

Balancing Waters, Negotiating Risks: Economic Growth, Environmental Protection and Water Governance in Industrial Germany

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The scene is the Gliwice Canal, on a swelteringly hot summer day in August 2022. The Oder River presents a devastating sight: for kilometres, countless dead fish float on the water's surface, while residents and fishermen stand stunned along the banks. Within just a few days, more than 100 tons of dead fish are recovered on the Polish side, while in Germany, it is 135 tons.¹

At the time that it happened, the cause of this massive fish die-off was unclear. Speculations ranged from industrial chemical discharges to natural phenomena. After extensive investigations, scientists identified the primary culprit as a toxic algal bloom of the brackish water alga *Prymnesium parvum*. This alga produces toxins that damage the gills of fish and other aquatic organisms, ultimately causing death by asphyxiation.² But how could a brackish water alga which normally thrives in saline environments inflict such harm in the freshwater Oder? Investigations revealed that unusually high salt concentrations in the river—which were presumed to have been caused by industrial discharges from the mining company KGHM Polska Miedź on the Polish side—had created ideal conditions for its growth. Low water levels and high temperatures had further contributed to algal proliferation.³ This environmental disaster sparked a public outcry and raised urgent questions about the regulation of industrial wastewater discharges and the protection of transboundary bodies of water. One central issue preoccupied a wide range of actors. To what extent—and in what form—are state interventions necessary to protect both the environment and the population, and how can such interventions be made without jeopardising economic development and jobs?⁴

1 Eggerichs/Przemek, Jahre; Hawiger/Billig, Fischsterben.

2 MDR Wissen, Leipzig; Zimmermann, Herumdoktern.

3 Lüdemann/Venohr, Giftalge.

4 MDR Wissen, Leipzig; Zimmermann, Herumdoktern.

The establishment of a sustainable water regime has long been one of the key resource challenges of the twenty-first century. The regulation of water access for industry, agriculture, fisheries, and private users is increasingly intertwined with fundamental questions of justice, economic development and ecological sustainability. Conflicts over vital water resources are as old as civilization itself—but with the onset of industrialisation, these disputes took on a new dimension. The rapid industrial development and explosive urban population growth of the nineteenth century introduced an unprecedented dynamic into the equation.⁵

Industrialisation led to an exponential increase in the demand for water across Europe and the United States—not only for human consumption but also for industrial production processes. At the same time, the densification of urban areas resulted in the pollution of water sources, bringing issues of water quality and management to the forefront.⁶ While the technological advances of the nineteenth century offered new possibilities for water supply and irrigation, they also introduced new potential for conflict, as the control and governance of this vital resource became an increasingly central concern.⁷ With the formation and rise of various nation-states in the nineteenth century, debates emerged around the possible need for national legislation to centralise water rights and the establishment of state authorities that could be responsible for managing such regulations.⁸ The shift from locally-based access and usage rights to complex, legally codified systems not only transformed the ways in which water-related conflicts were conducted but also reshaped how they were understood and resolved.

The dangers posed by industrial water pollution and the degradation of publicly accessible water sources were a pressing concern for contemporaries. The second half of the nineteenth century witnessed the rapid rise of the chemical industry, which contributed to growing water inequality. In 1856, British chemist William Henry Perkin synthesised the first aniline dye, mauveine, thereby initiating the foundation and expansion of the synthetic dye industry.⁹ This sector became particularly significant for the German Empire, where companies such as BASF, Bayer and Hoechst played a key role in the country's economic ascent. The development and produc-

5 Sheail, *Management*, 198.

6 Sheail, *Management*, 198–200.

7 Butschek, *Industrialisierung*, 115–120.; Jakobsson *Industrialization*; Rudorff, *Verhältnis*.

8 Bayly, *Geburt*, 251–54; Osterhammel, *Verwandlung*, 680–685; Anderson, *Communities*.

9 Harrow, William.

tion of pharmaceuticals—such as Bayer’s commercialisation of aspirin at the end of the nineteenth century—also date to this period. From the mid-nineteenth century onward, industrial enterprises increasingly invested in scientific research related to chemical products and their applications. They established in-house research departments and collaborated closely with universities.¹⁰

This article aims to trace the tension in the German Empire of the late nineteenth and early twentieth centuries between the need to sustain economic growth and the need to protect the environment, and the resulting debates. It will particularly explore the dynamics of water security, assessing the interplay between industrial expansion, environmental sustainability and transboundary water governance. In the first part, this paper will specifically examine how industrial sectors assessed concerns over security at the littoral zone, favouring economic benefits at the price of significant environmental impacts. Conversely, local agriculturalists and fisheries, whose subsistence depended on the river’s resources, advocated for rigorous environmental regulation. Their claims will be analysed in the second part of this paper. The third section focuses on state responses to the disputes over industrial water pollution. It examines how local and national authorities navigated the growing tensions between economic growth and environmental protection, and how they responded to the demands of competing interest groups. Particular attention is given to the development of legal frameworks, regulatory institutions and administrative practices designed to manage water use and mitigate pollution. The section also explores how state actors interpreted and balanced notions of public health, economic security and environmental risk in their policymaking during a period of rapid industrial and social transformation.

“To protect the greater economic interest”¹¹ – Positions of Industry

Criticism of industrial water pollution increased rapidly in the second half of the nineteenth century. Numerous complaints emerged—about foul odours, undrinkable water, fish die-offs and the constraints placed on agriculture. As a result, industrialists were increasingly compelled to engage with the accusations directed at them. In 1886, the German chemist Konrad

10 *Aftalion*, History, 32–43; *Haber*, Chemical, 39–46; *Stanitski*, Chemistry.

11 *Jurisch*, Verunreinigung, 40.

