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Extractive industries and the environment

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Published in:
The Extractive Industries and Society

DOI:
[10.1016/j.exis.2021.100933](https://doi.org/10.1016/j.exis.2021.100933)

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Document Version
Publisher's PDF, also known as Version of record

Publication date:
2021

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Pesa, I., & Ross, C. (2021). Extractive industries and the environment: Production, pollution, and protest in global history. *The Extractive Industries and Society*, 8(4), [100933].
<https://doi.org/10.1016/j.exis.2021.100933>

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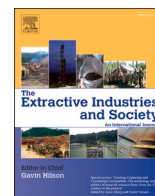
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Original article

Extractive industries and the environment: Production, pollution, and protest in global history

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ARTICLE INFO

Keywords:

Environmental history
Resource extraction
Political ecology
Anthropocene
Globalisation

ABSTRACT

Resource extraction has historically caused dramatic environmental changes across the globe. Although mining and oil drilling have transformed landscapes and polluted the air and water wherever they have taken place, knowledge of how these environmental transformations have been experienced and lived in different parts of the world remains fragmentary. This special issue seeks to provide new insights into the environmental histories of resource extraction, particularly in the Global South, where extractive industries have intensified markedly since 1950. Inspired by recent environmental history scholarship, we link together analyses of imperialism, capitalism, and environmental inequality in African, Asian, and Latin American localities of resource extraction. Furthermore, drawing on the analytical framework of political ecology, we examine why protests against extractive industries did or did not occur in specific sites. Given the increasing global demand for resources and pressing current-day questions about how to live in the Anthropocene, it is timely to scrutinise production practices, pollution, and protest in global history.

1. Introduction

We live in a world based on minerals. Although they often remain unnoticed in everyday life, the products of mining are all around us. From the buildings we inhabit to the infrastructures that supply them, from the machines that move us around to the energy networks that animate them – all are based to a large extent on materials that are extracted from the earth's thin outer crust (LeCain, 2017). Despite our continued reliance on wood, and despite the post-war boom in plastics, modern societies rely more heavily than ever on minerals. The airplanes, cars, smartphones, and computers of today contain literally dozens of different metals. Like most of our gadgets, they are largely powered by fossil fuels extracted from deep underground, whether directly in the form of refined petroleum or via coal- and gas-dependent electrical systems built mainly of copper and aluminium. Even much of what we eat depends on mining. Without artificial fertilisers based on mined phosphates and potassium salts, and above all synthetic nitrogen – whose main feedstock is natural gas – it is estimated that global food production would decline by around 40–50% (Smil 2001a, 2001b; Stewart et al., 2005). As human numbers continue to grow in the coming decades, there is little sign that mining will become less important.

On the contrary: mining is set to grow rapidly in the future.

According to the OECD, global metal use amounted to 7 gigatonnes per year in 2011, and forecasts suggest a rise to 19 gigatonnes by 2060. Over the same period, the use of non-metallic minerals is projected to rise from 35 to 82 gigatonnes, with the strongest rise occurring in developing countries (OECD, 2018). Extractive industries already provide the bulk of items that we use, and will doubtless continue to do so. Estimates based on USGS data indicate that of the 100.6 billion metric tonnes of material used around the world in 2017, a full three-quarters came from mining operations (roughly half in the form of bulk materials for construction and mineral ores for agriculture, and another quarter in the form of fossil fuels and metals). Much of it was moved around the world from sites of extraction to centres of economic activity. From 1950 to 2003 the WTO reckons that the volume of worldwide mineral exports grew by 4.1% annually. Over the same period the value of metal exports grew from \$23 billion to \$671 billion, mainly due to increases in the amount shipped across borders (Davis, 2010). Simply put, mineral extraction is an enormous business. Altogether, the combined value of mining and mineral production in the 2010s hovered between 1.2 and 1.8 trillion USD, which constitutes nearly 2% of global GDP (Ericsson and Löf, 2019).

