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Subterranean Reverberations and the Horror of the Chemical Sublime

Caroline Ektander
Bauhaus-Universität Weimar, Deutschland

Abstract This article examines how the faint, persistent hum of groundwater pumps exposes the limits of industrial clean-up. Focused on efforts to manage groundwater contaminated by a century of coal-based chemical industrialization in Bitterfeld-Wolfen, it draws on sonic methods and the concept of transmediation to explore how sound and water unsettle the illusion of containment. Attuning to these peripheral vibrations offers a way of sensing pollution as ongoing, relational, and irreducible – within what the paper frames as a toxic common.

Keywords Toxicity. Transmediation. Legacy pollution. Sonic epistemologies. Remediation. Slow violence. Toxic commons.

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1 Introduction

Herr D, the groundwater engineer, pulls out a laminated map of the Bitterfeld-Wolfen superfund site, scaled at 1:1000. The map reveals a dense web of information: road networks, building outlines, property zones, and a patchwork of wells, overlaid with directional arrows indicating groundwater flows. Beneath it, a technicoloured blotch blooms across the page – pinks and purples at the centre marking zones of highest toxic concentration, fading into blues, greens, and yellows along its amorphous edge. As I follow Herr D's finger tracing the logic of hydrogeological, a low, persistent hum of pumps begins to invade my senses. The monotonous, mechanical drone conjures the strain of liquid forced through tightly regulated remediation conduits that pierce the surface, breaching the boundary between above and below ground. My attention drifts toward the chemical park that seems to hover – placeless – feeding into an expanding global circulation of chemical presences. I am reminded that the sound of strained pumps, like contaminated groundwater itself, resists both containment and easy representation. It leaks across thresholds, forging new relations and unsettling the spatial orderings upon which remediation depends.

The chemical-industrial twin-town Bitterfeld-Wolfen – once stigmatized as one of East Germany's mega-polluters – underwent a radical transformation after the fall of the Iron Curtain. To reintegrate the former socialist territory into a newly unified Germany, the federal government launched an ambitious remediation program[1] designed not only to erase the region's sensational pollution but also to pave the way for its transition back into a capitalist market economy (Chaney 2017, 157). The results were quickly discernible. Within a few years, the towering smokestacks and outdated Soviet factories were systematically demolished, causing the characteristic yellow-grey smog to dissipate from plain sight. The scoured landscape left behind by large-scale lignite extraction was gradually concealed, colonized by vegetation. The exhausted opencast mines flooded and

1 The *Ökologisches Großprojekt Bitterfeld-Wolfen* (ÖGP), launched in the early 1990s by the German Federal Ministry for the Environment, was one of the largest and most complex environmental remediation efforts in post-reunification Germany. Its goal was to address the extensive contamination of soil, groundwater, and surface waters caused by long-term coal-based chemical production. The project involved the coordination of federal and state agencies, private industry, and scientific institutions, focusing on the installation of large-scale groundwater remediation systems, containment structures, and legal frameworks to manage long-term liability. It also served as a model for remediation governance in other post-industrial regions. See: Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU), *Ökologisches Großprojekt Bitterfeld-Wolfen: Abschlussbericht 2014*.

repurposed into picturesque lakes – designed as much to rehabilitate the land as to reframe its narrative (Maertens 2024, 1002-3). Others, having served as receptacles for industrial waste, were quietly sealed shut – capped, covered, and folded into the terrain. Industrial clean-up became both an impetus and a justification for the neoliberal reconstruction that the region was coerced to undertake, legitimizing the continued production and distribution of synthesised chemicals under the newly greenwashed identity of a chemical park.[2]

Yet, despite over three decades of remediation and its new, clean appearance, Bitterfeld-Wolfen's polluted past never truly disappeared. The toxic legacy of over a century of coal-based chemical industrialization – once as palpable as raucous sounds, noxious fumes, and thick yellow-grey smog – has instead shapeshifted into 200 million tons of heavily toxic groundwater laced with persistent organic pollutants such as chlorobenzene, DDT, and HCH (see Wycisk et al. 2013). To prevent its spread, an extensive 'pump and treat' system has been installed – an interconnected network of wells, pumps, pipelines, and filtration units. Paradoxically, this infrastructure, designed to contain toxicity, relies on the very act of circulation: contaminated groundwater must be continuously extracted, displaced, and processed to prevent it from migrating unchecked. The system's faint but unrelenting hum forms a peripheral, yet unsettling soundscape – an acoustic reminder of a strained containment belied by the restless mobility of the subsurface. Lundsteen describes such pumps as "a slow-motion mitigation process and a critical technology that works as a safeguard, transforming an urgent and intolerable chemical cataclysm into a long-term, gradual release" (Lundsteen 2024, 201).

