterised by practices of "domestication and commodification."[11] In the nineteenth century, rapid industrial production and urban growth imposed new demands on water, which helped to create the

idea of water as a resource that could be "industrialized." While water had long been a fundamental element in the formation of cities, the scale of demand generated by industrialisation was unprecedented, necessitating large-scale infrastructure and a reorganisation of water management within the framework of urban governance. Rivers, once natural entities, were altered and subordinated to principles of efficiency.

Eva Jakobsson captures this transformation in her concept of the "industrialization of rivers,"[12] describing it as the process by which river flows were commodified for economic gain. Although Jakobsson's analysis focuses primarily on the hydropower developments in Sweden—highlighting extensive infrastructures such as dams—her framework is useful for examining the broader implications of industrialisation on water. Expanding the concept of the "industrialization of rivers" to encompass the "industrialization of water" allows for a more comprehensive understanding of how various water bodies—rivers, lakes, canals, fountains, and infrastructures—were affected by these transformative processes. This expanded perspective elucidates the multifaceted effects of industrialisation, revealing how water, once seen as a diverse resource, became increasingly homogenised and instrumentalised within the growing urban landscape.[13]

Nineteenth-century Berlin and its industrialising river

In nineteenth-century Berlin, the city's slowly meandering rivers could not be exploited for large-scale hydropower projects. Yet, they had long served other economic functions already. The Spree and Havel rivers integrated Berlin into a trans-European trade network, linking the city to the Baltic Sea through the river Oder and Stettin to the east, and to the North Sea via the river Elbe and Hamburg to the west. For a short period of time, Berlin even became a member of the Binnenhanse, the Hanse network.[14] As industrial production and trade networks expanded, Berlin's role as a hub for ship traffic and commerce grew significantly, leading to the industrialisation of its rivers, particularly the Spree.

With Berlin becoming the capital of the German Empire in 1871, industrial production along the Spree's shores surged. By 1901, forty-two industrial production sites had settled on the shores of the Oberspree, the eastern segment of the river.[15] Industrial settlements were favoured in the east to reduce air pollution, since the prevailing winds came from the west. Furthermore, the region's existing infrastructure, affordable land, and low population density made it an attractive location for the textile, chemical, metal, and electrical industries.

As a consequence, the lands in front of the Stralauer Tor were turned into construction sites for the growing metropolis. The Stralau peninsula, with its long shoreline, became home to various factories, such as breweries, shipyards, a bottle factory, a palm kernel- and carbon disulfide industry, and a carpet manufacturer.[16] This carpet manufacturing business was part of the growing textile industry which had settled along the Oberspree and employed around 400 workers in the production processes of washing, dyeing, spinning, and reeling raw wool.[17] Thus, the river provided for the livelihood of industrial workers. The processes of dyeing and washing required substantial volumes of water, necessitating high-quality, clean water sourced directly from the Spree. However, the residual wastewater was heavily polluted when discharged back into the river, exacerbating environmental degradation.

Historically, the Spree had functioned as a sewage outlet for centuries, but the increased volume and intensity of industrial waste significantly strained the aquatic ecosystem.[18] Besides the devastating effects of water pollution, the lives of fish were increasingly disturbed by the ship traffic, making it impossible for fish to spawn.[19] Thus, only a few fish survived the Spree's industrialisation, and their gradual extinction reciprocally affected human lives on Stralau's shores. For centuries, Stralau had been a fishers' village whose livelihood was built on the Spree's nourishing water as a habitat of freshwater fish, such as pike, tench, zander, catfish, bass, carp, bleak, and eel.[20] The annual festival, Stralauer Fischzug, expressed the close relation between Stralauers, the Oberspree, and the fish, celebrating the villagers' fishing tradition.[21] As fish populations dwindled, professional fishing ceased to exist too.[22] Industrial water pollution, however, also became a public health concern. Berliners bathed in the Spree's numerous river baths, many of which were located downstream of Stralau and its industries and thus exposed to wastewater flows. Similarly vulnerable to water pollution was Berlin's drinking water supply, which was until 1892 provided by the city's first waterworks built right next to the Oberbaumbrücke, close to Stralau's industries.[23]

By 1901, municipal authorities initiated annual chemical analyses of the wastewater from the industrial plants to monitor the effects of industrial production on the river.[24] This regular chemical analysis was part of an increasing regulation of the Spree's waters, which intensified from the 1890s onwards and also included the adjustment of the riverbed. Due to increasing ship traffic, the width and depth of the river's bed was broadened to accommodate bigger ships and their voluminous hulls.[25]

Water as a governance tool

Berlin's industrialisation of water also entailed the construction of new waterways. These were planned not only as industrial transportation routes but also as means to structure urban growth. In the early nineteenth century, Prussian architect and superintendent of public works Karl Friedrich Schinkel devised plans to regulate Berlin's urban development through the design of the city's waterways. After travelling to England in 1826 to study its industrial and residential architecture, Schinkel was determined to prevent Prussia's capital from growing as "disorganized."[26] He imagined that with the help of its waters, Berlin could be put in order, kept clean and ventilated, preconceiving the idea of modern water.