Although such figures are useful for conveying a sense of the colossal scale of mining activity around the world, in fact they only hint at its wider

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<https://doi.org/10.1016/j.exis.2021.100933>

Received 29 January 2021; Received in revised form 20 April 2021; Accepted 25 April 2021

Available online 12 May 2021

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ramifications. Ever since the dawn of the industrial era, the explosive expansion of mining has reshaped economies, redistributed patterns of wealth and political power, overturned long-established social structures, and spawned whole new fields of scientific knowledge and technological innovation (see Curtis, 2013; Ross, 2017). At the same time, mineral extraction also dramatically transformed the biophysical environment. It has been a century since Robert Sherlock (1922) first suggested that humankind had become a ‘geological agent’ to rival the natural forces of wind, water, and tectonic movements, and in the meantime our impact has steadily multiplied. All across the globe, miners have flattened mountains, excavated canyons, washed away hillsides, filled entire valleys with waste, and riddled the earth’s outer crust with a maze of tunnels, shafts, and boreholes (LeCain, 2009). What is more, the effects of extraction and processing have reached far beyond the lithosphere. Mining operations have impounded or re-directed rivers, razed forests, and poisoned air and water with a cocktail of chemical pollutants, causing severe damage to the health and well-being of countless organisms, including humans (Odell et al., 2018; Sovacool, 2020).

Yet despite the ubiquity of minerals in the modern world, and despite their importance in shaping the social, political, and physical landscape, we still have a decidedly patchy understanding of how these dynamics have unfolded in different parts of the world and how the communities living around extractive sites have dealt with the consequences (LeCain, 2017; Ross, 2017). While there is nowadays a sprawling literature on the economic, political, and social effects of mining, studies that explicitly link these changes with the concomitant transformation of the physical environment are still relatively rare (exceptions are Robins, 2011; Hecht, 2012; Leech, 2018). To be sure, over the past two decades scholars have become more and more interested in the ways in which non-human organisms and inanimate things shape human activity, and vice-versa. The rise of political ecology in the social sciences and the parallel boom of environmental history as a sub-discipline have transformed our understanding of the reciprocal entanglements between humans and the material world of which we are an integral part (see below and Martínez-Alier et al., 2016; Peša, 2020).

But if these trends have pointed the way towards a more ‘down to earth’ vision of our past, present, and future, most research in these fields has remained confined to the earth’s surface rather than digging into the materials and social worlds that lie beneath it (Latour, 2018). Even amongst the relatively small number of studies that focus on mineral extraction, the coverage in the literature is remarkably uneven, with some regions and themes receiving far more consideration than others. We know, for instance, far more about mining and socio-environmental change in recent years than in the more distant past, let alone how the latter shaped the former. We also know more about the links between extractive industries and environmental change in the Global North than in the Global South. Furthermore, the familiar strictures of academic specialisation have meant that most research on mining has focused on local or national contexts, with far less attention being given to larger global interconnections and broader patterns of change (some exceptions are Kumar, Damodaran, and D’Souza, 2011; Evans and Miskell, 2020; Lane, 2021). As a result, we are only beginning to understand how local social and political constellations interacted with wider trends to shape the environmental impact of mining and the ways in which different groups reacted to it.

This special issue is therefore devoted to investigating the relationship between societies, mining, and environmental change in a global perspective. While the articles focus mostly on large-scale industrial resource extraction, whose dramatic effects on landscapes and lifeworlds can be traced more easily through archival documentation, the questions we ask can be extended to ‘artisanal’ mining as well (D’Avignon, 2018), as Protschky and Morgan (this volume) show through the example of small-scale ‘forager’ mining in Indonesia and Australia. Our overarching aim is two-fold: to highlight broader patterns of change that were rooted in the increasingly global circulation of technologies, knowledge, and capital over the past century or so, and to

explore how these forces played out on – and under – the ground. By bringing together a selection of examples from around the world, we seek to analyse how wider changes in the environmental dynamics of mineral extraction have been, and continue to be, mediated by the specific social, cultural, political, and physical contexts in which they are set (see also Beckert, 2021).