The tension between the visible success of remediation and the ongoing persistence of contamination is difficult to reconcile. Toxicity regularly exceeds containment – spatially, epistemically, and aesthetically – through slippages, ambivalence, and persistent uncertainties that resist resolution (Liboiron et al. 2018; Boudia et al. 2018). Within environmental governance, remediation is largely shaped by a visual aesthetic regime – one that renders contamination invisible, ordered, and seemingly resolved, reinforcing the fiction

2 The Chemical Park Bitterfeld-Wolfen (*Chemiepark Bitterfeld-Wolfen*) was established in the 1990s as part of a broader effort to restructure and modernize the region's chemical industry after reunification. Built on the site of the former Chemiekombinat Bitterfeld, the park now hosts a mix of national and international firms operating within a shared infrastructure. Its business model – replicated in other post-industrial regions – relies on centralized services such as water treatment and energy supply, enabling companies to outsource environmental management and cut costs. Spatially, the park clusters production on selectively remediated land, avoiding areas deemed too contaminated or geologically unstable.

of containment. But containment does not operate solely through visuality. It is also legal – codified through property boundaries, liability exemptions, and threshold values – as well as sensory, privileging what can be seen over what is felt, heard, or smelled. Together, these regimes help make present or obscure the uneven distribution of toxicity.

Addressing this tension calls for alternative modes of sensing that move beyond the ocular. Unlike vision, which creates distance and reinforces a sensation of separation between above and below ground – here, figuratively, between past and present – other sensory practices and ways of knowing are better equipped to collapse such distinctions. Mignolo and Vázquez (2013) argue that modernity has structured perception around the primacy of vision, determining what is made perceptible while relegating the so-called 'lower' senses – hearing, smell, and touch – to the margins of legitimate knowledge. The pumping infrastructure, though inconspicuous and peripheral, produces a constant undertone that is both evocative and suggestive, drawing attention to what remediation seeks to obscure. Although the region's industrial legacy resists easy representation, it nonetheless continues to manifest through the pump's faint, yet emphatic murmurs.

Sound and acts of listening help to disrupt the modernist impulse to control and categorize by instead demanding relationality, attunement, and proximity (Kanngieser 2020, 442). In their text, Kanngieser argues that listening is not just an act of perception but an embodied and ethical practice – one that calls for situated engagement with place, history, and power. In response to this tension between surface and depth – and the limits of vision alone to account for a thick present – this paper homes in on the peripheral sound of pumps to trace their affective transmissions and analytic dimensions. It introduces 'transmediation' as a conceptual and methodological approach that draws on feminist technoscience, media studies, and artist research to explore how different aesthetic practices can help mediate what is sensed, known, and ultimately remembered.[3]

Where remediation is typically framed as a technical solution aimed at removing contaminants from air, soil, or water – and gestures, as the prefix *re-* suggests, toward a return to a prior state of purity – *trans*mediation signals something else. The prefix

3 A fuller articulation of *transmediation* as both theory and method – emerging at the intersection of feminist technoscience, media studies, and aesthetic practice – is developed in the author's dissertation, *Toxic Commons: Transmediating Permanent Pollution* (forthcoming, Bauhaus University Weimar, 2026). There, acts of transmediation are framed as epistemic devices that foreground so-called "inferior senses" – touch, smell, and sound – as a means of attuning to the often imperceptible, relational dimensions of toxicity and the conditions that contribute to an expanding *toxic commons*.

trans- implies movement across, over, and beyond, establishing pollution as ongoing, irreversible, and inherently contested. Clean-up is thus not a finite act but a continual negotiation – one that must constantly grapple with the question *cui bono?* For whom, where, when, and how is remediation enacted, and at what cost? Transmediation is not intended to negate or conflate the important work of technocratic remediation but rather works alongside it, drawing attention to the aspects that regularly fall outside its frame: fragmented histories, embodied exposures, and the unruly seepages of groundwater. It is only through situated and layered acts of translation and mediation that certain harms can be made known.

This article emerged from a 2022 field visit to several sites within ÖGP Bitterfeld-Wolfen, conducted together with sound technician Max Schneider and local remediation engineers. Through an artistic and ethnographic engagement with the site, listening became both method and analytic – and a way of attending to what usually falls outside public purview. Drawing on Chion's (1994) typology of listening, this approach engaged three interrelated modes: 'semantic listening', focused on the meaning of spoken content as it unfolded in conversations with local interlocutors; 'causal listening', oriented toward identifying the sources of specific sounds, ranging from passing cars and birdsong to the quiet hisses of the pumps; and 'reduced listening', which foregrounded the acoustic textures themselves – the hums, drones, and pulses – as aesthetic phenomena that transmit affect beyond informational content. Layering these modes enabled a situated sonic epistemology – one that brought into focus a different reading of Bitterfeld-Wolfen: not as a remediated landscape, but as an unsettled and still-unfolding toxic site. This emergent perspective challenges dominant narratives of successful clean-up and draws attention to the ambiguities of managing toxic legacy sites, highlighting the creative and ethical engagements they demand (Müller, Balayannis 2025, 70).

2 The Endless Murmur of Pumps

It is early February. Cold, grey and damp. We find Herr D pacing next to his company car at the parking lot behind the train station. We exchange politenesses and quickly retreat into the car to escape the raw weather. I intuitively take the front seat and the sound technician the backseat to accommodate his bulky sound equipment. Herr D – the main groundwater engineer at the regional remediation company Mitteldeutsche Sanierungs- und Entsorgungsgesellschaft mbH (MDSE) – signals a naive curiosity upon our arrival. It quickly becomes obvious that his work rarely warrants attention from the outside, especially not from people like us.