In the mid-nineteenth century, landscape architect Peter Joseph Lenné continued Schinkel's trajectory but concentrated his plans for Berlin on the building of new canals. In less than fifteen years, Landwehrkanal (1845–50), Luisenstädtischer Kanal (1848–52) (Fig. 1), and Spandauer Schifffahrtskanal (1848–59) were constructed, each designed with different intentions. While the Landwehrkanal was perceived as a way to bring building materials such as bricks into the city, the design of the Luisenstädtischer Kanal followed primarily aesthetic and not functional principles, which rather hindered than enabled ship traffic.[27] The Spandauer Schifffahrtskanal was built to connect industrial production sites and adhered to economic principles. Decades later, the Teltowkanal (1900–06) was designed in a similar vein as a circumvention route of the inner city, relieving the Spree and the Havel from ship traffic. The mentioned canals were only some of the major construction projects in Berlin's inner city;

Fig. 1 Luisenstädtischer Kanal (1926): Engelbecken (Angels' Basin) [Landesarchiv Berlin, F Rep. 290 (09) Nr. II1925 / Foto: k. A. / übernommener Bestand]

in addition, one-way canals were built to provide access to industrial areas, and other canal projects in the region expanded the infrastructural water network. Thus, the industrialisation of Berlin's waters took on many forms, and interests in reconceiving waters as modern water were manifold.

These canal projects were emblematic of the "engineering era" which, as Kaika notes, "heralded a new relationship between human beings and nature" that reconfigured waters and societies "for the benefit of capitalist expansion."[28] As preconceived by Schinkel, the design of waterways and new water infrastructures was increasingly employed as a governance strategy to create a spatial and social order in the urban sphere. In nineteenth-century cities, deteriorating living conditions and recurring outbreaks of infectious disease "posed a complicated set of dilemmas for the scope and effectiveness of modern government,"[29] according to geographer and urbanist Matthew Gandy. As a reaction, public health policies were implemented that built on the reconfiguration of urban water flows to enforce sanitation and hygiene measures. The introduction of water infrastructures relegated polluted waters as causes of illnesses to sewer systems, while freshwater was separately piped to clean both urbanites and urban spaces. These water infrastructures relied on the idea of modern water as a clean and homogeneous liquid that could be employed to erase smells, dirt, and dust and thereby also regulate social lives.[30]

Berlin, however, lagged behind cities like Paris and London in separating and manipulating water flows. While those cities had established water supply networks for decades, Berlin's mid-nineteenth-century demand for both raw and drinking water was still covered by various fountains on private and public grounds.[31] Water access was dispersed across urban spaces and the quality of the pumped waters varied accordingly, depending on the grounds they were being extracted from.

> Many houses have their own wells and every 200 steps you can find such wells in all streets [. . .] The quality of this water is very different. In some areas it is pure, bright, fresh and tasteless. The water from the fountains in the castle courtyards, for example, is of excellent quality. In others, it is hard, yellowish, and has an unpleasantly pungent taste that comes from the ground where the wells are dug.[32]

This excerpt from Johann Formey's *Versuch einer medicinischen Topographie von Berlin* published in 1796 demonstrates an astonishing sensitivity to the city's diverse waters. It also highlights that the access to 'good' water depended on class and socio-economic affluence, as the best water quality was registered in the "courtyards of castles."

Thus, before the implementation of centralised water infrastructure, people were attuned to the idea of different waters and had gained knowledge of Berlin's varying water qualities, relating to Linton's idea of premodern waters. Social relations with water were influenced by class, yet remained intimate and somewhat self-determined. Urban residents devised their own water management solutions such as backyard tanks for rainwater collection and gas-fuelled water towers in residential attics.[33] As agents of their water, it was therefore not the people which demanded a change in urban water management. Instead, governing authorities saw an opportunity to establish urban order.[34]

In the nineteenth century, the police had been assigned the responsibility to monitor and govern Berlin's streets and squares. This included the management of public fountains as well as street cleaning and firefighting responsibilities. It was the authoritarian police commissioner Karl von Hinckeldey who implemented Berlin's first centralised water supply system: the regulation of urban waters aimed to establish social order and secure political power.[35] The primary goal of the city's first water supply system was not to ensure access to clean water for residents, but to solve curbstone cleaning issues by eliminating excrements from public spaces. Berlin's first water supply system therefore aimed at establishing the city's hygiene, and not the hygiene of citizens, and was, in fact, a precursor to the later introduced sewage system.[36] After decades of discussions and several proposals for a sewage system, Berlin's magistrate appointed urban planner James Hobrecht to develop a new sewage plan in 1869.[37] The immense growth in population and urban density made it seem urgent to eliminate pollution of urban waters in order to combat diseases and establish hygiene. Hobrecht had already left a distinctive mark on Berlin's development with his 1862 Extension Plan for Berlin, which became the main regulative framework for the city's future growth. Now, he was to bring order to the city's water flows. Hobrecht's approach to Berlin's sewage system was novel in that he introduced the so-called "radial system," which proposed draining the city's wastewater onto fields outside of the urban area—fields that were also used as fruit plantations: wastewater thus became a nourishing liquid.[38]