Wilhelm Jurisch (1846–1917) addressed the issue of industrial wastewater disposal in rivers on behalf of the Association for the Protection of Industrial Interests. In England at this time, the introduction of strict river laws was under discussion. Jurisch warned of the potential consequences: should such laws be rigorously enforced, he claimed, many branches of English industry would face ruin.¹² While he acknowledged that the industrial sector had recognised its responsibilities and was making efforts to reduce or at least mitigate the burden of wastewater discharges, Jurisch insisted that a careful balancing of interests was required: “In the case of conflicting and irreconcilable interests, the greater economic interest must be protected.”¹³ One particularly controversial example was the Rhine. While medical professionals such as the renowned public health officer Robert Koch urgently warned of the increasing contamination of the river, industrial experts like Jurisch countered that there was, as yet, no definitive proof of a serious health threat to local populations caused by factory effluent.¹⁴

The impact of pollution on fisheries was also a matter of controversy. Representatives from the fishing sector reported damage to fish populations, particularly near the industrial wastewater discharge points. However, Jurisch countered these claims by arguing that fish came into contact with harmful substances only for a fraction of a second before seeking out clean water again.¹⁵ From this, he derived the thesis that even arsenic-laden wastewater from aniline dye factories could be discharged into large rivers such as the Rhine and the Main without harming fish or fish farming. In his broader economic assessment, Jurisch regarded the significance of the fishing industry as marginal compared to that of the industrial sector as a whole. He attributed the decline in fish stocks not solely to industrial pollution, but also to population growth and consequent overfishing. Furthermore, he emphasised the vast economic disparity between the two sectors: while the fisheries contributed six million marks to national wealth in 1882, the value added by other industry amounted to 16,022 million marks.¹⁶

These figures were used to argue that damage to the fishing industry had to be accepted in favour of industrial progress. Jurisch also downplayed

¹² Jurisch, *Verunreinigung*, 40.

¹³ Jurisch, *Verunreinigung*, 40.

¹⁴ Jurisch, *Verunreinigung*, 71–73.

¹⁵ Jurisch, *Verunreinigung*, 94–96.

¹⁶ Jurisch, *Verunreinigung*, 101.

public health concerns, asserting that it was not factory effluent but rather urban wastewater that was responsible for the spread of epidemics.¹⁷ From this, he derived the claim that the discharge of industrial wastewater into rivers was not only necessary but also legitimate. Rivers, he argued, were “natural conduits” for wastewater, and their use for this purpose was justified in the interest of industrial development.¹⁸ This line of reasoning must be situated within the broader economic and political context of the so-called “Long Depression” that followed the stock market crash of 1873. In Germany, the crisis marked the end of the speculative boom of the early 1870s and ushered in a prolonged period of economic stagnation, intensified by overproduction, market saturation and increasing international competition. Industrial consolidation and state intervention became defining features of the era, as the belief grew that industrial progress was essential for Germany to remain a strong nation, including for it to retain its military strength. It was within this climate of economic uncertainty and shifting priorities that arguments like those put forward by Jurisch gained traction.¹⁹

By the early twentieth century, industrial actors were beginning to acknowledge broader safety concerns, particularly the need to balance the economic safety of industry with the environmental security of water resources. However, economic considerations still dominated, with industries advocating for state subsidies to avoid bearing the full cost of wastewater treatment. Unlike Jurisch, who had rejected the idea 15 years earlier due to excessive costs, Georg Adam investigated the wastewater issue in 1905 on behalf of the Association of the German Textile Finishing Industry. He argued that the industry had to take technically feasible measures to purify wastewater before discharging it into rivers.²⁰ Adam reasoned that if industry had the right to discharge waste into bodies of water, others also had the right to use those waters for their own purposes. However, Adam

17 Jurisch, *Verunreinigung*, 107. Jurisch’s argument reflects a broader shift in environmental governance during the late nineteenth century, when industrial development was increasingly prioritised over ecological and public safety concerns. Speaking with Uwe Lübken and Frank Uekötter, risk-taking needs to be analysed in its broader context by focusing not only on single events but on longer perspectives of risk-taking. Lübken/Mauch, *Environments*, 2. See also: Uekötter/Lübken, *Functions; Worster, Rivers*, 19–21; Smith, *Hazards*, 54–56.

18 Jurisch, *Verunreinigung*, 108.

19 Wehler, *Gesellschaftsgeschichte*, 552–558.

20 Adam, *Stand*, 5.

was also concerned with minimising the costs for industrial operations. He proposed that state subsidies were necessary to enable factories to invest in purification systems, as the cleaning of wastewater was in the public interest. Nevertheless, the issue of economic efficiency had to be considered in the interest of the common good. Economic interests needed protection,²¹ and these interests were rated higher than those of fisheries, agriculture or local residents. While the various industrial sectors now admitted responsibility for river pollution, this responsibility was seen as limited and justified by the public interest in economic development. Adam also emphasised that domestic wastewater posed a more serious threat in terms of infectious diseases than industrial effluent.²² While this was scientifically accurate, it simultaneously served to divert attention from other environmental damage that affected different occupational groups and local residents. Like Jurisch, Adam focused on contrasting public welfare with economic efficiency.²³ The interests of industry were deemed worthy of protection due to their economic value, as they contributed to the common good through job creation and added value.

Many representatives of industry in the early twentieth century acknowledged that their wastewater posed a problem, but they also emphasised that no viable solutions were available. In 1905, W. Beumer stated in the *Mitteilungen des Vereins zur Wahrung der gemeinsamen wirtschaftlichen Interessen in Rheinland und Westfalen* (Newsletter of the Association for the Protection of Joint Economic Interests in the Rhineland and Westphalia) that the comprehensive purification of wastewater was either impossible or associated with extremely high costs. While commercial enterprises were increasingly restricted in their use of rivers and streams for waste disposal, there remained uncertainty regarding what industry could and could not do from a legal perspective.²⁴ Beumer stressed that although industry had to take responsibility for maintaining orderly (“ordentliche”) conditions, overly strict regulation could jeopardise its competitiveness. A complete and standardised solution to the wastewater issue was deemed unrealistic, yet industry was willing to support research in this area.²⁵ In this context,

21 Adam, Stand, 85–89.

22 Adam, Stand, 36.

23 Adam, Stand, 89–96.

24 BArch (Bundesarchiv Berlin), R 1501/ 109244, W. Beumer, *Mitteilungen des Vereins zur Wahrung der gemeinsamen wirtschaftlichen Interessen in Rheinland und Westfalen*, hrsg. vom Vereins-Vorstande, Jg. 1905, Nr. 4.

25 Ibid.

a lack of scientific knowledge contributed to the persistence of existing inequalities in access to water.

Analyses by industry-aligned experts at the turn of the nineteenth to the twentieth century reveal that their conception of the common good was primarily shaped by the economic benefits of industrial development. Safeguarding the public interest was equated with maintaining a flourishing industrial sector, whose contribution to societal stability was seen above all in the creation of jobs and the increase of national wealth. Embedded in this understanding was a distinct logic of security: the continued functioning and competitiveness of industry were considered essential to the economic and social order. Consequently, minimising health and environmental damage became a secondary concern—relevant only insofar as such harms posed a direct threat to productive capacity. Although companies publicly acknowledged their responsibility to reduce harmful discharges, they clearly tied this commitment to the condition that their economic performance remain unaffected. In doing so, they promoted an interpretation of the common good that positioned industrial progress as the primary driver of societal well-being. This legitimised an implicit logic in which social and ecological interests were subordinated to the imperative of economic security.

