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A Planetary Anthropocene? Views From Africa

Iva Peša, *University of Groningen*

Abstract: The Anthropocene is built on complex technological systems that span the globe. Historians of science have done much to document the emergence of this “technosphere.” Yet more interdisciplinary and regionally diverse approaches are needed to understand the complexity and unpredictability of the technosphere in our Anthropocene times. Rather than assuming a single planetary phenomenon, this essay emphasizes the widely varied lived experiences of the Anthropocene. Taking industrialized mining and oil drilling as examples of the technosphere, it examines three African localities of resource extraction—the Congolese Copperbelt, the South African Witwatersrand, and the Niger Delta in Nigeria—to ask why the environmental transformations of large-scale industry have caused violent protest in one locality but apparent acquiescence in others. The concept of the Anthropocene urges historians of science to connect questions about scientific knowledge and technology to issues of environmental change, economic organization, political power, social differentiation, and cultural imagination. This broad approach, the essay suggests, can prove extremely fruitful in explaining historical variations and contemporary responses to the Anthropocene.

In recent years historians of science have provided valuable contributions to debates on the Anthropocene. Deborah Coen and Jürgen Renn, most notably, have been rethinking notions of knowledge and science, showing how these have continuously adapted in response to historical climate change and global transformations.¹ Within these debates, historians of science are particularly well placed to study the “technosphere,” which underpins the Anthropocene. Building on Peter Haff’s work, Renn defines the technosphere as “a human-created fabric of industrial technologies, infrastructures, harnessed energy sources, knowledge systems, and power relations that increasingly interacts with and functions on a magnitude equivalent to that of natural spheres.”² Yet although humans, by deploying scientific knowledge, have played a dominant role in developing

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¹ Deborah R. Coen, *Climate in Motion: Science, Empire, and the Problem of Scale* (Chicago: Univ. Chicago Press, 2018); and Jürgen Renn, *The Evolution of Knowledge: Rethinking Science for the Anthropocene* (Princeton, N.J.: Princeton Univ. Press, 2020).

² Peter K. Haff, “Humans and Technology in the Anthropocene: Six Rules,” *Anthropocene Review*, 2014, 1:126–136, on p. 127; and Jürgen Renn, “Another Challenge of the Anthropocene: Turning History into a New Science of Time,” presented at “Rethinking History in the Anthropocene,” Utrecht Univ., 11 Feb. 2021.

the technosphere, humans and their technologies are equally part of “a dynamic . . . Earth system” that they do not control. Asking questions about how people live differently with the Anthropocene’s Earth system destabilization requires focusing simultaneously on science, technology, environmental change, and socioeconomic, political, and cultural factors. To grasp the complexity and unpredictability of the technosphere in our Anthropocene times, I argue that historians of science need more radical interdisciplinarity as well as a regionally more diverse focus. Taking mining and oil drilling as examples of the technosphere, I examine three African localities of resource extraction, considering their varied responses to the environmental effects of industrial technology. I follow Coen and Fredrik Albritton Jonsson in trying to recover “the multiplicity of meanings that the Anthropocene carries and the variety of narratives it affords.”³

The Anthropocene is evidently a planetary phenomenon, which affects all life on Earth. Dipesh Chakrabarty has forcefully argued this, explaining that imperialism and capitalism changed not just global power relations but the biosphere itself. Still, the Anthropocene and its effects on lived realities are differentiated by locality.⁴ Rather than a single planetary Anthropocene, we need to examine diverse experiences and perspectives by engaging “local models and expectations everywhere in the world,” in order to highlight what the planetary gaze conceals. Kathryn Yusoff asserts that there are “a billion black Anthropocenes.” I wish to explore these specificities by asking what the Anthropocene looks like when viewed from different African localities. Resource extraction, one of the biggest earthmoving activities globally, which also causes environmental transformation and severe pollution, is in many ways an extreme example of the technosphere.⁵ I will look at vignettes of copper mining on the Congolese Copperbelt, gold mining on the South African Witwatersrand, and oil drilling in Nigeria’s Niger Delta. In all three localities, extractive industries have changed the course of rivers, transformed the landscape, and polluted the air. Yet there are also important specificities in each locality, which have caused different responses to mining and oil drilling.