It is obviously impossible to consider all aspects of these questions in a single volume such as this. Instead, the current special issue assembles a series of case studies that together give us a clearer sense of common issues and developments that have arisen in mining areas around the world, and how they were moulded and refracted by local social and physical contexts. Although the geographical emphasis is mainly – albeit not exclusively – on the Global South, collectively the essays cover a lot of ground, from Chile to the Russian Arctic and from central Africa to Indonesia. The collection as a whole revolves around a number of overarching questions: How did the increasingly global circulation of technologies shape the socio-ecological impacts of extraction and processing? How did the motives of profit and economic development serve to justify or naturalise environmental harm in different times and places? Who has borne the brunt of the environmental risks and burdens imposed by mining, and how were these burdens experienced differently by different groups of people? In what ways did international legislation since the 1980s alter environmental standards and perceptions of mining impacts? Why has mining-induced environmental change sparked protest in certain times and places and not others, and what factors underpin the success or failure of such initiatives? Though hardly an exhaustive list, this set of questions nonetheless serves to highlight many of the principal developments in the recent environmental history of mineral extraction.

2. Environmental dynamics of extractive industries: State of the field

From the silver mines of Potosi in the sixteenth century, to the massive open-pit copper mine in Butte, Montana in the nineteenth century, to the oil deposits of the Niger Delta in the twentieth century, the development of mines and oil wells has long attracted attention from a variety of actors (LeCain, 2009; Adunbi, 2015; Lane, 2021). While investors fantasised about huge profits, labour organisers dreamt of new social and political arrangements to serve the interests of ordinary workers. And while engineers boasted about the ‘technological miracles’ that they built and managed, local residents often viewed mines as either a much-needed source of income or as a sore on the landscape that imperilled their health (Curtis, 2013). This diversity has meant that historians have actively studied extractive sites from a variety of different angles, whether focusing on labour organisation, engineering, or the economic and political structures that enabled mineral exploitation (Moodie and Ndatshe, 1994; Lahiri-Dutt, 2016).

Remarkably, however, historians long remained muted about the environmental aspects of mineral extraction. Despite its status as a favourite field of enquiry for labour and economic historians, in the early 2000s mining was still something of a stepchild of modern environmental history (see McNeill, 2003; exceptions are Smith, 1987; Kretschmer, 1998). Over the following years this relative lack of attention has gradually improved, especially for the mining history of North America, and to a lesser extent in European contexts (Morse, 2003; Isenberg, 2005; LeCain, 2009; Anreiter, 2010; McNeill and Vrtis, 2017; Leech, 2018). Yet for many parts of the world, the environmental history of mining has remained under-investigated or largely unwritten (though see Dore, 2000; McDaniel and Gowdy, 2000; Daley and Griggs, 2006; Evenden, 2011). This is all the more remarkable given that the business of mineral extraction ‘moves more earth than any other human endeavor’ (Kirsch, 2010, p. 87), has perennially been one of the most environmentally destructive forms of industry, and has long served as a keystone of imperial expansion and global trade. The articles in this special issue start to address this lacuna.

What explains the relative oversight of environmental issues in histories of mining and oil drilling? In his pioneering work on copper mining in the American West, LeCain (2009, p. 18) emphasises that resource extraction was a ‘transformative but often overlooked technology that was a necessary condition to the building of the modern industrial and postindustrial world.’ Yet due to an ingrained tendency to regard nature and culture in a dichotomous relationship, environmental historians and historians of technology ‘on the whole neglected ... the environmental consequences of industry’ and resource extraction (Stine and Tarr, 1998, p. 621). As LeCain and others have suggested, an ‘envirotechnical analysis’ provides a useful lens to study mining and resource extraction, as it offers a different way of understanding humans and their biophysical surroundings (LeCain, 2009, p. 21), and reveals ‘how technological society had its roots deeply planted in nature’ (Ibid., p. 4).