Gendered spaces for water interaction

Earlier in the nineteenth century, Berlin's water infrastructure was built on the idea of modern water as a homogeneous cleansing liquid. This led to the creation of urban spaces that further manifested this imagination. Invisible to the public eye, new underground pipe networks now linked neighbourhoods, unifying

the city as a cohesive force for city administration.[39] Waterworks, like Berlin's first plant built along Stralau's Oberspree, pumped and purified water to supply the growing city (Fig. 2). Sociologist Elisabeth Heidenreich refers to these infrastructures as "technical *flowing* spaces" to emphasise their spatiality, defining them as a synthesis of nature and "modern everyday life."[40] To access these controlled "*flowing* spaces," new "spaces of transition," such as bathrooms, emerged. These spaces redefined the relationship between public and private spheres, impacting social roles and domestic dynamics. Public fountains, formerly sites

Fig. 2 Waterworks in Alt-Stralau, Stralauer Chaussee / Warschauerstraße (1888) [Landesarchiv Berlin, F Rep. 290-09-01 Nr. 61-5077 / Foto: k. A.]

of communal water access, were succeeded by new private "wet rooms"[41] within homes, shifting the responsibilities and experiences of water interaction.

In a gendered reallocation of responsibilities, household water management, traditionally seen as women's work, became confined to the bourgeois home's interior, as Kaika notes.[42] Meanwhile, the industrialised water flows feeding these wet rooms were public and controlled by male engineers and municipal administrators. Thus, water management responsibilities were separated according to the contemporary logic of gender characteristics:[43] The economisation of public water flows was the responsibility of 'rational' men, whereas women 'passively received water from the tap within the home. Anthropologist Veronica Strang concludes that women were the first to be "disenfranchised from the control of water,"[44] as men took over water's technical and administrative aspects.

Indeed, water had "always been perceived as the feminine element of nature,"[45] as Illich underlines. Fluidity and wetness were understood as physical characteristics not only of water but also of female bodies. Thus, water flows undergirded gendered and sexualised imaginations. Philosopher Astrida Neimanis points out that the inherent wetness of female bodies and their capacity to gestate life in "intrauterine space" remains withdrawn from male control.[46] Therefore, she sees in female bodies a nexus of notions of fluidity and power. Transferring this idea to an urban

scale, strategies to control and contain water flows as part of the industrialisation of water were related to strategies of managing and disciplining biologically and figuratively fluid feminine bodies.[47] Moreover, in the nineteenth century, physis and morals were understood to be inherently related, which helped to proliferate ideas of untamed water flows as a morally bad influence, according to sociologist Susanne Frank. Disorderly urban spaces reflected characteristics of the open sea as an uncontrollable and endless water body. And the sea was in turn a symbol for the devouring and destructive aspects of female sexuality.[48]

In contrast, designed and controlled urban water flows such as fountains symbolised the successful taming of wild female natures. Designed by male planners and engineers, such controlling strategies expressed the nineteenth-century bourgeois male angst of urban disorder. Frank contends that these urban water-control measures reflected a deeper anxiety within the nineteenth-century bourgeois male psyche, triggered by the city's growth and transformation.[49] The demolition of city walls to accommodate expansion symbolised not only physical but also social disintegration; boundaries that once defined and maintained a male-centric social order were eroding. These (symbolic) ruins became a ground for the bourgeoisie to cultivate their unease and anxiety about the industrialising city, with its growing working-class neighbourhoods, raging epidemics, decaying morals, and eroding bourgeois gender roles.

The crisis of the modern city, therefore, was a gender crisis.[50] Yet, it was as much a class conflict and a struggle to deal with the fluidity of urban natures, which played out in domesticating and disciplining urban waters and human natures alike. The underlying fear that men dominating nature could suddenly shift to nature dominating men informed both strategies of taming urban waters and female bodies.[51] Fluids and mushy substances, such as swamps, marshes, mud, or slime, and their capacities to absorb and swallow everything without a trace were feared by the militaristic Prussian morale, according to sociologist Klaus Theweleit. In congruence with Neimanis, Theweleit sees a relation between this fear of fluids and wetness to the masculine (military) disgust of women.[52] Thus, the containment of water flows into hidden infrastructural spaces and the industrialisation of water as a means to exploit and control urban water, both reconfigured the urban sphere and manifested social imaginaries.