Industry representatives accordingly invoked a “natural right” to discharge wastewater into the environment.²⁶ However, increasing political pressure—such as that resulting from investigations by the German Imperial Health Office into a sugar refinery in Dessau—forced some companies to reconsider their position.²⁷ At the same time, individual industrial sectors shifted responsibility onto one another: the textile finishing industry and the Association of German Potash Interests, for example, identified paper, cellulose, starch and sugar factories as the main sources of water pollution.²⁸ The potash industry, however, came under particular scrutiny from environmental advocates and other industrial sectors after the German-American hygienist William Philipps Dunbar demonstrated in reports in 1913 and 1914 that potash wastewater could seep into deeper soil layers, potentially endangering groundwater quality and thus undermining envi-

26 *Baumeister*, Referat, 89–92.

27 BArch, R 86/ 2524, Gutachten betreffend die Ableitung cyanhaltiger Abwässer der Zuckerraffinerie zu Dessau in die Elbe, Kaiserliches Gesundheitsamt 2009/07.

28 BArch, R86/ 2522, Verein der deutschen Kaliinteressenten, Geschäftsführer, an Staatssekretär des Inneren, 10.7. 1913.

ronmental and public health security.²⁹ In response, the chemist Johann Heinrich Vogel, writing on behalf of the journal *Chemische Industrie*, issued a counter-statement dismissing any potential threat to tea or drinking water.³⁰

The contradiction between Dunbar's findings and Vogel's rebuttal illustrates how scientific knowledge became instrumentalised by various actors in negotiating competing visions of security. Industry stakeholders, equipped with financial resources and extensive networks, commissioned their own experts or published studies supporting their position. Through these means, they sought to ensure regulatory predictability and economic security, asserting their perspective as scientifically legitimate. By influencing public discourse, these actors aimed to safeguard their operational freedom, framing environmental pollution as a manageable risk rather than a fundamental threat to societal stability.³¹

The disputes reveal a fragmented landscape of competing interests, in which numerous actors—from fisheries and local residents to rival industrial sectors—argued against one another. Because the state had access to only a limited number of qualified experts and the legal framework remained ambiguous, influential companies often succeeded in pushing through their demands for minimal regulation.³² The resulting environmental costs typically affected residents, fisheries and agriculture disproportionately. Nonetheless, pressure increased to reconcile these divergent interests under the banner of the common good; while biologists such as Paul Schiemenz argued that a “robust, thriving industry”³³ and responsible wastewater management were equally vital to ensuring the broader security interests of the nation, industrial actors leveraged their political influence to prevent stringent regulatory measures, thereby preserving their right to discharge wastewater into public waters largely unimpeded.³⁴

Demands for an imperial law emerged in response to the perceived inadequacy of the existing legal framework. In this era of ground-breaking technological advancements, the introduction of the Imperial Trade Regulation (*Reichsgewerbeordnung*) of 1883 was intended to redefine the relationship

29 Dunbar, *Abwässer*, 21; Dunbar, *Abwässer II*, 9–13. On the debate about the potash industry as a cause of water pollution, see also Büschenfeld, *Flüsse*, 289–290; 299–303.

30 Vogel, *Abwässer*, 131–136.

31 Büschenfeld, *Flüsse*, 251–254.

32 Wey, *Umweltpolitik*, 42–44.

33 Schiemenz, *Einwirkung*, 381.

34 Corsten, *Wasserressourcen*, 600.

between industry, society and the environment.³⁵ This trade regulation, which was to be continuously expanded over the years, articulated a new understanding of responsibility and environmental protection. However, the roots of this environmental legislation reach further back. As early as 1869, the trade policy (*Gewerbeordnung*) for the North German Confederation laid the groundwork for protecting the population and its environment from industrial pollution—an ambition that can be traced even earlier to the Prussian *Gewerbeordnung* of 1845.³⁶ In contrast to previous, rather hesitant efforts to counteract environmental pollution, the Imperial Trade Regulation of 1883 represented a markedly more comprehensive approach. It established uniform legal conditions for industry and commerce and, for the first time, introduced specific legal provisions for the protection of water bodies from industrial contamination. It mandated permits for certain trades deemed potentially hazardous to the environment, thereby enabling the implementation of preventive measures against water pollution. This new legislation signalled a growing awareness of environmental protection and public health, although its practical enforcement was often hampered by the influence of local interests and industrial stakeholders.³⁷

The legal foundations of environmental regulation at the time operated with vague terms such as “the common good” (*Gemeinwohl*) or what was considered “customary” (*gemeinüblich*). In 1886, the Imperial Court ruled that the discharge of wastewater was generally permissible as long as it did not “exceed the customary degree, even if this impairs the absolute usability of the inflowing water for any arbitrary purpose”.³⁸ Whether a particular discharge exceeded what was considered customary had to be assessed on a case-by-case basis. In addition to this ruling, the Imperial Trade Regulation provided legal grounds for restricting industrial activity in the German Empire. Industrial operations could be suspended at any time due to overriding disadvantages and dangers to the public good. As in the Imperial Court’s ruling, this phrasing presented a fundamental problem: notions of what constituted harm, and at what point it became unacceptable, varied considerably. Moreover, administrative authorities and the court often reached divergent decisions on such matters.³⁹

35 Olmer, *Wasser*, 132.

36 Olmer, *Wasser*, 133; *Büschendorf, Flüsse*, 196–199.

37 Olmer, *Wasser*, 133–135.

38 Adam, *Stand*, 10.

39 Fischer, *Wasser*, 93–95; Zellner, *Verunreinigung*, 70–74.

The German Civil Code (*Bürgerliches Gesetzbuch*, BGB) of 1900 also addressed these issues. According to Section 906, discharges into rivers were permissible to the extent that they corresponded with what was “locally customary” (*ortsüblich*). However, verifying this remained difficult, as the standards for what constituted “customary” at either the local or general level were not clearly defined. While public interest was nominally taken into account, there were no established regulatory bodies or thresholds in place to ensure compliance.⁴⁰ Due to increasing pollution of major trans-boundary rivers such as the Rhine, particularly by upstream federal states,⁴¹ Prussia adopted more restrictive water regulations than other German states. In 1901, a Prussian decree on water purity mandated that police officers and gendarmes supervise and report water pollution. They were also instructed to inspect industrial facilities regularly and without prior notice. Medical officers were likewise authorised to monitor waterways. These measures met with criticism, as neither police nor medical officers had the necessary training.⁴² In 1913, following lengthy debates, Prussia significantly tightened its water legislation. According to Sections 25 and 41 of the Prussian Water Act, wastewater discharges were prohibited if they were shown to have caused harm to others. This helped to prevent an increase in pollution levels. However, the law did not address existing pollution: under Section 379, the longstanding right to discharge wastewater remained in place, provided approval from the industry’s supervisory authorities had been granted. In most cases, there were no qualified experts to assess such approvals.⁴³ While the new legislation improved conditions within Prussia, it did not establish a unified imperial law nor a comprehensive system of state oversight and enforcement. As a result, large rivers such as the Rhine remained heavily polluted. For instance, industries in Baden were able to continue discharging wastewater into the Rhine without restriction, thereby causing harm to both enterprises and residents in downstream western Prussia.