Such entanglements quickly become apparent wherever we bother to look. Tracing the material dimensions of our modern systems of transport, energy, agriculture, or security takes us far beyond the final commodities or raw materials involved, for if we look more closely, we find that their essential provisioning chains involved the transformation of entire landscapes and ecosystems that became intimately bound up in the associated flows of inputs and wastes (Evenden, 2011; Jackson, 2016; MacLeod, 2018). Even the most mundane of modern technologies exhibit such interconnections. The humble tin can – the packaging mainstay of the nineteenth and early twentieth centuries – created a fundamental but generally unnoticed connection between the evolving consumer culture of the industrial world and the denuded, sluiced, and eroded tin-bearing landscapes of Southeast Asia (Ross, 2014).

Yet these evolving interconnections between cultural practices and mining landscapes cannot be fully captured in terms of the environmental impacts of human behaviour. The relationship also worked in the other direction: mining landscapes profoundly shaped people’s outlooks, identities, and sense of place. As Quivik has pointed out, exploring the often-fraught history of industrial mining waste can be a tool for ‘fully understanding, embodying, and representing the mining and mineral-processing methods that were historically employed on and beneath the landscape’ (Quivik, 2007, p. 36). In Congo and Zambia, for instance, giant slagheaps and tailings dams – which hold large amounts of toxic mining residues – have become assimilated and ‘naturalised’ as part of industrial urban heritage, as Peša’s article in this volume shows. As we seek to better account for this complex and reciprocal relationship between industry and nature, it is therefore important to recognise that the results were not always deleterious or unwanted. Instead, understanding how resource extraction used and transformed ‘the environment’ provides insights into emerging ideologies and political regimes, as well as economic and technological frameworks, which could be generative as well as destructive (Acker, 2020). By focusing on buildings and infrastructure, Venovevs’ article in this volume traces the linkages between the Soviet mining industry in Monchegorsk, its enduring influence on contemporary urban life, and the future trajectories this enables and forecloses.

On both a conceptual and empirical level the articles in this special issue consciously build on recent advances in the environmental history of resource extraction in the US and Europe. Over the past two decades scholars such as Morse (2003), LeCain (2009) and Curtis (2013) have shown how mining caused environmental change and how (mass) production methods were intertwined with social, economic, and political considerations. The geology of gold veins and copper ores influenced not only the technology developed to extract resources, but also the types of investments made and the regimes of political power that were built on mineral wealth (McNeill and Vrtis, 2017; Leech, 2018). Perhaps even more importantly, Curtis (2013) and LeCain (2017) have emphasised how mining activities influenced patterns of thought and societal organisation, generating what scholars sometimes refer to as ‘mining societies’. How did these ideological transformations influence extractive communities’ acceptance of or resistance to the environmental

changes wrought by large-scale mining? Related research on petrocultures highlights the ways in which oil extraction shapes social structures and cultural expressions, in addition to economic and political power (Black, 2012; Buell, 2012; Wilson, Carlson and Szeman, 2017). As Mitchell (2011) has provocatively argued, the extraction and processing of coal and oil has profoundly moulded political and economic systems, creating new forms of Euro-American ‘carbon democracy’. What kind of mining societies (Curtis, 2013) and oil cultures (Buell, 2012) did extractive industries create outside of Euro-American contexts? African, Asian, and Latin American mining industries, shaped by legacies of colonialism and the highly unequal structures of global capitalism, challenge existing environmental histories of resource extraction to ask questions about race, inequality, and grassroots activism (Ross, 2017). As Protschky and Morgan (this volume) innovatively show, these questions apply not only to large-scale industrial mining but to small-scale ‘forager mining’ in various parts of the world as well.