Whilst pursuing small talk, Herr D drives out of the train station parking lot, weaving his way through the outskirts of the historical town of Bitterfeld before heading northeast towards an industrial area that connects Bitterfeld with the town of Wolfen. We pass car dealers, printing companies and the odd *Imbiss* 'canteen'. At the dilapidated Bitterfeld Kulturpalast, we take a right and drive up along Parsevalstraße that splices straight through the former industrial grounds of the Chemiekombinat Bitterfeld (CKB)[4] – today operated by the Chemical Park. I have consumed numerous accounts of the sensational pollution at the height of socialist state rule but it takes a lot of imagination to conjure those impressions in the present: the colossal brick factories with rickety, leaking pipelines and towering smokestacks spewing out that infamous yellow grey smog that cemented Bitterfeld's reputation as "one of the dirtiest cities in Europe".[5] Today, the area is best described as a low-rise industrial sprawl interrupted by the odd, abandoned lot.

After reunification, the federal German government faced a major obstacle: the heavily contaminated underground posed serious risks to human and environmental health and deterred new business investment. In response, the state extended liability protections for legacy pollution and introduced a three-dimensional property regime. This framework ensured that the state assumed responsibility for pollution predating the cut-off date – 1 July 1990 – while enabling redevelopment and privatization of land without burdening new owners with remediation costs.[6] In practice, this means that the Chemical Park occupies only a thin surface layer – down to a depth of about 30 cm – while the toxic legacy beneath remains the responsibility of the state. The park itself is a spatial and legal construction that enables industrial activity to persist atop a polluted and unstable subsurface. Pipes weave together below and above ground, forming part of a controlled circulatory system that moves both contaminated groundwater through remediation infrastructure, as well as chemical intermediates between the chemical park's different companies and beyond. This network not only sustains the appearance of containment and efficiency

4 The Chemiekombinat Bitterfeld was one of the largest chemical production complexes in the German Democratic Republic (GDR), specializing in chlorine chemistry, synthetic materials, and pesticides. Its intensive manufacturing processes made it a cornerstone of the GDR's economy but also one of its most polluted industrial sites.

5 See, for instance, Monika Maron's novel *Flugasche* (1981), and the documentaries *Bitteres aus Bitterfeld* (1988) and *Sehnsucht nach Bitterfeld* (1993), all of which depict the region's industrial pollution in vivid detail during the late GDR period.

6 See "Landesanstalt für Altlastenfreistellung", Landesanstalt für Altlastenfreistellung des Landes Sachsen-Anhalt (LAF).

but also plugs the site into an expanding global circuit of chemical production, exchange, and flow.

The small settlement of Greppin approaches and Herr D pulls over and parks next to an inconspicuous pumping station connected to elevated pipelines that run along the main road. He leaves the motor humming and pulls out a pile of laminated A3 pages consisting of maps, sections and diagrams. He guides us through the plans and elevations and contours his technocratic gaze of the region's groundwater problem – one that is undeniably substantial. The sound technician and I listen attentively to Herr D' descriptions of the movement of the groundwater; the locations of underground wells and pumps; and where the two collude to prevent a further spread of the multicoloured toxic soup.

The pumping operates on a two-fold scheme, he explains: either it extracts dirty groundwater before it 'spills over' into clean water bodies or it salvages the incoming clean groundwater and displaces it above ground before it mixes and mingles with dirty. Due to excessive mining and the fundamental terraforming of the underground, the natural ground water table was rearranged. The pump and treat system is therefore designed to artificially regulate the groundwater table of the roughly 1,300 hectares of former industrial grounds into the unforeseeable future. Continuous pumping has become essential to prevent flooding, subsurface contamination, and the uncontrolled migration of legacy pollutants beyond the confines of the superfund site (Wycisk et al. 2013).

Herr D points to a series of pumps, strung like a string of pearls along the northeastern side of his map, near the location where we have parked. He explains that they were among the first pumps installed in the early 1990s, designed to protect the small village of Greppin from impending spills of legacy pollution from the adjacent industrial zone. The heavily contaminated groundwater naturally gravitates toward the Mulde River, which lies on the other side of the settlement. Without the pumps, groundwater levels would rise beneath the village, seeping into building foundations, dampening basements, and potentially causing the organophosphates pervasive in the groundwater to sublimate into a lethal gas.

A generative, yet toxic, bond between cheap and dirty brown coal and coal-based chemistry lies at the heart of Bitterfeld-Wolfen's dual reputation as a *Wirtschaftswunder* 'economic miracle' and *sensationally polluted place.* Shortly after the serendipitous discovery of lignite in the mid nineteenth century, Germany's chemical industry, spearheaded by Agfa, strategically resettled from Berlin. The abundant reserves of brown coal – combined with cheap land, labour, and a well-connected railway – drove a gradual yet violent terraforming of the landscape. The subsurface was torn open and systematically emptied of its bounty. The coal animated the chemical

industry that in turn expanded exponentially. Within a century, the region had transformed beyond recognition – from small-scale farmland to a chemical industrial hub populated by a dense fabric of coal-fired factories. The rhythmic clatter of machinery, the hiss of steam, and the churn of coal-fired factories merged and concentrated, echoing across a barren moonscape that surrounded it.