Meanwhile, the perspective of industrialists on stricter water legislation began to shift in the years around 1900. Industry representatives increasing-

40 Fischer, Wasser, 101–103.

41 While Prussia is often associated with its eastern provinces, after the Congress of Vienna (1815) the kingdom also incorporated extensive western territories, including the Rhineland and Westphalia. These regions became central to Prussia’s industrial development

42 Adam, Stand, 17–18.

43 Olmer, Wasser, 374–376.

ly faced pressure as their own production processes also suffered from severe water pollution. In 1902, chemistry professor Ferdinand Fischer from the University of Göttingen comprehensively addressed the assessment of industrial and municipal wastewater in public waterways in his work, *Das Wasser, seine Verwendung, Reinigung und Beurtheilung mit besonderer Berücksichtigung der gewerblichen Abwässer und der Flussverunreinigung* (Water, its Use, Purification and Analysis, with a Particular Consideration of Industrial Wastewater and River Pollution). In his analysis, Fischer criticised the “highly exaggerated demands of some agricultural representatives,” emphasising at the same time that the “one-sided fish advocates” paid insufficient attention to the fact that agricultural practices could themselves harm fish populations and even negatively impact industrial sectors.⁴⁴ Fischer argued that these resulting conflicts of interest could not be resolved “from behind an office desk,” but instead required the expertise of “chemists with practical technical experience.”⁴⁵ Furthermore, Fischer pointed out that various sectors—including starch, sugar and beer production, as well as tanneries, bleaching and dyeing industries—depended significantly on clean water for manufacturing their products.⁴⁶ He simultaneously stressed that freely flowing water should remain dedicated to the public welfare and thus should not fall entirely under the control of any single owner.

Industrial representatives accordingly advocated legislative reform, albeit explicitly oriented towards corporate interests. Already in June 1907, the German Central Association for Hydraulic Engineering and Water Management, represented by its general secretary Dr Max Sasse, asserted its goal of “representing the interests of all parties involved in water management issues, particularly those of industry and affiliated circles.”⁴⁷ The primary aim was a fundamental revision of outdated laws in a way that adequately considered industrial, agricultural and municipal needs alike; how this should be done remained unspecified.

The concept of safety in industrial considerations was primarily focused on the potential for economic growth. They viewed the costs of maintaining clean water as uneconomical, and thus downplayed the risks to rivers. To sum up, industrial actors often framed their economic contributions as essential to the safety of the nation, arguing that any regulation threatening

44 See: Fischer, *Wasser*, v–vi.

45 Fischer, *Wasser*, v–vi.

46 Fischer, *Wasser*, 30–35.

47 BArch Berlin, R 154/ 10327, Dr. Max Sasse, Generalsekretär des Centralverbandes für Wasserbau und Wasserwirtschaft an RMdI, Juni 1907.

industrial productivity would undermine national security by reducing jobs and weakening the economy. This conflation of economic safety with national security allowed industries to resist stricter environmental regulations.

“The Deadly Waters”⁴⁸ – Demands for Greater Water Security

The lack of a comprehensive water law for the entire German Empire as well as the lack of any regulatory body contributed to inequalities between industrial, fishing and agricultural enterprises, as sanctions on actors responsible for polluting rivers often remained de facto unworkable. State institutions and legislators were unprepared for the economic and environmental consequences of pollution and acted only gradually in response to the increasing criticism from various actors, such as fishing associations.⁴⁹ Overall, these associations viewed the damage caused by wastewater pollution as incalculable. Fishing enterprises, whose livelihoods depended on clean water, viewed the degradation of rivers as a direct threat to their economic safety, linking the loss of fish stocks and increased flood risks to broader concerns over public health and environmental security. Around the turn of the century, German rivers had experienced an increase in floods.⁵⁰ The rising threat of flooding due to wastewater, particularly along the Rhine, further fuelled the fishing industry’s pessimism.⁵¹ Thus, in response to arguments that they were economically insignificant compared to manufacturing industries, they countered that they, too, had suffered significant financial losses. They had experienced production shortfalls that significantly reduced their economic yields.

That various fishing associations opposed manufacturing’s view of their economic insignificance is hardly surprising. In 1913, the West German Fishing Association estimated the annual loss to fishing due to river pollution at 125 million marks. From the Association’s perspective, the industry threatened the safety of the river for other actors, such as local fishermen and residents, through pollution, which led to fish die-offs, environmental

48 BArch Berlin, R 86/2424, Louis Parisot: *Chimiste. Les Eaux Homicides*, in: *Le Matin*, Nr. 6069, 7.10.1900.

49 Büschenfeld, *Flüsse*, 193–97.

50 Hannig, *Suche*.

51 Heine, *Beiträge*, 152.

disasters and the unusability of the water. Yet other, fundamental values were also at stake: water was necessary “in common use for drinking, watering livestock, washing and cooking [...]” and much more:⁵²

Water, which we necessarily require for common use [...] rightly represents our greatest national wealth. Whoever destroys or degrades this natural treasure for the benefit of a few not only harms the fishing industry but also agriculture, trade and industry, endangering public health and our national defence.⁵³

In emphasising the threat to the common good, representatives of the fishing associations demanded that all “beneficiaries” of the rivers, such as industry, but also agricultural and fishing associations and state institutions, must take action to improve the situation.⁵⁴ Fishing representatives were well aware that the economy of the German Empire depended on industry. Curt Weigelt saw the “nourishment of the German people” to be at risk if the regulations were too strict.⁵⁵ He therefore called for legal provisions “that limit industry without imposing unaffordable sacrifices, that supervise industry without harassing it with rigid regulations.”⁵⁶ Finding the right balance between restrictions and freedoms for the industry presented a significant challenge for contemporary actors. Fishing representatives saw the state as particularly responsible for legislating in a way that took the interests of all parties into account.