This spatial reallocation of water access and interaction thereby affected and reaffirmed gender roles as well as bodily ideals. Illich points out that water, now flowing through pipes directly into the home, also became central to new ideals of domestic intimacy and privacy: "Water became that stuff that circulates through indoor plumbing, and the nude became the symbol of a new fantasy of sexual intimacy defined by the newly created domestic sphere."[53] From fountains to pipes, from backyard water collection to simply turning on the tap—new urban water infrastructures altered everyday lives tremendously. And they did not do so equally for all, not only in terms of gender. While water access had potentially become as "easy and simple as turning a tap inside the private space of one's home,"[54] it remained unevenly distributed. High costs of plumbing and construction required capital and socio-economic affluence; only wealthier households could afford these amenities. Thus, water access at the turn of the twentieth century was limited to middle-class households.[55] Nevertheless, industrialised water and its new infrastructures influenced everyday interactions with water not just in the bourgeois home.

New urban hydrosocial experiences

As water management was no longer dependent on collective labour but instead a task for the hydrological engineers of the hidden "*flowing* spaces," shared knowledge about different water qualities was increasingly lost. Yet, it can also be argued that as water infrastructures now provided for everyday needs of water, urbanites were freed from a purely functional relation to water access. Instead, they were able to discover new interactions and aspects of urban waters, inventing new "hydrosocial" experiences. When environmental historian Stéphane Castonguay widens Jakobsson's idea of the "industrialization of water" to encapsulate the "formation of an economic system based on the integration of different industrial systems," he explicitly includes recreational activities, such as swimming, rowing, or sailing, that were linked to the "industrialization of water."[56] These new hydrosocial activities emerged in tandem with industrialisation and reconfigured urban spaces and water landscapes.

Thus, the transformation of the river Spree extended beyond its waters and aquatic life; it altered the river's atmosphere and social dynamics. Industrialisation redefined work schedules and traffic patterns, influencing the temporal rhythms of urban life as well as the river's physiognomy. A newspaper article from 1896 noted that the Spree now had a "weekday and a Sunday-physiognomy":

> Berlin is a busy city, and on weekdays one therefore rarely sees a pleasure boat on the water; [. . .] hardly a few hours of the night are left in which the appallingly tuned steam whistles of the tugboats do not frighten the residents out of their sleep. The water idyll on the Spree is over. The weekday physiognomy of the river is decidedly prosaic [. . .] and the rowers' boathouses are closed. The situation is different on Sundays and holidays, when the Spree shows a festive physiognomy early in the morning. Rowers and sailors hurry upstream with their flagged boats, and steamers with music lead companies to locales of the Upper Spree.[57]

The river's atmosphere changed depending on the day of the week. On weekdays, the Spree appeared "decidedly prosaic," populated by ship traffic which supplied Berlin and filled the atmosphere with particles and noise of steam pipes, leaving only a "few hours of the night" to the riverine inhabitants. Thus, Otto Hellmann talks of the "noisy age of technology" to which the "idyllic fishing village" Stralau surrendered, having become a "factory village" instead.[58] The morphology and the soundscape of the city changed in unison. Yet, it was also this clocked-in rhythm of production processes and working hours which created spare time for leisure and new ways of engaging with the urban water landscape. Thus, on weekends, the Spree showed "a cheerful physiognomy" already early in the morning, when rowers and sailors "hurried in their boats upstream."[59]

August Trinius humorously noted in 1885 that a "Sportbacillus"[60] had spread among Berlin's population, and it had "infected" the river and its shores, transforming Stralau into a centre for water sports. The area had already been a popular destination for Berliners seeking respite from urban life on summer weekends.[61] Here, the village's century-old fishing tradition, which had established a close (social) relation to the surrounding waters, might have helped to quickly integrate the Oberspree into this growing leisurely environment. As urban growth eventually consolidated infrastructural connections, the peninsula became accessible for an increasingly diverse public, and on weekends people