Anthropocene debates ambitiously invite “historians of science, technology, and the environment” to reassess the narratives they “have written until now.”⁶ Historians of science have long considered the societal embeddedness and power relations of scientific knowledge, as well as the development and uptake of new technologies in the technosphere.⁷ Yet engaging with the Anthropocene and its fundamental unpredictability requires that historians of science examine the interrelationships between scientific knowledge, technology, and broader environmental and societal dynamics of economic organization, political power, social differentiation, and cultural imagination in new ways. As the Anthropocene has made human interdependence with broader ecosystems

³ Haff, “Humans and Technology in the Anthropocene,” p. 135; and Deborah R. Coen and Fredrik Albritton Jonsson, “Between History and Earth System Science,” in this Focus section.

⁴ Dipesh Chakrabarty, *The Climate of History in a Planetary Age* (Chicago: Univ. Chicago Press, 2021). For work that takes the differentiated locality of the Anthropocene into account see Gabrielle Hecht, “Interscalar Vehicles for an African Anthropocene: On Waste, Temporality, and Violence,” *Cultural Anthropology*, 2018, 33:109–141; Mark J. Hudson, “Placing Asia in the Anthropocene: Histories, Vulnerabilities, Responses,” *Journal of Asian Studies*, 2014, 73:941–962; and Antoine Acker, “A Different Story in the Anthropocene: Brazil’s Post-Colonial Quest for Oil (1930–1975),” *Past and Present*, 2020, 249:167–211.

⁵ Acker, “Different Story in the Anthropocene,” p. 211 (quotation); Kathryn Yusoff, *A Billion Black Anthropocenes or None* (Minneapolis: Univ. Minnesota Press, 2018); and Iva Peša and Corey Ross, “Extractive Industries and the Environment: Production, Pollution, and Protest in Global History,” *Extractive Industries and Society*, 2021, 8(4):100933, <https://doi.org/10.1016/j.exis.2021.100933>.

⁶ Helmuth Trischler, “The Anthropocene: A Challenge for the History of Science, Technology, and the Environment,” *NTM: Zeitschrift für Geschichte der Wissenschaften, Technik und Medizin*, 2016, 24:309–335, on p. 309.

⁷ Sandra Harding, *Sciences from Below: Feminisms, Postcolonialities, and Modernities* (Durham, N.C.: Duke Univ. Press, 2008); and Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton, N.J.: Princeton Univ. Press, 1985).

undeniable, historians of science should more explicitly consider how science, technology, and the environment intersect.⁸

What insights and lessons can the history of science offer for the Anthropocene, if humans and our technologies are part of an unpredictable Earth system that we do not control? Like Zoltán Boldizsár Simon and Julia Adeney Thomas, I see merit in “a humanities-induced Anthropocene science” and in a historical approach in particular.⁹ History can show path dependencies, which help explain current ways of living with the Anthropocene. To understand why popular responses to resource extraction have varied considerably in Congo, South Africa, and Nigeria, ranging from submission to protest, we need to consider longer histories of capitalism, colonialism, and scientific knowledge.¹⁰ I call for a more fine-grained historical analysis of the socioeconomic and political conditions prevailing in African localities of resource extraction, for these help us to understand the Anthropocene present and its future ramifications.¹¹ This essay proceeds as follows. First, I will outline historical theorizations of the Anthropocene, related to capitalism, colonialism, and scientific knowledge. Then I will offer three vignettes of resource extraction in Congo, South Africa, and Nigeria. I will conclude by sketching some future paths for the history of science in the Anthropocene.

THEORIES OF THE ANTHROPOCENE: CAPITALISM, COLONIALISM, AND SCIENTIFIC KNOWLEDGE

While the future of the Anthropocene remains radically unpredictable, historians play an important role in studying its past and explaining how we got to our current predicament. Crucially, historians can highlight the diversity of the Anthropocene’s lived experiences across space and time.¹² Three debates—on capitalism, colonialism, and scientific knowledge—have been particularly influential when explaining the Anthropocene’s variety and profound inequalities. I will summarize these briefly.

Capitalism, Jason Moore asserts, requires “an environment-making revolution,” entailing “a system of power, profit, and re/production in the web of life.” Various scholars have argued that capitalist relationships, and the industrial societies they have spurred, underpin the Anthropocene. While capitalism is indeed a “world-ecology of power,” it is critically “dependent on finding and co-producing Cheap Natures.”¹³ This entails the valuation of some resources, people, and places

⁸ Sara B. Pritchard and Carl A. Zimring, *Technology and the Environment in History* (Baltimore: Johns Hopkins Univ. Press, 2020).

⁹ Zoltán Boldizsár Simon and Julia Adeney Thomas, “Earth System Science, Anthropocene Historiography, and Three Forms of Human Agency,” in this Focus section.