However, even among fisheries representatives, there were moderate voices striving to reconcile seemingly divergent interests. One prominent example was Professor Paulus Schiemenz (1856–1936), director of the State Institute for Fisheries in Berlin-Friedrichshagen and Professor of Fisheries and Fish Breeding at the Agricultural College in Berlin. Widely recognised as the founding figure of modern fisheries science,⁵⁷ Schiemenz repeatedly addressed the pressing issue of water pollution and its adverse impact on inland fisheries through numerous expert reports and public lectures. Overall, Schiemenz advocated greater efforts in wastewater treatment to

52 BArch Berlin, R 86/ 2523, Bericht über die am 25.Oktober 1913 zu Magdeburg abgehaltene XXIX. Generalversammlung des Westdeutschen Fischerei-Verbandes, erstattet vom Verbands-Vorstande.

53 Ibid.

54 *Weigelt*, Fischgewässer, 245–47.

55 *Weigelt*, Schädigung, 30–31.

56 *Weigelt*, Schädigung, 40.

57 *Köfler-Trockner*, Auf den historischen Spuren des IGB, 86–87.

protect fish populations sustainably. Nevertheless, he explicitly argued against imposing sweeping restrictions on industry, cautioning against creating unnecessary obstacles to industrial development.⁵⁸ According to Schiemenz, effective solutions required detailed, case-by-case evaluations of different wastewater types and their specific impacts on fisheries. This approach was especially pertinent for industries such as paper, cellulose, starch and sugar production, where sedimentation basins represented a beneficial measure but were not universally applicable.

Schiemenz emphasised the importance of scientifically grounded analyses to accurately determine which wastewater discharges genuinely harmed aquatic ecosystems before implementing extensive regulatory measures. He further criticised the fisheries representatives for their delayed efforts in developing robust scientific foundations for assessing wastewater issues. Due to this delay, these critical matters had frequently been addressed by non-experts rather than specialists, resulting in misguided judgments and inadequate regulations. Schiemenz utilised his scientific expertise to present a nuanced and less normative assessment of the situation. In his 1918 expert report for the Imperial Health Authority, later published in 1925 in the *Zeitschrift für Fischerei und deren Hilfswissenschaften*, Schiemenz emphasised the necessity of this differentiated approach, stating: “It is in the collective interest of our nation to maintain a vigorous, thriving industry, but it is equally in the collective interest that wastewater be discharged in a manner causing no harm.”⁵⁹ Schiemenz was advocating a balance between economic development and environmental protection, rejecting blanket prohibitions or regulations as inappropriate. Instead, he strongly recommended thorough, individual assessments of each specific scenario to ensure both the sustainability of fisheries and the economic vitality of industry.⁶⁰

Schiemenz’s analyses and proposals highlighted the intricate tensions between economic interests and environmental safeguards. His arguments underscored the importance of rational, scientifically-informed evaluations,

58 BArch Berlin, R 86/ 2522, P. Schiemenz, Wasserverunreinigung und Fischerei, in: Bericht des Geschäftsführers des Vereins der deutschen Kaliinteressenten an Staatssekretär des Inneren, 10.07.1913.

59 BArch Berlin, R 86/ 2522. Über die Einwirkung der Abwässer der Kali-Bergwerke auf die fischereilichen Verhältnisse der Leine, Gutachten erstattet dem Reichsgesundheitsamt im Februar 1918, in: *Zeitschrift für Fischerei und deren Hilfswissenschaften* 23.3 (1925), pp. 381–413, p. 381.

60 Ibid.

reflecting his nuanced perceptions of risk and safety. His work demonstrated that wastewater management encompassed not merely environmental protection concerns but also broader issues of economic justice and industrial advancement. Ultimately, few contemporaries engaged in such carefully considered mediation efforts.

Conversely, one “Scriba” (first name unrecorded) of the Chamber of Agriculture in Halle inverted the argument concerning the economic significance of industry. He acknowledged that industries such as sugar and paper had made notable progress in treating organic wastewater, but pointed out the persistent challenges posed by inorganic wastewater.⁶¹ Scriba warned about the increasing degradation of German rivers into “sewers” (*Kloaken*) and criticised many factories for neglecting treatment measures purely in order to save costs. According to him, the financial investment required for wastewater treatment facilities was minimal compared to the substantial economic profits that industries were making. Scriba asserted emphatically: “Many factories have no right to pollute the most essential condition of life for their fellow citizens and transform our magnificent German rivers into sewers simply to save a one-time expense of 2 % on the minimal maintenance costs of these facilities!”⁶²

With this statement, Scriba was condemning the environmentally destructive practices of many factories, driven primarily by greed, which neglected appropriate wastewater treatment measures. Like many industry critics, he employed ethical—particularly utilitarian—arguments to elevate his position morally. He criticised the short-sightedness of factory owners, arguing that a mere 2 percent of maintenance costs was tiny compared to the severe ecological and societal consequences that would result if action was not taken.⁶³ Scriba depicted the pollution of rivers, which were essential for both human and other natural life, as unethical and irresponsible. The stark contrast he drew between the “magnificent German rivers” and their impending transformation into “sewers” underscored not only physical damage but also the cultural loss associated with such environmental destruction. Rivers, he argued, were not merely natural resources but integral parts of a nation’s landscape, history and identity.⁶⁴ Scriba thus articulated a moral appeal: economic interests must not overshadow

61 Ibid.

62 Ibid.

63 Ibid.

64 On rivers and cultural identity see: *Cioc*, Rhine, 10–14; *Etzemüller*, Landschaft, 17–18.

the common good and environmental protection. Companies had societal responsibilities and must take proactive measures to prevent long-term damage.⁶⁵ His statements explicitly rejected short-term, profit-driven thinking in favour of a more conscious approach to managing natural resources.

The contrasting perspectives of Schiemenz and Scriba highlight the critical role played by risk assessment and safety considerations among fisheries and agricultural representatives. These evaluations not only framed environmental protection as an ecological necessity but also situated it within broader ethical, economic and social discourses. The interplay between careful, scientifically-informed decisions and ethical accountability underscored the fundamental tension involved in balancing immediate economic benefits against long-term ecological sustainability. But while farmers and fishermen emphasised the dangers and risks that pollution posed to ecological sustainability, industrial companies rebutted such claims with the alleged self-purifying capacity of rivers, a concept popularised by Max von Pettenkofer in the late nineteenth century.⁶⁶ According to this theory, rivers possessed a natural ability to cleanse themselves through the dilution, sedimentation and microbial breakdown of organic waste. This view suggested that bodies of water could absorb and neutralise pollutants without long-term environmental harm.