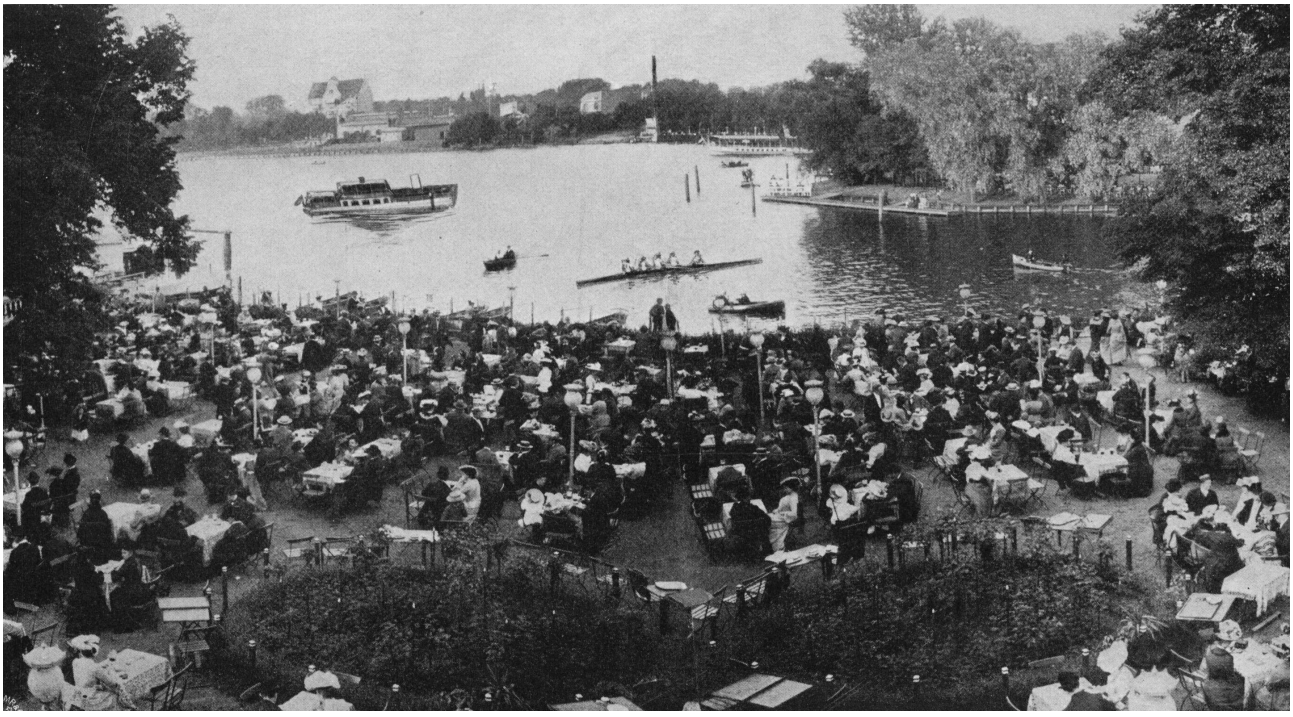

Fig. 3 Zenners Gartenrestaurant [Fedor Zobeltitz, *Berlin und die Mark Brandenburg* (Verlag von Velhagen und Klasing, 1902), 75]

from all social classes came to seek rest from Berlin's densifying and loud urban environment.[62]

The industrialisation of the Spree, therefore, took on many forms, which impacted not only the river, its water, and environment but also the lives within as well as ashore. Industrial processes extracted water, produced wastewater, polluted aquatic environments, and created increasing ship traffic, disrupting the river's ecological balance. Conversely, these same industrial processes facilitated the discovery of the river as a public space, enhancing living conditions and creating opportunities for leisure on and along the water. Moreover, infrastructures such as waterworks provided for everyday needs of water, creating opportunities to engage with water beyond purely utilitarian concerns. In that sense the Spree not only had become a "weekday and a weekend physiognomy," but instead many different faces, according to the diversifying uses and perceptions of its water.

The intellectual abstraction of waters into modern water had imagined water as a homogeneous liquid that could be industrialised. This industrialisation of water took on multiple forms and reconfigured both city spaces and urban societies in complex ways. One consequence was that urbanites were freed from a purely functional, individual relation to water. Open waters were newly discovered as spaces of leisure and rest, transforming Berlin's rivers into public spaces—yet ones still shaped by power relations. As such, Berlin's rivers and canals also became sites of social negotiation, where ideas about gender and class were articulated and contested. Built by male engineers, various water infrastructures helped (re)affirm dominant gender roles and class privileges. Yet, while these power relations continued to shape industrialised urban water flows, water itself remained fluid, blurring boundaries as well as social norms. Contradictions were inherent. The Oberspree, one of the most polluted river segments, simultaneously served as a leisure playground for the bourgeoisie, who rowed and sailed on this part of the river. Still, as a flowing river, the Spree could not be entirely

controlled or governed. In the late nineteenth century, for example, female workers rowed alongside upper-class men on the Oberspree—disrupting the social order inscribed onto the city's waterscape.[63] Attending to such contradictory microhistories reveals the shifting currents of urban water flows—currents that continue to shape the city today.

NOTES

1. Ivan Illich, *H20 and the Waters of Forgetfulness* (Dallas Institute of Humanities and Culture, 1985), 25.

2. Jamie Linton, *What Is Water?: The History of a Modern Abstraction* (University of British Columbia Press, 2010), 4f.

3. Eva Jakobsson, "Industrialization of Rivers: A Water System Approach to Hydropower Development," *Knowledge, Technology & Policy* 14 (2002): 41–46.