An important issue that needs further theorisation is the role of extractive industries in capitalist modernity and how structures of capitalism influence the exploitation of environments and communities. Bridge (2009, p. 1) explains extraction as ‘a primal pursuit, a business of wresting raw materials from the earth that can be converted into value. From pits, wells and mines, raw geology is liquidated into energy and money, a double-alchemy at the heart of the modern capitalist economy.’ As various commentators have argued, the logic of capitalism tends to ‘externalise’ environmental damage and does not take it into account as a cost of production (Swyngedouw and Heynen, 2003; Hornborg et al., 2007; Foster et al., 2010; Peluso, 2012; Moore, 2015; Malm, 2016). This is a general problem the world over, but the tendency is further exacerbated by the creation of sprawling commodity networks that spatially detach production from consumption, and consumption from its costs. In this sense, mine-induced water pollution in places like Chuquicamata, Chile or the destruction of fields around oil facilities in areas such as Gamba, Gabon are thus doubly invisibilised – firstly by the ‘remoteness’ of these localities, and secondly by the capitalist offloading of production costs onto the environment, as Mangarella aptly illustrates in his article (this volume).

As Kirsch (2007, p. 306) rightly emphasises, minerals are in some ways especially prone to this kind of ‘externalisation’. Metals possess a particular form of anonymity, since there ‘is no direct interface between mining companies and the public’, whether between tin producers and food shoppers, or between copper producers and consumers of electricity. LeCain (2009, p. 5) equally stresses that ‘modern technological society often keeps us from recognizing our everyday dependence on raw materials extracted from nature.’ Within the context of colonialism, in particular, there has been ‘a geographically expansionary dynamic at the heart of capitalism’, an insatiable tendency ‘towards the end of the earth that has seen the extractive frontier constantly redefined’ (Bridge, 2009, p. 10). Mining has long created new ‘ecological teleconnections’ linking industrial heartlands with far-flung areas of supply (McNeill, 2019), as Méndez, Galaz-Mandakovic, and Prieto also argue in their article (this volume). Yet because of how these teleconnections work, its environmental effects tend to remain especially ‘invisible’, mediated as they are through a complex web of processes from extraction to refining to manufacturing and consumption.

In seeking to understand these dynamics it is useful to approach mineral extraction not as a social activity with ecological consequences, but rather as a socio-ecological activity in and of itself (Moore, 2010). At a fundamental level mining was a process of re-ordering nature-society arrangements, of creating new constellations of people and other things in order to convert mineral wealth into a useful (and usually tradeable) product. A crucial first step was making this wealth ‘visible’ and available in the first place. Mineral reserves were themselves more than just natural assets lying under the surface. Informed by capitalist power relations, minerals are constructed, ‘social appraisals’ of nature, ‘those elements of nature that are understood to be useful and for which technologies exist to enable their capture or extraction’ (Frederiksen,

2010, p. 28). What counted as a 'reserve' shifted over time according to market prices and methods of production. In this sense they are human creations, products of a bundle of interrelated factors: extractive technologies that made them accessible and/or profitable, a political framework that encouraged large-scale mining and that allowed a far-reaching externalisation of its costs, and a set of cultural beliefs that accepted these costs as the price of 'progress'.

For all of these reasons, a political ecology lens is useful for examining both 'how economic and political processes determine the way natural resources have been exploited' and how the exploitation of resources in turn shapes political, social, and economic processes' (Swyngedouw and Heynen, 2003, p. 906). The articles in this special issue work towards nuancing this general approach by exploring specific examples from Colombia, Indonesia, and the Democratic Republic of Congo. The socio-ecological conditions under which resource extraction took place always mattered and specifically shaped the types of community responses and environmental consequences of mining and oil drilling, as Martinez-Alier shows in great detail (this volume). Understanding why these responses varied from place to place and how they evolved over time is a core aim of this special issue. Wedding the insights of political ecology with a longer historical perspective is important, for as Ballard and Banks have rightly noted, the effects of extractive industries are everywhere mediated by 'a positioning that draws upon historically sedimented practices, landscapes, and repertoires of meaning' and that 'emerges through particular patterns of engagement and struggle' (Ballard and Banks, 2003, p. 298).