Around the turn of the century, however, different perspectives emerged regarding the long-term consequences of industrial pollution. Although the theory of self-purification was still influential, it was increasingly considered disproven—at least to the extent of the claims originally made by Pettenkofer. At the same time, perceptions of risk and the desire for security played a growing role in public discourse, particularly in the context of natural disaster prevention.⁶⁷ However, the long-term environmental consequences of pollution were often seen as less immediate or threatening by large parts of the population.

These debates illustrate how perceptions of risk and safety profoundly shaped policy discussions. State actors, caught between the demand for economic growth and rising concerns over environmental degradation, faced a dilemma: how to ensure both economic and environmental safety. This tension often resulted in half-hearted measures, as stricter regulations

65 BArch Berlin, R 86/ 2523, Bericht über die am 25. Oktober 1913 zu Magdeburg abgehaltene XXIX. Generalversammlung des Westdeutschen Fischerei-Verbandes, erstatet vom Verbands-Vorstande.

66 *Büschendorf*, Flüsse; *Büschendorf*, Abwasserproblem, 34.

67 *Hannig*, Zukunft; *Hannig*, Gefahren, 23.

were seen as potentially destabilising for the economy, even though the environmental risks threatened long-term societal safety.

Balancing Acts: The State as Mediator between Contested Evaluations of Safety and Risk

State institutions and administrative bodies in Germany increasingly recognised river pollution as a serious concern. They faced the challenge of evaluating and reconciling the numerous conflicting perspectives on the extent of river contamination. As legal debates remained contentious, state authorities were compelled to respond to the growing divergence of views regarding the causes and consequences of water pollution. Around the turn of the century, various governmental agencies were established tasked with addressing these issues. These institutions were intended to function as neutral, scientific bodies, providing expert assessments in cases of conflict and thereby contributing to the resolution of disputes.⁶⁸ On 1 April 1901, the Royal Testing Institute for Water Supply and Wastewater Disposal was established, primarily aiming at disease prevention and ensuring the “favourable economic development of populous communities,” as emphasised by Privy Medical Councillor R. Abel, an institute official, in 1913.⁶⁹ Abel stressed that the institute was conceived as an entity working in the public interest, advising central authorities and ministries.

Initially, the institute consisted of eleven staff members, including seven scientists. Due to rising demand and the increasing volume of evaluations, its budget and staff grew significantly. By 1912, the institute employed 44 people, including 25 scientists (physicians, chemists, engineers, botanists, zoologists), five technicians and seven office clerks. Scientists regularly collected water samples from Prussian rivers, predominantly focusing on the western, Rhine province, where 869 analyses were conducted between 1901 and 1912. The primary purpose of the institute was to advise state authorities, eliminating the need to commission private experts.⁷⁰ Additionally, industries such as textile factories, tanneries, leather factories and paper mills commissioned the institute’s evaluations, with private clients paying fees for these services. The unexpectedly high demand for evaluations

68 *Büschendorf*, Flüsse, 208–210.

69 *Abel*, Rat, 7.

70 *Abel*, Rat, 10–13.

Yet nearly simultaneously with the establishment of the Royal Testing Institute, a similar initiative emerged at the imperial level through the creation of the Imperial Health Council (*Reichsgesundheitsrat*) on 20 March 1901. The Council's main responsibility was to prepare advisory reports aimed at improving water conditions, particularly regarding public health and veterinary regulation.⁷² However, these assessments lacked legal authority, and interventions could only be initiated at the explicit request of individual federal states. Consequently, as the German interior minister recognised in the 1920s, these expert evaluations frequently proved ineffective as policy instruments.⁷³

The Royal Institute's evaluations, often favouring industrial establishments, reflected broader perceptions of security and risk. By utilising state and scientific authority, its assessments reinforced existing risks to public

74 Olmer, Wasser, 287–290.

health and perpetuated the dominance of certain industrial actors.⁷⁵ This dynamic illustrates how contested scientific knowledge could be mobilised to shape societal perceptions of risk and security, effectively supporting and entrenching established power relations. Thus, the establishment of centralised water governance institutions, despite public hopes, did not necessarily yield beneficial outcomes for all stakeholders. The establishment of these institutions demonstrated an awareness of the need for state regulation, but implementation was often inadequate as a means of effectively addressing the issue of river pollution. On the one hand, the interests of the various federal states clashed, many of which were critical of national legislation. On the other hand, various (especially industrial) associations exerted pressure on the government.⁷⁶ They saw state regulation as a threat to their economic growth. Particularly conservative and right-wing liberal parties in the Reichstag blocked progress toward national legislation in the early twentieth century due to their close ties to industry.⁷⁷ Jürgen Büschenfeld summarised: “The law had been adapted to the socioeconomic conditions of the young industrial society”.⁷⁸

Contested Waters: Risk, Security and the Politics of Expertise

Current political debates in Germany vividly illustrate the persistent tension between industrial growth and ecological protection. Friedrich Merz, leader of the Christian Democratic Union (CDU) and German Chancellor since May 2025, has emphasised that industry is at least as important as climate protection, advocating for a balanced approach that does not endanger industrial operations.⁷⁹ Similarly, former federal minister for foreign affairs Sigmar Gabriel has criticised the European Union’s proposal to ban internal combustion engines by 2035, warning that such measures could jeopardise key pillars of the German economy, particularly the car industry.⁸⁰ These perspectives underscore the ongoing tension between advancing environmental objectives and sustaining industrial strength, a balance that is crucial for Germany’s economic future. Policymakers grap-

75 *Das Kaiserliche Gesundheitsamt*, Kaiserliche.

76 Corsten, *Wasserressourcen*, 600–601; Wey, *Umweltpolitik*, 44.

77 Corsten, *Wasserressourcen*, 600–601.

78 Büschenfeld, *Abwasserproblem*, 44.

79 *Deutschlandfunk*, Merz.

80 *Die Welt*, “Gabriel”.