¹⁰ Regarding varied popular responses to resource extraction see Iva Peša, “Between Waste and Profit: Environmental Values on the Central African Copperbelt,” *Extract. Indus. Soc.*, 2020, <https://doi.org/10.1016/j.exis.2020.08.004>; Dianne Scott and Clive Barnett, “Something in the Air: Civic Science and Contentious Environmental Politics in Post-Apartheid South Africa,” *Geoforum*, 2009, 40:373–382; and Ike Okonta, *When Citizens Revolt: Nigerian Elites, Big Oil, and the Ogoni Struggle for Self-Determination* (Trenton, N.J.: Africa World Press, 2008). For longer histories of capitalism, colonialism, and scientific knowledge see Jason W. Moore, “The Capitalocene, Part I: On the Nature and Origins of Our Ecological Crisis,” *Journal of Peasant Studies*, 2017, 44:594–630; and Javier Auyero and Debora Swistun, “The Social Production of Toxic Uncertainty,” *American Sociological Review*, 2008, 73:357–379.

¹¹ Cheryl McEwan, “Decolonizing the Anthropocene,” in *International Relations in the Anthropocene*, ed. David Chandler, Franziska Müller, and Delf Rothe (Cham: Palgrave Macmillan, 2021), pp. 77–94.

¹² See Christophe Bonneuil and Jean-Baptiste Fressoz, *The Shock of the Anthropocene: The Earth, History, and Us* (London: Verso, 2016); John R. McNeill and Peter Engelke, *The Great Acceleration: An Environmental History of the Anthropocene since 1945* (Cambridge, Mass.: Harvard Univ. Press, Belknap, 2016); and Amanda Power, Iva Peša, and Eiko Honda, “Undoing the Discipline: History in the Time of Climate Crisis and COVID-19,” *Journal for the History of Environment and Society*, 2020, 5:33–44.

¹³ Moore, “Capitalocene” (cit. n. 10), pp. 594, 595. See also John Bellamy Foster, *Ecology against Capitalism* (New York: Monthly Review, 2002).

and the *devaluation* of others—creating complex and overlapping global and local inequalities. In many ways, capitalism is premised on resource extraction, which scours the surrounding countryside for fuel, labor power, and timber, effecting widespread pollution and environmental transformation in localities near mines and oil wells. These “extractive processes . . . have been crucial drivers of capitalism’s expansion.”¹⁴

Capitalism is intimately tied to colonialism, through its patterns of global expansion and domination. By extracting resources from an oftentimes colonial periphery, global capitalism benefited an imperial core. Yusoff emphasizes that colonialism entailed “racialized violences” and “asymmetries of colonial possession (of subjects, land, resources) and . . . dispossession.” Andreas Malm and Alf Hornborg concur that “uneven distribution is a condition for the very existence of” colonialism and capitalism.¹⁵ Over the years, environmental damage has been disproportionately concentrated in African localities of resource extraction, because “particular bodies and subject positions” have come to be defined as “disposable.” Importantly, these inequalities endure into the present, through practices of coloniality. Contemporary sites of resource extraction, thus, “are a product of, and reinforce, colonial divisions of power, territory, and life.”¹⁶

By examining scientific knowledge, historians of science have added vital insights to Anthropocene scholarship.¹⁷ As Marco Armiero states, “establishing what is toxic . . . is more a function of power relationships than of incontrovertible scientific truth.” Gabrielle Hecht’s work has lucidly shown that in uranium mines, from Gabon to South Africa, permissible radiation levels for Africans were different than those for whites throughout the twentieth century. This was not because experts “did not know” but because they deliberately manufactured doubt, feigned ignorance, and adopted double standards.¹⁸ Jock McCulloch has shown the same for silicosis in South Africa’s gold mines: black mine workers were for decades deliberately exposed to dangerous dust levels, but owing to the migratory and “temporary” nature of their employment this was considered an “acceptable” risk by the colonial and Apartheid regimes. There was no lack of scientific knowledge about toxicity and contamination. Instead, doctors concealed research results and downplayed risks to enable the continuation of powerful extractive industries. Scientific research and more widespread awareness about toxicity have in recent decades led to protests against mining and oil drilling, as people complain about pollution or radiation, but this is by no means an automatic outcome.¹⁹ Even where knowledge about the harmful effects of industry is available, it does not always enter the public domain and it does not inevitably cause popular protests. As the following examples will show, the unequal legacies of colonialism and capitalism profoundly shape the ability of individuals—differentiated along lines of race, socioeconomic status, and political power—to act on scientific knowledge about pollution.