In the shadows of the prospering industrial growth, surplus chemical waste was routinely dumped into the exhausted open-cast mines to offer temporary redemption. These repositories of industrial sludge – that at times reached depths of up to 60 m – became a new subterranean medium through which the groundwater was then forced to flow and contributed to its severe chemical saturation. Above ground outdated factories would drip, leak and spill chemical intermediates that eventually seeped and leached into the ground and create three-dimensional plumes of chemical residues evidencing what was once present above ground, even though few records remain to confirm it.

After examining Herr D's map and forming an initial understanding of the complex groundwater problem, he suggests we inspect one of the pumps. We get out of the car and walk some meters down the road where we approach a 1 × 1.5 m green casing designed to blend with the surrounding landscape. He opens the case and reveals a modest metal infrastructure – a folded pipe with some simple measuring devices. It emits a dull hum with the occasional hiss. The sound is more pronounced without the casing, but it still folds into the wider, muffled soundscape of the chemical park – that indistinct blend of low-frequency sounds interrupted by the occasional passing truck. I get up close and lightly hold my hand against the metal pipe, sensing the pump's stubborn vibration as it runs through my body.

Herr D stresses the scale of the operation and the monumental task these pumps perform day in and day out even though it does not look like much from where we are standing. He waves his arms horizontally to gesture at the axis of pumps that punctuate the ground at an interval of roughly 10-15 m. The central challenge, according to him, is to keep the pumps running despite their propensity to clog up or corrode due to the abrasive chemical composition of the groundwater. Herr D explains that there have been investigations into the possibility of constructing an underground slurry wall that would hermetically seal Greppin from the impending pollution from the past. The saturation of groundwater is however so varied and unpredictable that there is till this day no uniform material able to tolerate the full range of potential threats. Besides, he adds, there are no machines available that would be able to produce a deep enough slit into the ground. Not even the most advanced mining equipment has that capacity.

Herr D has no problem admitting that the system is imperfect. He explains that the locations of the pumps were approximated using a combination of chore samples, GPR scans and geological records. There is also a portion of historical data and random water sampling that helped specify certain decisions. The data was translated into a three-dimensional model used to artificially regulate the groundwater flow by monitoring the performance of each individual pump in relation to the whole. The system responds to different variables and can project the effects of periods of sustained drought or calculate its capacity to withstand heavy rains or even a flood. The looming threat of intensifying local climate catastrophes are, however, no match. The system has very clear limitations, he admits.

Once extracted, the dirty groundwater is transported via elevated pipes to a purifying plant nearby where the most severe chemicals are expurgated with the help of coal filters. By the end of this process, only a tiny portion of the water will be deemed 'clean enough' to move on to the adjacent sewage treatment plant where it joins the regional grey and black water. At the sewage treatment plant, incoming dirty water is refined to meet legal threshold levels to the degree that it can be released into the Mulde river that snakes its way through the landscape on its journey to the North Sea. There is a clear threshold differentiating water that moves above and below ground. Alarmingly, Herr D explains that most of the filtered groundwater is returned to the ground after initial treatment, as it is still considered too polluted to meet the light of day. According to him, approximately two and a half million cubic meters of groundwater are displaced annually, and hundreds of tons of pollutants have already been recovered through the treatment process. Yet despite these efforts, he notes, the overall contamination levels have not decreased significantly. Perplexingly, the concentration of certain pollutants has even increased.

As I listen to Herr D speak, the robust figure of a 'pump and treat' system begins to weaken in my mind's eye. The sheer scale of contamination – 200 million metric tons of heavily toxic groundwater – makes it clear that depletion is an illusion. The orchestrated rerouting of water instead sustains the appearance of control, a present in which the groundwater *Blase* 'bubble' remains intact. The fact of the matter is that the groundwater will never be cleaned, nor will the problem ever be solved. Instead, the pumps are doomed to pump into the unforeseeable future, consuming endless amounts of energy and generating a humming stratum imperceptible to most human consciousness.

3 Coming into Proximity to Antonie's Toxic Underbelly

We travel to another location on Herr D's map, to the southwestern edge of Antonie – a former coal mine that, like others of its kind, doubled up as a landfill and filled up with miscellaneous industrial waste during the last century. We have come to inspect the pumps that intercept incoming 'clean' groundwater before it collides with Antonie's toxic underbelly. With the fall of state socialism at the end of the 1980s, Antonie was sealed shut and remediated as part of the reparations fund. Her content is sensationally dirty, yet substantially under-documented and she is colloquially referred to as a *Sorgenkind* 'problem child' by local remediation experts. Predictions suggest that it contains roughly six million cubic metres of industrial waste – half of which is immensely toxic. The Helmholtz Centre for Environmental Research (UFZ) in Leipzig has recorded, among other things, 76,000 tonnes of HCH from lindane production, 48,000 tonnes of DDT sludge, 19,000 tonnes of hexachloroethane, 13,000 tonnes of chlorobenzene and 70,000 tonnes of sulphuric acid, which were illicitly dumped directly from railway tank wagons via hoses into the unprotected opencast mining pit during the GDR era.[7]

Standing next to the remediated landfill today, there are few visual clues that disclose what hides below the surface. The pit has been concealed by a carpet of greenery and its perimeter modestly demarcated by a fence. Public access on paved paths is restricted; only we are present on the premises. I look over onto a neat arrangement of landscaped retention pools that give off a soothing, trickling sound. The surface of the pools, that would otherwise reflect the grey February sky, are today unsettled by a light drizzle.