4. Linton, *What is Water?*, 105f; Erik Swyngedouw, *Liquid Power: Contested Hydro-Modernities in Twentieth-Century Spain* (MIT Press, 2015).

5. The Cambridge Dictionary defines water as "a clear liquid, without colour or taste, that falls from the sky as rain and is necessary for animal and plant life." "Water," Cambridge Dictionary, accessed 30 October 2024, *https://dictionary.cambridge.org/dictionary/english/water*.

6. Linton, *What is Water?*, 83.

7. While Linton's notion of "modern water" is helpful to delineate shifting social natures of water, his idea of "premodern waters" remains problematic, and Western-centric. Sacred waters never ceased to exist and framing cultural practices celebrating sacred waters as "premodern" remains problematic. There were never such clear shifts between "modern" and "premodern," instead these processes remain ambiguous.

8. Linton, *What is Water?*, 94f.

9. For a more detailed definition on "modern water", cf. Linton, *What is Water?*, 13–19.

10. Linton, *What is Water?*, 80f.

11. Maria Kaika, *City of Flows: Modernity, Nature, and the City* (Routledge, 2005), 53; Linton, *What is Water?*, 97.

12. Jakobsson, "Industrialization of Rivers," 44.

13. Broadening Jakobsson's concept is inspired by Stéphane Castonguay, "Rivers, Industrial Cities, and Hinterland Production in Quebec in the Nineteenth and Twentieth Centuries," in *Rivers Lost, Rivers Regained*, edited by Martin Knoll, Uwe Lübken, and Dieter Schott (University of Pittsburgh Press, 2017).

14. Laurenz Demps, "Berlin am Wasser: Ein historischer Ausflug," in *Wasser in der Stadt: Perspektiven einer neuen Urbanität*, edited by Uli Hellweg and Jörg Olmanns (Transit, 2000), 13–55; 19.

15. Karin Winklhöfer, "Die Wasserqualität der Berliner Spree zwischen Reichsgründung und Erstem Weltkrieg" (PhD diss., Freie Universität Berlin, 2015), 27. This dissertation is a biological analysis of the Spree's shifting waters. With regards to the industries on the Oberspree's shores, see Karin Winklhöfer, Marc Leszinski, and Christian Steinberg, "Industriebetriebe an der Oberspree und ihre Auswirkungen auf die biotische Beschaffenheit des Flusses im frühen, 20. Jahrhundert," in *Hydropolis: Wasser und die Stadt der Moderne*, edited by Susanne Frank and Matthew Gandy (Campus Verlag, 2006), 199f.

16. Otto Hellmann, "Stralau und seine Geschichte," *Mitteilungen des Vereins für die Geschichte Berlins* 46 (1929): 97.

17. Winklhöfer, Leszinski, and Steinberg, "Industriebetriebe an der Oberspree," 123.

18. Until regulations limited discharges of wastewater in 1842, all sewage water was directed into the Spree, see Winklhöfer, "Die Wasserqualität der Berliner Spree," 31.

19. "[. . .] the ever-increasing steamboat traffic and other vessels, such as the many rowing and sailing boats, do not allow the fish to spawn quietly," "Lokales," Berliner Börsen-Zeitung 385, 19 August 1909, 1; translation by the author.

20. Hellmann, "Stralau und seine Geschichte," 76.

21. In 1841, the century-old Stralauer Fischzug attracted as many as 50,000 visitors, including the king and royal court, see Hellmann, "Stralau und seine Geschichte," 91f. The increasingly excessive character was countered by Prussian authorities with severe police and military presence, until the festival was repeatedly banned in the late nineteenth century. It continued in decentred form in various restaurants, yet as Baedeker notes in 1891, the visitors are only from "the lower ranks" of urban society—see Karl Baedeker, *Berlin und Umgebungen. Handbuch* für *Reisende* (Verlag von Karl Baedeker, 1891), 167.

22. Still in 1929, the fishing territory existed and Stralau's fishers celebrated the Stralauer Fischzug, yet bought the fish on Berlin's markets. After the bought fish was released into the Spree, it was immediately caught again: a legal ritual for the fisher to retain their still existing fishing rights; Hellmann, "Stralau und seine Geschichte," 90.

23. In 1877, the second waterworks opened at the Tegeler See; Winklhöfer, "Die Wasserqualität der Berliner Spree," 31.

24. Winklhöfer, Leszinski, and Steinberg, "Industriebetriebe an der Oberspree," 129.

25. Between 1875 and 1908, Berlin's locks registered a drastic increase of freight volume which rose from 787,404 to 2,769,300 tons, with a simultaneous decrease of lock operations due to bigger ships—see Winklhöfer, "Die Wasserqualität der Berliner Spree," 31.