¹⁴ Yusoff, *Billion Black Anthropocenes or None* (cit. n. 5); and Sven Beckert *et al.*, “Commodity Frontiers and the Transformation of the Global Countryside: A Research Agenda,” *Journal of Global History*, 2021, 16:435–450, on p. 435.

¹⁵ Yusoff, *Billion Black Anthropocenes or None*, p. 30; and Andreas Malm and Alf Hornborg, “The Geology of Mankind? A Critique of the Anthropocene Narrative,” *Anthropocene Rev.*, 2014, 1:62–69, on p. 64.

¹⁶ Yusoff, *Billion Black Anthropocenes or None*, pp. 59, 62.

¹⁷ Coen, *Climate in Motion* (cit. n. 1); and Renn, *Evolution of Knowledge* (cit. n. 1).

¹⁸ Marco Armiero, “The Case for the Wasteocene,” *Environmental History*, 2021, 26:425–430, on p. 429; Gabrielle Hecht, *Being Nuclear: Africans and the Global Uranium Trade* (Cambridge, Mass.: MIT Press, 2012); and Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York: Bloomsbury, 2010).

¹⁹ Jock McCulloch, *South Africa’s Gold Mines and the Politics of Silicosis* (Woodbridge: Boydell & Brewer, 2012); Iva Peša, “Mining, Waste, and Environmental Thought on the Central African Copperbelt, 1950–2000,” *Environment and History*, 2020, <https://doi.org/10.3197/096734019X15755402985703>; and Joan Martinez-Alier *et al.*, “Is There a Global Environmental Justice Movement?” *J. Peasant Stud.*, 2016, 43:731–755.

How do historical theories of the Anthropocene contribute to understanding the varied responses to resource extraction's environmental transformation across Africa? Focusing on questions of capitalism, colonialism, and scientific knowledge brings particular historical path dependencies to light, which inform the possibilities and impossibilities of contemporary action in the Anthropocene. Using three examples, I will ask what insights histories of the technosphere can offer in grappling with the Anthropocene's present and future.

LEARNING TO LIVE WITH INDUSTRY ON THE CONGOLESE COPPERBELT

Large-scale industrial copper mining started in the Congolese region of Katanga in 1907. The Belgian colonists, through the Union Minière du Haut-Katanga (UMHK), immediately sought maximum profits from mineral deposits. Copper revenues proved essential to keeping the colonial state afloat.²⁰ After independence, Katanga tried to secede under the leadership of Moïse Tshombe, to prevent the presidential clique in Kinshasa from skimming off its copper wealth. The secession attempt between 1960 and 1963 failed, and the ruling elite subsequently sought a tight grip on the mineral-rich province, taxing its wealth heavily. Forms of extractive capitalism persist to this day, as government agents try to profit from Chinese investments in the copper mines, which benefit mining communities themselves very little.²¹

The effects of more than a century of copper mining—which epitomizes the technosphere—have profoundly and often detrimentally transformed the Katangese environment. Residents are acutely aware of these transformations and readily point to wilted vegetation due to toxic emissions and dead fish in the rivers after an acid spill. Of particular concern is *kachoma* (sulfur dioxide smoke), which causes coughing, skin rashes, and other ailments, especially in June and July, when strong wind spreads mineral dust far and wide. Lack of knowledge was never the reason for government or industry inaction against pollution. As early as 1936, UMHK engineers examined the fumes from Lubumbashi's smelter, concluding that 2,500 tons of sulfur dioxide were emitted on a monthly basis. Still, colonial officials dismissed residents' complaints about "the inconvenience of the fumes" as "strongly exaggerated." Although chemical methods to minimize the fume nuisance existed and UMHK engineers considered building a higher chimney for the purposes of dilution, the company opted to transfer operations to the smaller town of Kipushi, where "the risks of criticism are less severe" than in Lubumbashi.²² This example illustrates that colonial mining officials were fully aware of the environmental risks posed by copper mining and processing and that popular protest occasionally occurred, yet in the end profit trumped environmental concerns.

The tone of the medical correspondence of UMHK's successor Gécamines in the 1970s is eerily similar. The nationalized mining company carefully researched the impacts of mining-related professions on worker health. Doctors were aware of occupational diseases such as silicosis and lead poisoning, and they examined the effects of toxic substances (arsenic, cadmium, and mercury) on workers' bodies. Yet the Gécamines directors proclaimed that medical services were merely designed to "lead to an improvement in productivity." Espousing this productivist attitude, a Gécamines doctor in 1974 recognized pollution as a cause of occupational diseases

²⁰ Donatien Dibwe dia Mwembu, *Bana Shaba abandonnés par leur père: Structures de l'autorité et histoire sociale de la famille ouvrière au Katanga 1910–1997* (Paris: L'Harmattan, 2001).