Together with Herr D and a mechanic from the MDSE, we climb down a shaft to get to an underground mechanical room that coordinates the salvaging of incoming groundwater and redirects it to the retention pools above ground. *Trockenlegen* 'drainage' is the central tenet of the pumping on the southwestern side of the superfund site. Containment, I begin to understand, is not a static barrier but an ongoing infrastructural effort – a mitigation strategy aimed at preventing the past from reasserting itself. As Hird (2013, 114) reminds us, landfills defy closure: the contents do not lie inert but seep, react, and mutate in ways that resist prediction. Even when kept dry, such sites harbour "unknown unknowns" – chemical reactions, microbial activity, and subterranean movement that

7 For more details, see the annual report of the Helmholtz Centre for Environmental Research (1998/1999), which includes Peter Popp's article "Das Bitterfelder Grundwasser – Ein gefährlicher Cocktail" (pp. 18-24), available at: `https://www.ufz.de/export/data/2/84245_018_024.pdf`.

continue to unfold beyond human perception or control. In this context, containment becomes speculative – an attempt to manage risks that will never be fully known.

As we step into the underground pump room, sound thickens – reverberating through the architecture and intensifying the pulse of translocating water. The sound technician moves methodically, affixing contact microphones to cold concrete walls, vibrating metal railings, piping and staircases. Unlike conventional microphones, which capture airborne sound, these devices extend human hearing into vibrations that evade human perception. Just as a seismograph detects tremors beyond the threshold of human sensation, contact microphones render the subterranean environment newly audible – though not in its entirety.

The sound engineer explains that contact microphones do not record water itself – water does not generate sound in this context. Instead, the microphones register the vibrations produced as water moves through the remediation infrastructure, pressing against pipes, valves, and metal casings. What we hear is not the water, but the resonance of its containment – the hum of compressed energy, the friction of liquid confined within narrow channels. An entire spectrum of sonic activity remains imperceptible: the seepage of moisture dispersing into sediment, and the slow diffusion of contaminants as they merge, react, and reassemble. These processes unfold in silence, slipping beyond the range of the microphones and the human ear alike, intuitively sensed but never fully grasped. The contact microphones pick up what I now feel: the overburdened machinery of containment peripheral to my senses now drawn into sharp proximity with my body. The quiet surface is turned on its head; what once seemed still now reveals itself as restless, always at work, never at ease.

4 The Fluid Movements of Sound and Water

Inspired by Andrea Ballestero's invitation to "exercise new figurations" that challenge dominant conceptions of the underground as static and inert, I make use of her spongy aquifers (Ballestero 2018) and voluminous plumes (Ballestero 2020) to recast the subsurface as a space full of dimension, obscurity, and unfolding relations (Hird 2016). When seen through the optics of watery movement, the underground can be understood as nothing but lively. Water is continuously shaped by its encounters with the varied granularity of the underground as it stakes out paths of least resistance; sieving through sandy sediments, dividing along stony crevices, or being temporarily immobilized by a clay surface or caught up in an oily resin.

Herr D's 2D map offers little fodder for imagining the tactility, temporality, and unruliness of the subsurface – qualities essential for understanding how contamination persists, disperses, and exceeds containment. According to his diagrams, water moves in simplified, straight lines and organizes along binary categories: above or below ground, dirty or clean. Definitions of clean and dirty, however, operate on a sliding scale of threshold values (Liboiron 2022, 58-9), and the legal perimeter of the superfund site is delineated by an arbitrary line that in no way reflects nor contains the problems of the past. Bodies of water are thereto neither singular nor stable. As Stacy Alaimo (2010) argues through the concept of *transcorporeality*, bodies – including bodies of water – are not closed systems but sites of constant exchange, where human, chemical, and environmental flows intermingle. Water can thus be understood at a molecular level or as a vast, moving mass, shifting in scale and composition depending on how it is encountered and framed.

Sound is often described in watery terms, moving in wave formations through different media – gas, liquid, or solid – each shaping its trajectory through absorption, reflection, or resonance. Unlike light, which can travel through a vacuum, sound depends on a medium to propagate, making it an inherently relational force. In open air, it moves slowly and dissipates over distance, much like the delayed rumble of thunder following a lightning bolt. In water, however, sound travels four times faster, allowing whales to communicate across vast expanses of ocean. Inside enclosed structures – such as a metal tube or a pump – sound reverberates, folding in on itself until it becomes unrecognizable from its source. As it moves through different materials it can create both proximity and distance – amplifying in some environments, dissipating in others, shaping what can be heard when and how, and by whom.