26. Demps, "Berlin am Wasser," 44.

27. The bridges crossing the Luisenstädtischer Kanal were of extremely low height to not alter the city's appearance from ashore. As the bridges were concealed from the streetscape, they became obstacles for the canal's traffic, and ships could not pass underneath, but had to wait for them to be opened—see Demps, "Berlin am Wasser," 45.

28. Kaika, *City of Flow*s, 107.

29. Matthew Gandy, "The Bacteriological City and Its Discontents," *Historical Geography* 34 (2006): 15.

30. The social effects of this "de-sensualization" of cities are analyzed by Tim Edensor, "The Social Life of the Senses: Ordering and Disordering the Modern Sensorium," in *A Cultural History of the Senses in the Modern Age*, edited by David Howes (Bloomsbury Publishing, 2014), 31–53. Research in Urban Political Ecology traced the effects of the separation of water into 'good' and 'bad' flows, consistent with Kaika, *City of Flows*.

31. Water supply infrastructures were introduced to Paris in 1802 and to London in 1808, cf. Gandy, *The Bacteriological City*, 17. Hilmar Bärthel provides a thorough history of the development of Berlin's water infrastructures, with detailed figures of Berlin's fountains and inhabitants at the beginning of the nineteenth century: Hilmar Bärthel, *Wasser für Berlin: Die Geschichte der Wasserversorgung* (Berliner Wasserbetriebe, 1997), 32.

32. Johann Ludwig Formey, *Versuch einer medicinischen Topographie von Berlin* (Berlin, 1796), 18; translation by the author: "Viele Häuser haben eigene Brunnen und ohngefehr alle 200 Schritte findet man dergleichen in allen Straßen. [. . .] Die Güte dieses Wassers ist aber sehr verschieden. In einigen Gegenden ist es rein, hell, frisch und ohne Geschmack. Von vorzüglicher Güte ist z.B. das Brunnenwaßser auf den Schloßhöfen. In andern ist es hart, gelblich und hat einen unangenehm mohrigen Geschmack, das dasselbe von dem Grund und Boden, wo die Brunnen gegraben sind erhält."

33. The latter inspired an 1806-contemporary to remark: "jedes Haus sein eigener

Wasserturm" [each building its own water tower], Bärthel, *Wasser für Berlin*, 42.

34. Demps, "Berlin am Wasser," 53.

35. Bärthel, *Wasser für Berlin*, 33; Demps, "Berlin am Wasser," 53.

36. Bärthel, *Wasser für Berlin*, 38. The ontological difference between 'clean' and 'dirty' water flows in separate water infrastructure systems (water supply versus sewage) was a socio-cultural ascription, and not a functional reality.

37. Oliver Krzywanek, "Die Entstehung der Berliner Kanalisation: Ein Kraftakt," *Wissenschaftsmagazin fundiert* 2 (2004), https://www.fu-berlin.de/presse/publikationen/fundiert/archiv/2004_02/04_02_krzywanek/index.html.

38. Laila Seewang provides a detailed analysis on the effects of Hobrecht's radial system and its "*Rieselfelder*" [draining fields] on the urban fabric and urban governance in her dissertation: Laila Seewang, "The Scale of Water: Networked Infrastructure and the Making of Municipal Berlin 1872–1900" (PhD diss., ETH Zürich, 2019), https://doi.org/10.3929/ethz-b-000381384, especially cf. pp. 84–105.

39. As an example serves a commission convened by the magistrate in 1902 to negotiate the "*Einverleibung*" [annexation] of Treptow, Stralau-Rummelsburg, Lichtenberg and Friedrichsberg in Berlin. This was deemed necessary by the city's administration as these eastern towns were to be connected to the sewage water system; "Aus Berlin," *Norddeutsche Allgemeine Zeitung* 64, 16 March 1902.

40. Elisabeth Heidenreich defines "*technische Fließ*räume" [technical *flowing* spaces] as infrastructural systems consisting of the nexus of the medium's source, the connective thread and the overall technical infrastructure; taken together, they form a continuous and dynamic space as an integral part of everyday (urban) life: Elisabeth Heidenreich, "Natur und Kultur heute: verwickelt in technische Fließräume" in *Hydropolis*, 60.

41. Kaika, *City of Flows*, 58.

42. The bourgeois home itself played a key role in establishing and inscribing the social division of labour in space in many regards, as it also allocated labour responsibilities according to gendered roles—see Kaika, *City of Flows*, 58.

43. Emerging in eighteenth-century Germany, "gender characteristics" defined men as rational and active, whereas women were ascribed to be passive and emotional, reflecting the idea of women as 'natural' and men as 'cultural' beings. By the end of the nineteenth century, gender characteristics had become an accepted ideology and a dominant political instrument that declared a 'natural' world order. Karin Hausen, "Die Polarisierung der 'Geschlechtscharaktere'—Eine Spiegelung der Dissoziation von Erwerbs- und Familienleben," in *Dis/Kontinuitäten: Feministische Theorie*, edited by Sabine Hark (Springer, 2007), 162–185.