²¹ Miles Larmer and Erik Kennes, "Rethinking the Katangese Secession," *Journal of Imperial and Commonwealth History*, 2014, 42:741–761; and Larmer *et al.*, eds., *Across the Copperbelt: Urban and Social Change in Central Africa's Borderland Communities* (Oxford: Boydell & Brewer, 2021).

²² Peša, "Mining, Waste, and Environmental Thought on the Central African Copperbelt" (cit. n. 19); and Archives Générales du Royaume 2, Brussels, UMHK Collection, Folder 319, "Fumées des usines de Lubumbashi, Justification et examen des conséquences du transfert éventuel des opérations de grillage à Kipushi," 19 June 1936.

but still maintained that “to secure production, industries are obliged to accept these permanent risks.”²³ Even when knowledge about the environmental ill effects of mining on health existed, this knowledge was rarely made public. In some instances, medical research purposefully manufactured doubt about toxicity and health.

If expert knowledge about the environmental harms of copper mining existed and communities complained about smoke, why were protest movements on the Congolese Copperbelt relatively rare? How did people “learn to live with pollution”?²⁴ While the answer to this question is complex, long-standing paternalism plays an important role. The Congolese Copperbelt was incorporated into the colonial and independent Congolese state in a particularly extractive way. The region’s mines were primarily designed to generate profits for a global capitalist economy. To achieve this, mines needed a stable and docile workforce, and they set up relatively generous paternalistic policies to attract workers. Mine workers received free housing, education, and health care and had access to libraries, sports facilities, and bars.²⁵ These employment benefits made workers hesitant to protest over pollution. Moreover, most workers were migrants from several hundreds of kilometers away, who tended to “naturalize” the industrialized environment of the Copperbelt. After independence, Mobutu Sese Seko’s authoritarian one-party state made any form of protest difficult. Even with the dismantling of paternalistic welfare services in the 1990s, mine workers have largely maintained similar relationships with new Canadian, Australian, and Chinese investors, though their corporate social responsibility policies are meager compared to the earlier benefits. Underemployment in the region means that mine workers are content to have jobs and reluctant to protest over environmental conditions.²⁶ Histories of colonialism and capitalism thus profoundly shaped Katangese residents’ perceptions of their environment and their responses to Anthropogenic change. Extractive capitalism has led Congolese residents to accept resource extraction despite all its blatant environmental effects. Mine workers and their families have naturalized resource extraction, seeing the environment as a resource that can best be profitably exploited while it lasts. This has profound consequences for how people on the Copperbelt live with the Anthropocene, as mining is a major contributor to climate change and crucial to global low-carbon transitions, but these consequences can only be understood when we are attentive to local historical circumstances.²⁷

GOLD MINING, WASTE DUMPS, AND THE TECHNOSPHERE ON THE WITWATERSRAND

The 1886 Witwatersrand gold rush spurred the urbanization of Johannesburg and profoundly shaped the character of colonial rule. Industrial gold mining in South Africa has been ongoing ever since, although gradual resource depletion has propelled a shift toward the reprocessing of mined “waste.” Yet even if gold mines close, problems of acid mine drainage and heavy metal

²³ Peša, “Between Waste and Profit” (cit. n. 10); “Délégation générale,” 1 July 1974, Gécamines Lubumbashi Archives, Lubumbashi, Democratic Republic of Congo; and Kelalu Nzanga, “Quelques conditions de rationalisation et de développement des services médicaux des grandes industries extractives,” *Maadini*, 1974, no. 3.

²⁴ Anna Lora-Wainwright, *Resigned Activism: Living with Pollution in Rural China* (Cambridge, Mass.: MIT Press, 2017).

²⁵ Iva Peša and Benoît Henriët, “Beyond Paternalism: Pluralising Copperbelt Histories,” in *Across the Copperbelt*, ed. Larmer et al. (cit. n. 21), pp. 27–52.

²⁶ Miles Larmer, *Living for the City: Social Change and Knowledge Production in the Central African Copperbelt* (Cambridge: Cambridge Univ. Press, 2021); and Benjamin Rubbers, *Le paternalisme en question: Les anciens ouvriers de la Gécamines face à la libéralisation du secteur minier katangais (RD Congo)* (Tervuren: L’Harmattan, 2013).