At its most rudimentary level, sound is a physical and neurological event – waves enter the cochlea, triggering a cascade of sensory processing in the auditory nervous system and the brain. Yet much of what sounds does, escapes our direct attention. Some frequencies are too high or too low for us to register, while others blend into the backdrop of everyday life, unnoticed through habituation. Whether actively perceived or not, sound remains omnipresent and promiscuous, leaking across boundaries and material thresholds. As Gallagher et al. (2016, 620) remind us, "Every space and place sounds and resounds, every living body and being vibrates, and every kind of material, object and surface has acoustic properties".

Sound is also transgressive, entering bodies without consent. Unlike vision, which we can control by simply closing our eyes, hearing remains involuntary – ears are always open, always receiving. Reflecting on the relationship between sound and the unconscious, Cox (2009) argues that sound is not merely a

representational phenomenon but operates at a deeper, vibrational level, shaping experience before it reaches cognition. He describes this as the "sonic unconscious" – a domain where sound bypasses rational interpretation and instead acts on the body, lodging itself beneath perception. Even when unheard, it lingers, shaping how we sense and respond to the present, attuning us to forces we may not immediately recognize but nonetheless feel.

I chat to Herr D and the mechanic whilst the sound technician is busy with his various recordings. We climb out of the shaft and into the open air, taking shelter under a provisional roof. Herr D is in his fifties and grew up in a village nearby. The mechanic is younger, I would guess somewhere in his early thirties. Their recollections of the past thus vary greatly in perspective. Herr D was trained in mining during the GDR in his early twenties and lived in the outskirts of Bitterfeld, close to an active coal mine. He clearly remembers the haunting high-pitched creaks that would echo throughout the night as the bucket wheel excavators scraped up the subsurface. He recounts the industrial soundscape as having been filled with *Kriechen* 'screeches' and *Geklapper* 'clatter' but that this changed drastically after reunification.

With the federal reintegration, jobs in mining became increasingly obsolete as East Germany fell under the stricter environmental laws of the unified German state. Reunification thus marked the beginning of a gradual phase-out of brown coal, driven by both legal mandates and economic restructuring (cf. Chaney 2017, 140-2). As large-scale coal extraction was scaled down, Herr D transitioned into remediation science, a shift he describes as less drastic than it might seem – both fields, after all, operate within the same logic. The mechanic grew up shortly after the region's restructuring and has therefore never experienced the haunting sounds of coal digger makes, nor does he carry the embodied memories of the troublesome heavy industry and the way it used to invade and hang heavy on the senses. The swishing of wind turbines has now replaced the rattle of the fossil regime.

Sound does not need to be consciously registered to affect us. A sudden bang hijacks the nervous system, triggering an immediate surge of adrenaline, while low-frequency vibrations – inaudible yet physically palpable – seep into the body over time, embedding themselves as unease. In Bitterfeld-Wolfen, the muffled, mechanical soundscape of remediation operates in this same register – an almost imperceptible pressure, a weight without origin. What strikes me the most are omissions.

As Herr D, the mechanic, and I stand huddled together, we drift into conversations about more-than-human ecologies and how they have been forced to adapt to the region's drastic transformations. As fossil extraction ceased and heavy machinery fell silent, ecological

processes gradually resumed. The pioneering forest that has recolonised the eastern side of the remediated open-cast coal mine Goitzche – today a scenic lake – has become a treasured sanctuary for birds and insects that were once driven away due to mass deforestation. Biodiversity has since then exploded exponentially and now also attracts human populations that spend their pastime in proximity to the soothing sound of rustling leaves and variations of chirps and trills. These sounds require no interpretation; they announce themselves as signs of life, of restoration, of an environment that can be perceived as whole.

Despite the visual coherence of Bitterfeld-Wolfen's remediated landscape – its scenic lakes, reforested areas, and absence of visible smog – my body registers a cognitive dissonance, as attunement to other faculties reveals a gap between what is seen, what is sensed, and what remains obscured. Above ground, pipes shuttle both contaminated groundwater toward treatment facilities and newly synthesized chemical intermediates between the various chemical companies of the chemical park. Below ground, a hidden infrastructure strains to contain legacy pollutants that remain restless, and unruly. These parallel networks of movement and control – visible and submerged – converge in a space where toxicity is managed but never resolved. The scale and invisibility of these flows evoke a quiet unease, a sense of vast chemical processes unfolding into eternity, unsettling the surface image of recovery and hinting at something vaster, more unstable, and unresolved.

What initially presented itself as coherent begins to unravel, pulled apart by the sonic undertow. As I continue to listen, I realize that Herr D and I are perceiving from very different vantage point. He carries embodied memories of past pollution that once defined everyday life here, allowing him to read the landscape with practiced familiarity and fill in the cognitive gaps. I, by contrast, struggle to make sense of what I hear and feel. The longer we speak however, the more my perception begins to shift and sharpen. The remediated lakes and the winding river Mulde cease to appear natural, revealing themselves instead as engineered bodies of water – controlled, contained, and artificial in both dimension and composition. I begin to grasp how they are hydrologically connected to sources beyond my immediate field of vision. From our exchange, I also learn how much legacy toxicity lies buried in the Mulde's alluvium. A single disturbance of these sediments could send shockwaves downstream, unleashing harm that might reverberate all the way to the North Sea. I pause, reflecting on the endless labour of the pumps and the relentless energy required to sustain the precarious illusion of clean-up. This energy demand, in turn, necessitates ever-deeper excavations – extracting from the earth to perpetuate the very system tasked with managing its harm.