As this article shows, this contemporary dynamic can be historically

Conversely, fishermen, farmers and local residents focused primarily on

82 *Büschendorf, Natur; Büschendorf, Visionen.*

83 Corsten, Wasserressourcen, 600; Wey, Umweltpolitik, 42–45.

too great. At the same time, available technological solutions were still underdeveloped and, from the perspective of many industrial enterprises, too costly to implement.⁸⁴

The lack of a unified legal framework and dedicated regulatory institutions further complicated efforts to balance these competing interests. Fragmented regulations and inconsistent enforcement hindered clear resolutions, despite growing attention to environmental and public health concerns. Ultimately, economic security commonly took precedence due to industry's critical role in fostering economic growth and improving living standards. The divergent perspectives and priorities regarding safety between industry and local communities shaped environmental governance significantly, influencing regulatory outcomes. These early twentieth-century conflicts set significant precedents for future resource management issues. Prioritising immediate economic gains without sufficiently accounting for long-term ecological impacts created enduring environmental challenges, complicating later efforts towards pollution control and sustainable resource management in the twentieth and twenty-first centuries.

Bibliography

- Abel, R.: Vortragendem Rat im Ministerium des Innern, Leiter der Landesanstalt für Wasserhygiene, in: Mitteilungen aus der Kgl. Prüfungsanstalt für Wasserversorgung und Abwässerbeseitigung 17 (1913), pp. V–XVII.
- Adam, Georg: Der Gegenwärtige Stand der Abwässerfrage dargestellt für die Industrie unter besonderer Berücksichtigung der Textilveredlungsindustrie: Auf Veranlassung des Vereins der Deutschen Textilveredlungsindustrie Düsseldorf. Braunschweig 1905.
- Aftalion, Fred: *A History of the International Chemical Industry: From the "Early Days" to 2000*. Philadelphia, Pa. 2001.
- Anderson, Benedict R. O'G.: *Imagined Communities: Reflections on the Origin and Spread of Nationalism*. London/New York 2016.
- Baumeister: Referat, in: Deutscher Verein für öffentliche Gesundheitspflege: Bericht des Ausschusses über die Fünfte Versammlung des Deutschen Vereins für öffentliche Gesundheitspflege zu Nürnberg am 25. bis 27. September 1877, 1878.
- Bayly, Christopher Alan: *Die Geburt der modernen Welt: Eine Globalgeschichte 1780–1914*. Frankfurt am Main 2008.
- Büschendorf, Jürgen: *Flüsse und Kloaken: Umweltfragen im Zeitalter der Industrialisierung (1870–1918)*. Stuttgart 1997.

84 Olmer, Wasser, 44–45.

- Büschendorf, Jürgen: Visionen des Fortschritts: Grenzwerte in der Gewässerschutzdebatte um 1900, in: Dienel, Hans-Liudger (ed.): Visionen des Fortschritts. Stuttgart 1998, pp. 77–128.
- Büschendorf, Jürgen: Natur oder Technik – Selbstreinigung oder Kläranlage? Kommunale Abwasserbeseitigung und Hygienevorstellungen im späten 19. und frühen 20. Jahrhundert, in: Dinçkal, Noyan/Mohajeri, Shahrooz (eds.): Natur oder Technik – Selbstreinigung oder Kläranlage? Berlin 2001, pp. 183–206.
- Büschendorf, Jürgen: Das Abwasserproblem im Widerstreit der Interessen: Akteure, Konflikte und Lösungsmuster in der Phase der Hochindustrialisierung, in: Berbermeier, Wiebke/Henning, Anna-Sarah/Mutz, Mathias: Vom Wasser: Umweltgeschichtliche Perspektiven auf Konflikte, Risiken und Nutzungsformen. Siegburg 2008, pp. 17–47.
- Butschek, Felix: Industrialisierung: Ursachen, Verlauf, Konsequenzen. Wien/Köln/Weimar 2006.
- Cioc, Mark: Rhine: An Eco-Biography, 1815–2000. Seattle 2009.
- Corsten, Anna: Wasserressourcen als umkämpftes Gut: Forschungen zu Wassersicherheit im 19. und 20. Jahrhundert, in: Archiv für Sozialgeschichte 63 (2023), pp. 589–622.
- Das Kaiserliche Gesundheitsamt: Das Kaiserliche Gesundheitsamt: Rückblick auf den Ursprung sowie auf die Entwicklung und Thätigkeit des Amtes in den ersten zehn Jahren seines Bestehens. Unpublished manuscript, 1886.
- Deutschlandfunk: Merz sieht Ausstieg aus Kohle und Gas nur, wenn Industrie dadurch nicht gefährdet wird. URL: <https://www.deutschlandfunk.de/merz-sieht-ausstieg-aus-kohle-und-gas-nur-wenn-industrie-dadurch-nicht-gefaehrdet-wird-106.html>. (Accessed March 27, 2025).
- Die Welt: Sigmar Gabriel hält Verbrenner-Verbot für ruinös für Deutsche Wirtschaft. URL: https://www.welt.de/wirtschaft/article253872920/Autoindustrie-Sigmar-Gabriel-haelt-Verbrenner-Verbot-fuer-ruinoes-fuer-deutsche-Wirtschaft.html?utm_source=chatgpt.com. (Accessed March 27, 2025).
- Dunbar, William Philipps: Die Abwässer der Kali-Industrie: Gutachten Betr. die Versalzung der Flüsse durch die Abwässer der Kali-Industrie. München/Berlin 1913.
- Dunbar, William Philipps: Die Abwässer der Kali-Industrie: Zweites Gutachten Betr. die Versalzung der Flüsse durch die Abwässer der Kali-Industrie. München/Berlin 1914.
- Eggerichs, Grit/Zuk, Przemek: Zwei Jahre nach dem Fischsterben: So geht es der Oder jetzt, in: Deutschlandfunk. URL: <https://www.deutschlandfunk.de/zwei-jahre-nach-dem-fischsterben-deutschland-polen-und-die-oder-dlf-49bc79a0-100.html>. (Accessed March 14, 2025).
- Etzemüller, Thomas: Landschaft und Nation: Rhein – Dalarna – England. Bielefeld 2022.
- Fischer, Ferdinand: Das Wasser, seine Verwendung, Reinigung und Beurtheilung mit besonderer Berücksichtigung der gewerblichen Abwässer und der Flussverunreinigung. Berlin 1902.