Extractive industries, with their 'capacity for generating both tremendous wealth and intense environmental transformation' have served as 'a potent metaphor for the energies and contradictions of development' (Bridge, 2004, p. 241). Environmental disruption, according to some, was an inevitable by-product of the development process, 'part of the price paid for the opportunity to enter the development race' (Adams, 2009, p. 335). Yet just what constituted environmental damage – and whether it was a price worth paying – was a matter of perspective, and could shift substantially over time. There was no singular or fixed definition of environmental destruction, just as there was no universal answer to the question of whether the economic and social benefits were worth it. For this reason, it is important to pay attention to 'the symbolic attachments that residents of mining communities often form with the mined landscape' (Bridge, 2004, p. 210). As the articles by Martinez-Alier, Orihuea, and Peša (this volume) clearly show, not all communities responded to resource extraction in the same manner. Even amidst ever-growing warnings of resource depletion and environmental harm, millions of people continue to rely on mining for their livelihoods, and many more still feel a strong familial or cultural attachment to it. It is therefore imperative to examine local and historical understandings of resource extraction, both negative and positive.

3. Pollution and protest: Why mobilisation does or does not occur

One of the fundamental characteristics of mining is that it tends to generate a 'slow-motion environmental disaster' whose effects accumulate over several decades and are sometimes 'neither felt nor witnessed' until it is too late (Kirsch, 2014, p. 4). Extractive industries are in many respects a textbook case of what the literary scholar Rob Nixon (2011, p. 8) has called 'slow violence'. The concept is useful for highlighting not only the 'attritional lethality' of many of the environmental threats posed by mining, but also the ways in which they have long tended to be overlooked due to their spatial concentration in particular (often poor or remote) places and the gradual, creeping nature of their consequences. All around the world thousands of rural communities have had to live with the injurious consequences of mining, and these consequences have often lasted long after operations shut down. Abandoned mines in the United States still discharge around 50 million

gallons of contaminated water per day, which pollutes ground and surface waters with heavy metals (Montrie, 2003; LeCain, 2009). Likewise, China's booming rare-earth mining industry has covered large expanses of inner-Mongolia and the south-eastern Jiangxi Province with toxic tailings pools that pose a lasting danger to local people and animals (Lee and Wen, 2016). Many of the worst polluters have been situated in so-called developing countries, where regulations are often lax or poorly enforced. Radioactive waste around Gabon's Franceville uranium mine and lead residues from Zambia's Kabwe mine have poisoned water, soils, and human bodies around the sites; in Kabwe lead levels in children's blood reached ten times the recommended maximum (Hecht, 2012; Human Rights Watch, 2019). amongst the most notorious cases are the mega-mines of New Guinea and surrounding islands, which dumped millions of tonnes of contaminated tailings into local rivers, destroying floodplain agriculture and fisheries for miles downstream. Billions of tonnes of waste material from the gigantic Grasberg mine in West Papua – currently the world's largest gold mine and second-largest copper mine – even threatened the Lorentz National Park, a UNESCO world heritage site (Hyndman, 1994; Bolton, 2009; Imbun, 2011).

For many people living above valuable mineral or oil deposits, the discovery of these supposed treasure troves has often done more harm than good. While mining has sometimes helped boost local incomes by generating jobs and stimulating demand for local produce, it has also frequently subjected people to the so-called 'resource curse' – that is, the idea that states which rely on a single mineral resource are more likely to be corrupt, undemocratic, and militaristic than those that do not (Auty, 1993; Ross, 2012). Although the theory is by no means equally applicable everywhere – as demonstrated by highly developed mineral-rich countries such as Canada, Australia or Norway – the overall pattern is readily observable across much of the Global South. Oil-rich states such as Angola, Gabon, or Nigeria in many ways epitomise the problem (Reed, 1987; Monday Kouango, 2002; Okonta and Douglas, 2003; Reed, 2009). In such 'spigot states' the wealth derived from large flows of extracted petroleum was used mainly to prop up dictatorial regimes and line the pockets of their supporters rather than to improve the lives of ordinary people, as Mangarella shows in his article (this volume). Yet the 'resource curse' was about more than just economics; it also had an important ecological dimension. The tragic fate of the Niger Delta, which has arguably suffered more acute and sustained ecological damage from oil extraction than any other place in the world, has long served to symbolise the interconnections between the political, social, and environmental costs of mineral extraction (Okoji, 2000; UNDP, 2006; Steyn, 2014). For resource-cursed regions such as the Niger Delta, 'a mineral strike, though less immediately spectacular than a missile strike, is often more devastating in the long term, bringing in its wake environmental wreckage, territorial dispossession, political repression, and massacres by state forces doing double duty as security forces for unanswerable petroleum transnationals or mineral cartels' (Nixon, 2011, p. 70).