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To Herr D, working with the underground requires a certain humility – an acceptance that the truth will always be partial, that remediation is not a solution but an ongoing negotiation with the past. It is a form of speculative containment: a performative effort to manage the unmanageable, to maintain the appearance of control in the face of uncertainty. The act of monitoring and pumping, despite its limits, is just as much about keeping contamination from vanishing into forgetfulness, much like how landfills render waste invisible through infrastructure and regulation (Hird 2013, 106-7). Not all industrial wastelands are granted this attention; most drift into oblivion, their toxic legacies absorbed by the lands and bodies that surround them. Nixon (2011) argues that slow violence is not sensational but attritional. It unfolds beyond immediate perception, persisting at frequencies at the cusp of consciousness (Nixon 2011, 2). Without tools to render these lingering violences perceptible, they inevitably fade into obscurity.

5 Transmediating the Chemical Sublime

As we sit together in the sound studio back in Berlin and listen to the field recordings, something unexpected happens. The recordings of the pumps reveal an acoustic reality we had not fully perceived on site. My senses and cognition struggle to process the unfamiliar sounds, creating an atmosphere of eeriness. The contact microphones, attached to the metal pumps and filtered through the sound technician's software, have transformed the monotonous rhythm of water management into a carpet of metallic drones, punctuated by faint, swirl-like frequencies that evoke the distorted echoes of distant, terrified screams. The tone is dark. The pulse is propulsive. Metal, energy, and water have collapsed into a singular sonic presence – one that borders on the horrific.

Both Steininger (2018) and Engelhardt and Cinkevich (2023) evoke horror as central to the experience of chemical and infrastructural systems: for Steininger, a petrochemical sublime marked by awe and dread; for Engelhardt and Cinkevich, the slow pulse and generational suspense in which violence unfolds beyond the threshold of visibility. In Bitterfeld-Wolfen, this tension becomes palpable. Chemical companies float above ground, seemingly detached from the region's polluting past. Their gleaming infrastructure projects an uncanny illusion of order and purity, even as it continues to redistribute an invisible yet unceasing stream of chemicals that permeate and accumulate in land and bodies elsewhere. It is only when a pipe of contaminated water punctures the surface, leaking uncontainable sound, that the connection between above and below merges, and

their true scale and effect become disturbingly present. Water and chemical intermediates flow silently, pumps strain quietly

Remediation in Bitterfeld-Wolfen, rather than eliminating pollution, reinforces it through the profound interconnectedness of remediation infrastructures and ongoing chemical production. Publicly framed as environmental restoration, remediation actively sustains the industries it ostensibly regulates. The promise of a 'clean' environment paradoxically facilitates new extractions, additional toxicities, and the uncanny persistence of synthetic chemistry integrated into global supply chains. Chemicals prohibited in Europe are synthesized and discreetly exported, entering broader circulations and geographies, perpetuating harm in an expanding and ever-deepening toxic commons (Müller 2021).

If the toxic sublime resides in the affective tension between awe and dread, its sonic form might be precisely this: a presence at once monumental and elusive – quietly signalling an unresolved environmental legacy, where awe at infrastructural scale invokes horror. Yet this sonic sublime can be politically ambivalent: while it gestures to the scale and persistence of environmental harm, its abstraction and infrastructural grandeur risk naturalizing or aestheticizing toxicity. Rather than catalysing action, the soundscape may instead reinforce the perception that remediation is already underway – rendering the crisis audible but seemingly managed. Remediation thus functions as a mechanism of deferral – managing toxicity without resolving it.

To tinker with imaginaries of technological horror and chemical monstrosity is to explore new ways of confronting global networks of extraction and contamination – systems that operate at scales often imperceptible to human senses. The notion of a monstrous presence – partly visible, partly sensed – echoes the difficulty of apprehending the long-term consequences of industrial processes. The human faculties struggle to register the abstract casualties of slow violence, diffused across time, space, and bodies of all sorts. This is where transmediation asserts its force. It does not aim to restore or resolve, but to amplify. By working with silence, absence, and peripheral frequencies, transmediation makes perceptible what remediation conceals. The pump's barely audible hum becomes a signal: that contamination has not vanished, only receded from view. Against the visual rhetoric of restoration, transmediation attunes to a thick present in which nothing truly disappears, becoming a practice of staying with what remains.

Inspired by how stargazing in the dark of night stirs a longing to grasp complex planetary relations and their cosmic pull, delving into the subsurface similarly opens pathways into our collective fears, repressions, and desires for control. There is no 'away', no 'elsewhere' to which pollution can be relegated. Sound and water

move continuously through and between bodies, breaking down imagined boundaries – earth, skin, piping – that obscure their deep entanglement. Though often concealed, the subsurface inevitably reemerges, unsettling the illusion of containment. Thinking with water and sound reveals how they leak, cling, and reverberate across bodies, opening new ways of sensing and relating within an expanding toxic commons.