44. Veronica Strang, *The Meaning of Water* (Routledge, 2004), 24.

45. Illich, *H20 and the Waters of Forgetfulness*, 1.

46. Astrida Neimanis, *Bodies of Water: Posthuman Feminist Phenomenology* (Bloomsbury Publishing, 2016), 79.

47. According to Neimanis, who refers to the psychoanalyst Luce Irigaray, feminine bodies are both biologically fluid, in their "genital mucosity, their placental interchanges, and their amniotic flows" and figuratively fluid "in their non-subsumability into a masculine paradigm," Neimanis, *Bodies of Water*, 78.

48. Susanne Frank, "'Schmutziges Wasser' und 'schmutzige Frauen'. Zur Verbindung von Wasser- und Weiblichkeitsbildern in der Stadtentwicklung des 19. Jahrhunderts," in *Hydropolis*, 159.

49. Frank, "'Schmutziges Wasser' und 'schmutzige Frauen,'" in *Hydropolis*, 147.

50. Frank, "'Schmutziges Wasser' und 'schmutzige Frauen,'" in *Hydropolis*, 147.

51. Frank, "'Schmutziges Wasser' und 'schmutzige Frauen,'" in *Hydropolis*, 149.

52. Kirsty Bell refers to Theweleit's influential study "Männerphantasien," which traced fascist continuities in male fantasies and sexualities after WWII: Kirsty Bell, *Gezeiten der Stadt: Eine Geschichte Berlins* (Kanon Verlag, 2021), 72.

53. Illich, *H20 and the Waters of Forgetfulness*, 1.

54. Kaika, *City of Flows*, 53. Kaika traces the multiple relations between the commodification of water and social formations, especially in her chapter "Nature as the Urban Uncanny" (pp. 51–75), focusing on the effects on the 'modern home.'

55. Gandy, *The Bacteriological City*, 20. This would only change with "wider diffusion of prosperity during the twentieth century." Kaika highlights that as the bourgeois household turned into the home and a signifier for "freely flowing good water," urban public spaces were increasingly perceived as "the place where 'bad' water dwells (together with other urban anomies)"—see Kaika, *City of Flows*, 57.

56. Castonguay, "Rivers, Industrial Cities, and Hinterland Production in Quebec," 29: "[. . .] for the production of hydropower, pulp and paper, and aluminium, as well as log driving and touristic and recreational activities."

57. "Berlin ist eine arbeitsame Stadt, und an Wochentagen sieht man deshalb selten ein Vergnügungsboot auf dem Wasser; [. . .] kaum ein paar Nachtstunden sind noch übrig, in welchen die entsetzlich gestimmten Dampfspfeifen der Schleppdampfer nicht die Anwohner aus dem Schlafe schrecken. Mit dem Wasseridyll an der Spree ist es vorbei. Die Wochentagsphysiognomie des Flusses ist entschieden prosaisch [. . .] und die Bootshäuser der Ruderer sind geschlossen—Anders sieht es an Sonn- und Festtagen aus, da zeigt die Spree schon in aller Frühe eine festliche Physiognomie. Ruderer und Segler eilen mit ihren beflaggten Booten stromauf, und Dampfer mit Musik führen Gesellschaften nach Lokalen der Oberspree.": "Lokal-Nachrichten und Vermischtes: Erstes Beiblatt," *Berliner Tageblatt und Handels-Zeitung* 485, 23 September 1896; translation by the author.

58. Hellmann, "Stralau und seine Geschichte," 97: "Das idyllische Fischerdorf war dem geräuschvollen Zeitalter der Technik zum Opfer gefallen. Es war ein großes Fabrikdorf in unmittelbarer Nähe Berlins geworden."

59. "Lokal-Nachrichten und Vermischtes."

60. August Trinius, *Vom Grünen Strand Der Spree: Berliner Skizzenbuch* (J. C. C. Bruns Verlag, 1885), 40f: At that time, watersports in Berlin were concentrated on the Oberspree, the only other hotspot of water sports was in Köpenick, on the other, eastern 'end' of the Oberspree.

61. Located on the outskirts of the city (gates), yet within easy reach, Stralau came alive in the warm season and fell silent in the winter—see Hellmann, "Stralau und seine Geschichte," 96f.

62. The inauguration of new train lines, such as the Ringbahn (1877) and the Stadtbahn (1881), drew Stralau closer to Berlin, while the construction of the Tunnelbahn (1899) consolidated the Spree's shores, connecting Stralau with Treptow; Hellmann, "Stralau und seine Geschichte," 97.

63. Hannah Strothmann, "Unter dem Radar? Rudernde Arbeiterinnen oder die vergessenen Wegbereiterinnen des Frauen-Rudersports in Berlin (1892–1914)," in *Arbeit Bewegung Geschichte* III (2023), 75–97.