²⁷ Benjamin K. Sovacool et al., “The Decarbonisation Divide: Contextualizing Landscapes of Low-Carbon Exploitation and Toxicity in Africa,” *Global Environmental Change*, 2020, 60:102028.

pollution will continue to affect surrounding communities for decades to come.²⁸ The disruptive migrant labor system and the Apartheid regime initially curbed protest against the environmental transformation caused by gold mining. Yet activism focused on environmental degradation has become much more vocal since democratization in 1994.²⁹

Waste sites embody the afterlives of industrial technology. They give us insight into how past mining activity continues to impact the contemporary technosphere. Waste sites are a microcosm for understanding how the environment has historically been valued in Johannesburg. Gold mining moves tons of earth, most of which ends up in one of the numerous waste dumps scattered across the city. Mine dumps are “large manmade structures” that “have given Johannesburg its character and familiar skyline.” Gold mining residues were deposited in the Top Star mine dump in southwest Johannesburg between 1889 and 1939. The town council prohibited housing construction on top of the dump, due to “envisaged danger” and the risk that it would be held responsible for possible damages.³⁰ Nonetheless, in 1955 permission was given to build houses all around this toxic pile of waste. The dump itself served as a drive-in cinema for whites only from 1958 to 2008, illustrating how waste became normalized and positively reimagined. In 2008, the five-million-ton dump started to be recycled to recover profitable leftover traces of gold, and the residues were transported as tailings outside of Johannesburg. Cinema clientele protested the reprocessing, arguing that Top Star was part of their industrial heritage. Meanwhile, airborne, soil, and water pollution from the dump site continues unabated, generating health risks for the surrounding residents. Yet because of their informal land tenure agreements, they rarely protest against issues of pollution.³¹ Looking at mine dumps, thus, creates a clearer perspective on technology, environmental transformation, and human responses in the Anthropocene.

Today, Top Star is simultaneously viewed, by different groups, as toxic waste, as a heritage resource, and as economically valuable. The surrounding informal and high-density settlements suffer from daily air pollution, health problems, and toxicity, as the dump contains uranium, lead, and other heavy metals. On the basis of extensive interviews, Judith Muindisi has argued that people living around mine dumps “do not value them or see them as aesthetically pleasing, but rather see them as a health risk.” One of her interviewees asked: “How do you appreciate something that poisons you?”; a farm owner complained that “you know that this is not just sand, it’s toxic waste full of chemicals and you are living with it.”³² Others, nonetheless, argue that Top Star is part of Johannesburg’s rich mining history and a cultural marker of the city. When reprocessing was first discussed, dozens of listeners called in to a popular radio show to voice their disagreement and to reminisce about their youthful memories of attending the drive-in cinema. Heritage agencies likewise consider mine dumps valuable, part of the city’s “very significant mining heritage.” They further identify preservation as an opportunity to commemorate the migrant laborers who toiled in Johannesburg’s mines.³³ Mine dumps, such as Top Star, have clearly spurred considerable debate and are remembered differently by various actors.

²⁸ Charles van Onselen, *Studies in the Social and Economic History of the Witwatersrand, 1886–1914*, Vol. 1: *New Babylon*, Vol. 2: *New Nineveh* (Johannesburg: Ravan, 1982); and J. G. Lusilao-Makiese *et al.*, “The Impact of Post Gold Mining Mercury Pollution in the West Rand Region, Gauteng, South Africa,” *Journal of Geochemical Exploration*, 2013, 134:111–119.

²⁹ Scott and Barnett, “Something in the Air” (cit. n. 10).

³⁰ Wouter Fourie and Jaco van der Walt, “Heritage Scoping Assessment for the Top Star Dump Mining Project—Crown Gold Recoveries,” Matakoma Heritage Consultants Report (2006), pp. 2, 27.

³¹ Judith Muindisi, “Exploring the Preservation of Mine Dumps as Heritage: Debates in the Context of Johannesburg, South Africa” (M.A. thesis, Univ. Witwatersrand, Johannesburg, 2013).

³² *Ibid.*, pp. 63, 45, 54.

³³ Fourie and van der Walt, “Heritage Scoping Assessment for the Top Star Dump Mining Project” (cit. n. 30); and Muindisi, “Exploring the Preservation of Mine Dumps as Heritage,” p. 4.