- Günther, Carl: Die Wissenschaftliche Tätigkeit der Landesanstalt für Wasserhygiene in den ersten 12 Jahren ihres Bestehens, in: Mitteilungen aus der Kgl. Prüfungsanstalt für Wasserversorgung und Abwässerbeseitigung 17 (1913), pp. V–XVII.
- Haber, Ludwig Fritz: *The Chemical Industry During the Nineteenth Century: A Study of the Economic Aspect of Applied Chemistry in Europe and North America*. Oxford 1969.
- Hannig, Nicolai: Die Suche nach Prävention: Naturgefahren im 19. und 20. Jahrhundert, in: *Historische Zeitschrift* 300 (2015), 1, pp. 33–65.
- Hannig, Nicolai: Die Zukunft als Gefahr: Katastrophenschutz im 20. Jahrhundert, in: Hölscher, Lucian (ed.): *Die Zukunft des 20. Jahrhunderts: Dimensionen einer historischen Zukunftsforschung*. Frankfurt am Main/New York 2017, pp. 253–277.
- Hannig, Nicolai: *Kalkulierte Gefahren: Naturkatastrophen und Vorsorge seit 1800*. Göttingen 2019.
- Harrow, Benjamin: William Henry Perkin, in: *The Scientific Monthly* 9 (1919), pp. 234–245.
- Hawiger, Daniel/ Billig, Michael: Fischsterben in der Oder: Wie ein Fluss zur Giftfalle wurde. With the assistance of Mark Hugo and Michael Wiedemann, in ZDF: Video. URL: <https://www.zdf.de/dokumentation/umwelt-crime/umwelt-crime-das-fischsterben-in-der-oder-100.html>. (Accessed March 14, 2025)
- Heine, H.: Beiträge zur Schädigung der Landwirtschaft durch Industrielle Abwässer – Zusammengestellt nach den Jahresberichten der Fabrik-Investoren und Gewerbe-Aufsichts-Beamten, in: *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, 1895, pp. 152–55.
- Jakobsson, Eva: Industrialization of Rivers: A Water System Approach to Hydropower Development, in: *Knowledge, Technology & Policy* 14 (2002), 4, pp. 41–56. doi:10.1007/s12130-002-1014-0.
- Jurisch, Konrad Wilhelm: *Die Verunreinigung der Gewässer: Eine Denkschrift im Auftrage der Flusscommission des Vereins zur Wahrung der Interessen der Chemischen Industrie Deutschlands*. Berlin 1890.
- Köfler-Trockner, Barbara: *Auf den historischen Spuren des IGB: Ein Jahrhundert Forschung an Gewässern*. Berlin 2016.
- Lübken, Uwe/ Mauch, Christof: Uncertain Environments: Natural Hazards, Risk and Insurance in Historical Perspective, in: *Environment and History* 17 (2011), 1, pp. 1–12. doi:10.3197/096734011X12922358301012.
- Lüdemann, Dagny/Venohr, Sascha: Die Giftalge ist zurück? Aber tötet sie auch? in: *Die Zeit*. URL: <https://www.zeit.de/wissen/umwelt/2024-06/fischsterben-oder-goldalge-prymnesium-salzeinleitungen>. (Accessed March 14, 2025).
- MDR Wissen: UFZ Leipzig findet weitere Ursache für Fischsterben an der Oder. URL: <https://www.mdr.de/wissen/umwelt-klima/Fischsterben-an-der-Oder-UFZ-Leipzig-findet-weitere-Ursache-100.html>. (Accessed March 14, 2025).
- Olmer, Beate: *Wasser – historisch: Zu Bedeutung und Belastung des Umweltmediums im Ruhrgebiet 1870–1930*. Zugl.: Essen, Univ., Diss., 1997 u.d.T.: Olmer, Beate: *Wasser und Abwasser*. Frankfurt am Main/Berlin 1998.

- Osterhammel, Jürgen: *Die Verwandlung der Welt: Eine Geschichte des 19. Jahrhunderts*. München 2009.
- Rudorff, E.: Ueber das Verhältnis des Modernen Lebens zur Natur, in: *Preußische Jahrbücher* 45 (1880), pp. 261–76.
- Schiemenz, Paulus: Über die Einwirkung der Abwässer der Kali-Bergwerke auf die Fischereilichen Verhältnisse der Leine – Gutachten erstattet dem Reichsgesundheitsamt Im Februar 1918, in: *Zeitschrift für Fischerei und deren Hilfswissenschaften* XXIII (1925), 3, pp. 318–413.
- Sheail, John: The Sustainable Management of Industrial Watercourses: An English Historical Perspective, in: *Environmental History* 2 (1997), 2, pp. 197–215.
- Smith, Keith: *Environmental Hazards: Assessing Risk and Reducing Disaster*. Milton 2023.
- Stanitski, Conrad: Chemistry, Society, and Environment: A New History of the British Chemical Industry, in: *Journal of Chemical Education* 79 (2002), 5, p. 563. doi:10.1021/ed079p563.
- Uekötter, Frank/ Lübbken, Uwe: Introduction: The Social Functions of Ignorance, in: Uekötter, Frank/Lübbken, Uwe (eds.): *Managing the Unknown: Essays on Environmental Ignorance*. New York 2014, pp. 1–11.
- Vogel, Johann Heinrich: *Die Abwässer der Kaliindustrie – Zugleich eine Kritik des im April 1913 unter dem gleichen Titel erschienen Gutachtens von Prof. Dr. Dunbar, betreffend die Versalzung der Flüsse durch Abwässer der Kaliindustrie*. 1914.
- Wehler, Hans-Ulrich: *Deutsche Gesellschaftsgeschichte 1849–1914: Bd. 3: Von der "Deutschen Doppelrevolution" bis zum Beginn des Ersten Weltkriegs*. München 2008.
- Weigelt, Curt: *Die Schädigung der Fischerei durch Haus- und Fabrikabwässer*. Berlin, 1892.
- Weigelt, Curt: *Unsere natürlichen Fischgewässer: Wie sie sein sollten und wie sie geworden sind*. Stuttgart 1900.
- Wey, Klaus Georg: *Umweltpolitik in Deutschland: Kurze Geschichte des Umweltschutzes in Deutschland seit 1900*. Opladen 1982.
- Worster, Donald: *Rivers of Empire: Water, Aridity, and the Growth of the American West*. Oxford 1992.
- Zellner, Heinrich: *Die Verunreinigung der deutschen Flüsse durch Abwässer der Städte und Industrien*. Berlin 1914.
- Zimmermann, Jan: "Herumdoktern" – Ohne das Problem zu lösen: Ein Jahr nach dem Fischsterben in der Oder, in: *Tagesschau*. URL: <https://www.tagesschau.de/inland/gesellschaft/oder-fischsterben-katastrophe-100.html>. (Accessed March 14, 2025).