Bibliography

Alaimo, S. (2010). *Bodily Natures: Science, Environment, and the Material Self*. Bloomington: Indiana University Press.

Ballestero, A. (2018). "Spongiform". Theorizing the Contemporary, *Fieldsights*, 27 June. https://culanth.org/fieldsights/spongiform.

Ballestero, A. (2022). "The Plume: Movement and Mixture in Subterranean Water Worlds". Theorizing the Contemporary, *Fieldsights*, 22 September. https://culanth.org/fieldsights/the-plume-movement-and-mixture-in-subterranean-water-worlds.

Boudia, S.; Jas, N.; Roberts, C.; Schneider, W. (2018). "Residues: Rethinking Chemical Environments". *Engaging Science, Technology, and Society*, 4, 165-78. https://doi.org/10.17351/ests2018.245.

Chaney, S. (2017). "A Chemical Landscape Transformed: Bitterfeld, Germany since 1980". *Global Environment*, 10(1), 137-67. https://doi.org/10.3197/ge.2017.100106.

Chion, M. (1994). *Audio-Vision: Sound on Screen*. Transl. by C. Gorbman. New York: Columbia University Press.

Cox, C. (2009). "Sound Art and the Sonic Unconscious". *Organised Sound*, 14(1), 19-26. https://doi.org/10.1017/S1355771809000041.

Engelhardt, A.; Cinkevich, M. (2024). "Infrastructural Horror". *e-flux Architecture*. https://www.e-flux.com/architecture/new-silk-roads/621479/infrastructural-horror/.

Gallagher, M. (2016). "Sound as Affect: Difference, Power and Spatiality". *Emotion, Space and Society*, 20, 42-8. https://doi.org/10.1016/j.emospa.2016.02.004.

Gallagher, M.; Kanngieser, A.M.; Prior, J. (2017). "Listening Geographies: Landscape, Affect and Geotechnologies". *Progress in Human Geography*, 41(5), 618-37. https://doi.org/10.1177/0309132516652952.

Hird, M. (2016). "The Phenomenon of Waste-World-Making". *Rhizomes: Cultural Studies in Emerging Knowledge*, 30. https://doi.org/10.20415/rhiz/030.e15.

Hird, M. (2013). "Waste, Landfills, and an Environmental Ethic of Vulnerability". *Ethics & the Environment*, 18(1), 105-24. https://doi.org/10.2979/ethicsenviro.18.1.105.

Kanngieser, A. (2020). "To Tend for, to Care with: Three Pieces on Listening as Method". *Seedbox Environmental Humanities Lab*, 11 September. https://theseedbox.mistraprograms.org/blog/to-tend-for-to-care-with-three-pieces-on-listening-as-method/.

Kanngieser, A. (2015). "Geopolitics and the Anthropocene: Five Propositions for Sound". *GeoHumanities*, 1(2), 249-64.

Liboiron, M. (2021). *Pollution is Colonialism*. Durham; London: Duke University Press.

Liboiron, M.; Tironi, M.; Calvillo, N. (2018). "Toxic Politics: Acting in a Permanently Polluted World". *Social Studies of Science*, 48(3), 331-49. https://doi.org/10.1177/0306312718783087.

Lundsteen, S. (2024). "A Pump, a Depot, and Some Amber: On Submerged History and the Specter of Chemical Pollution." *Submergence: Environmental Justice and the Specter of Chemical Pollution* [PhD Dissertation]. University of Stavanger.

Maertens, C. (2024). "What's in a Landscape? Nature, Memory, and Tourism in Bitterfeld-Wolfen's Post-Mining Landscape, East Germany". *Landscape Research,* 49(7), 1001-14. https://doi.org/10.1080/01426397.2024.2397598.

Mignolo, W.; Vázquez, R. (2013). "Decolonial Aesthesis: Colonial Wounds/Decolonial Healings". *Social Text Periscope*. https://socialtextjournal.org/periscope_article/decolonial-aesthesis-colonial-woundsdecolonial-healings/.

Müller, S. (2021). "Toxic Commons: Toxic Global Inequality in the Age of the Anthropocene". *Environmental History*, 26(3), 444-50.

Müller, S.; Balayannis, A. (2025). "Toxic Commons and the Politics of Ambivalence: Reimagining Toxic Legacy Sites". Müller, S.; Schmidt, M.; Twelbeck, K. (eds), *Ecological Ambivalence, Complexity, and Change: Perspectives from the Environmental Humanities*. London; Routledge, 68-84.

Nixon, R. (2011). *Slow Violence and the Environmentalism of the Poor*. Cambridge; Harvard University Press.

Steininger, B. (2018). "Petromoderne Petromonströs". *Azimuth: Philosophical Coordinates in Modern and Contemporary Age*, 12, 15-30.

Wycisk, P. et al. (2013). "Integrated Methodology for Assessing the HCH Groundwater Pollution at the Multi-Source Contaminated Mega-Site Bitterfeld/Wolfen". *Environmental Science and Pollution Research*, 20, 1907-17. https://doi.org/10.1007/s11356-012-0963-4.