The deeply unequal history of Apartheid still conditions the ability of different actors to contest the legacies of mine dumps. While the white patrons of the drive-in cinema can shield themselves from toxic dust in distant gated communities, those residing in informal settlements directly adjacent to the dump have to live with its pollution every day. Yet they lack “the right contacts or money to pursue the matter against big mining houses.”³⁴ Histories of colonialism, capitalism, and scientific knowledge play a vital role in how the Anthropocene is experienced in Johannesburg. As a result, Anthropocenic effects play out very differently within the same city: while some naturalize and romanticize mining heritage, others object to its toxic effects. The power to protest against pollution is differentiated by race, class, and political influence—and is not neatly correlated with the presence or absence of scientific knowledge. Historical inequalities thus continue to shape ways of living in the Anthropocene, now and for the foreseeable future.

OIL DRILLING AND PROTEST IN THE NIGER DELTA

Oil was discovered in Nigeria in 1956, and British Petroleum and Shell steadily expanded production in the following decades. Strife over oil fueled the secession of Biafra and the Nigerian Civil War (1967–1970), as well as subsequent violent conflict in the Niger Delta region. These conflicts revolved around ownership of oil and access to its revenues.³⁵ The Niger Delta has become notorious for the large number of oil spills that occur there, and in the 1990s Ken Saro-Wiwa famously voiced deep-rooted environmental grievances.³⁶ Gas flaring, dead fish, and barren fields drew international attention to the Niger Delta’s “ecocide,” making Nigeria an illustrative case of mobilization against the oil industry’s Anthropocenic transformation. Literary works—poems in particular—offer a window for understanding why pollution mobilized protest in the Niger Delta.

Tanure Ojaide, in his poem “When Green Was the Lingua Franca” (1997), describes a fertile environment destroyed by oil drilling:

Then Shell broke the bond
with quakes and a hell
of flares. . . .
[This] drove the seasons mental
and to walk on their heads . . .
so many trees beheaded
and streams mortally poisoned
in the name of jobs and wealth!

Obari Gomba, in his poem “Acid Rain” (1999), offers an even more scathing critique:

Those who live here know
That acid rain is not a theory
From the vanities of science.
Our land is the very laboratory

³⁴ Muindisi, “Exploring the Preservation of Mine Dumps as Heritage,” p. 52.

³⁵ Okonta, *When Citizens Revolt* (cit. n. 10); Omolade Adunbi, *Oil Wealth and Insurgency in Nigeria* (Bloomington: Indiana Univ. Press, 2015); and Michael Watts, “Resource Curse? Governmentality, Oil, and Power in the Niger Delta, Nigeria,” *Geopolitics*, 2004, 9:50–80.

³⁶ Ken Saro-Wiwa, *Silence Would Be Treason: Last Writings of Ken Saro-Wiwa* (Dakar: Daraja, 2013); and Roy Doron and Toyin Falola, *Ken Saro-Wiwa* (Athens: Ohio Univ. Press, 2016).

Of its proof. If the rusty roofs
 Tell you nothing,
 Look at the crops that wither
 After the first rain.
 Ask the farmer why strange rashes
 Have ruined his or her skin
 After a workday under the rain.
 A sky that is fed
 With industrial waste will release
 Its illness as rainfall.³⁷

These two poems are mere illustrations, but they show clearly that the Niger Delta population was fully aware of the relationship between oil drilling, environmental degradation, and pollution. Furthermore, Ojaide's poem suggests that the price of environmental destruction was not worth the economic profit derived from oil drilling. On multiple occasions, militant activists against environmental degradation in the Niger Delta have attacked oil infrastructure. Why have people in Nigeria taken to the streets, whereas reactions against severe pollution have been much more resigned in Congo and South Africa?

Resource curse theories ask why natural resource wealth in Africa is so often correlated with poor governance and conflict.³⁸ Oil, in particular, generates vast cash flows that are centrally managed by a small and not always democratically sanctioned elite. Thanks to the windfall of oil revenues, the state is less reliant on taxation for its income, which further decreases government legitimacy vis-à-vis its constituency. The federal structure of the Nigerian state, which has been in place since British colonists instituted "indirect rule" and granted far-reaching local autonomy, exacerbated tensions over how oil wealth was to be spent.³⁹ Already in 1967, the oil-rich region of Biafra attempted to secede so as to keep a tighter hold on oil revenues. And in subsequent decades, as well, political tension has built up as the Movement for the Emancipation of the Niger Delta and other groups have tried to ensure that oil wealth benefits the population in the Niger Delta, rather than flowing directly to Lagosian businessmen and government officials.⁴⁰ While gold and copper wealth might equally be understood within the resource curse framework, the extractive and highly unequal structures of capitalism, colonialism, and one-party rule in Congo and Apartheid and racial inequality in South Africa made protest movements far more difficult. Oil drilling, perhaps, caused more direct and visible pollution and environmental devastation. Mining also set in motion profound environmental transformation, but as a form of "slow violence." This underlines the importance of the materiality of different resources and the specific forms of environmental change their extraction spurred.⁴¹ Overall, the particular mix of Nigeria's history with colonialism, capitalism, and scientific knowledge informed a distinctive form of militancy against multinational petroleum companies and their "ecocide" in the Anthropocene.

³⁷ Tanure Ojaide, *Delta Blues and Home Songs* (Ibadan: Kraft, 1997), p. 13; and Obari Gomba, *Pearls of the Mangrove* (Lagos: Mahogany, 1999), p. 94.

³⁸ Nicholas Shaxson, "New Approaches to Volatility: Dealing with the 'Resource Curse' in Sub-Saharan Africa," *International Affairs*, 2005, 81:311–324.

³⁹ Watts, "Resource Curse?" (cit. n. 35).

⁴⁰ Samuel Daly, *A History of the Republic of Biafra: Law, Crime, and the Nigerian Civil War* (Cambridge: Cambridge Univ. Press, 2020); and Adunbi, *Oil Wealth and Insurgency in Nigeria* (cit. n. 35).

⁴¹ Rob Nixon, *Slow Violence and the Environmentalism of the Poor* (Cambridge, Mass.: Harvard Univ. Press, 2011); and Timothy J. LeCain, *The Matter of History: How Things Create the Past* (Cambridge: Cambridge Univ. Press, 2017).

CONCLUSION

Given the way in which the technosphere has destabilized the Earth system, the Anthropocene's future is difficult to predict. I have therefore asked what a historical approach—a broad and interdisciplinary approach that combines the history of science with a focus on technology and the environment, as well as on issues of race, class, and political power—can contribute to understanding the Anthropocene today. Using three examples, from the Congolese Copperbelt, the Witwatersrand, and the Niger Delta, I assert that such an approach can reveal significant path dependencies related to capitalism and colonialism, which influence current responses to the Anthropocene. Despite the dramatic consequences of mining and oil drilling—exemplars of the technosphere—in all three localities, anthropogenic environmental transformation and scientific knowledge about pollution have elicited widely varying responses, ranging from ostensible resignation in Congo to racially differentiated reactions in South Africa to violent protest in Nigeria. The Anthropocene, as Cheryl McEwan points out, has “roots in colonialism, and . . . racialized inequalities and dispossession.”⁴² Yet in Congo legacies of extractive capitalism and state centralization circumscribed opportunities for protest, whereas in South Africa the history of Apartheid caused whites and blacks within the same city to experience mining and its toxic effects very differently—which also informed their proclivity to protest these effects. In Nigeria, by contrast, a federal structure and feelings of nationalist entitlement caused protest over oil drilling to be present from the start. Being attentive to these plural stories enables us to offer a more complicated account of the Anthropocene. While on a planetary level resource extraction will remain crucial to envisaging Anthropocene futures (a wind turbine park consumes tons of copper, and petroleum is used for everything from plastics to asphalt and synthetic materials), it is important to pay attention to the unequal histories that have brought about our current predicament.

By offering regionally diverse accounts of the technosphere, historians of science can contribute meaningfully to decolonizing discussions about the Anthropocene. Speaking of a single planetary Anthropocene universalizes a particular Euro-American understanding of environmental change, while silencing alternative experiences.⁴³ Whereas Niger Delta communities tend to associate pollution with a disruption of vital social relationships, white residents of Johannesburg are more likely to measure heavy metal levels in a laboratory.⁴⁴ Historians of science need to take these different forms of knowledge seriously, in order to account for different cultural imaginations of environmental change in the Anthropocene. This essay has examined experiences from Africa, but this approach could equally be applied to Asian, Latin American, and other localities. The historical dynamics of capitalism, colonialism, and scientific knowledge have informed how people all across the world live variously with the Anthropocene, generating “realities of differentiated vulnerability.”⁴⁵ Historians of science should strive to document these diverse stories, plural experiences, and varied forms of knowledge in the Anthropocene.

⁴² McEwan, “Decolonizing the Anthropocene” (cit. n. 11), p. 91.

⁴³ Macarena Gómez-Barris, *The Extractive Zone: Social Ecologies and Decolonial Perspectives* (Durham, N.C.: Duke Univ. Press, 2017).

⁴⁴ Stephanie Newell, *Histories of Dirt: Media and Urban Life in Colonial and Postcolonial Lagos* (Durham, N.C.: Duke Univ. Press, 2020).

⁴⁵ McEwan, “Decolonizing the Anthropocene” (cit. n. 11), p. 84.