Whereas the 'slow' environmental disruption caused by extractive industries has often been downplayed or accepted as 'an unavoidable part of industrial urban modernity' (Singer, 2011, p. 287), in many cases the level of damage to local environments, health, livelihoods, and lifeworlds was simply too great to be overlooked. Indeed, most people living in areas near extractive sites 'are acutely aware of, and concerned about, the threats they face from pollution' (Tilt, 2013, p. 1153). As Nixon (2011) himself has discussed in detail, environmental degradation and deteriorating access to resources on which local people rely has stimulated powerful currents of environmental activism against the ecological and social crises that such groups face. Yet the question of when and why pollution from extractive industries has sparked protest movements is by no means straightforward; in fact, it has been vehemently debated over the last two decades, as Orihuea, Martinez-Alier, and Walter and Wagner all show in their articles (this volume). Political ecology has certainly furnished a powerful tool for examining the connection between resource extraction, resource distribution conflicts,

protest movements, and violence (Bridge, 2004; Spiegel, 2017), but the answers it offers differ markedly in different contexts. One of the primary aims of this special issue is to contribute to these debates by analysing how people living near extractive sites in different times and places have perceived the environmental effects of industry and how they have responded to environmental change.

Many of the articles in this special issue rely on political ecology approaches to better understand how localised socio-cultural, economic, and political relations influenced reactions to the environmental transformation that resource extraction propelled. Political ecology 'seeks to understand the complex relations between Nature and Society through careful analysis of social forms of access and control over resources' (Peet and Watts, 2004, p. 3). Recent studies of resource extraction have shown the potential of political ecology approaches in revealing the contested meanings of 'natural resources', in addition highlighting struggles over access, governance, and distribution (e.g. Bebbington, 2008; Kirsch, 2014; Li, 2015; Verweijen and Dunlap, 2021). Political ecology approaches are particularly useful in analysing why protest against the environmental effects of resource extraction did or did not occur (Martinez-Alier et al., 2016; Lora-Wainwright, 2016). What forms did social movements advocating for ecological justice take? How can the significant differences in these movements across localities be explained (Peet and Watts, 2004)? Why did severe pollution sometimes spark radical protest movements, while at other times people reacted with apparent resignation? The articles in this special issue historicise these questions, by placing them within the broader frameworks of imperialism, global capitalism, and extractivism (Arboleda, 2020).

The concept of 'the environmentalism of the poor' suggests that low-income populations who depend on natural resources for their subsistence are more likely to protest environmental damage than groups that are wealthier and therefore more capable of drawing on resources from beyond their immediate localities (Guha and Martinez-Alier, 1997). In this respect, a plethora of studies from across the Global South – e.g. works by Li (2015) on Peru and Kirsch (2014) on Papua New Guinea – have documented the 'subterranean struggles' of poor communities (Bebbington and Bury, 2013) to achieve a measure of environmental justice in the face of threats to their livelihoods from the extractive activities of states or private corporations. Over the past two decades such research has demonstrated how farmers, mineworkers, teachers, and other groups have resisted pollution and the irreparable landscape change wrought by extractive industries.

Yet protest is not an automatic reaction to environmental degradation. From Montana to Argentina to central Africa, huge open-pit excavations and smoking smelter chimneys were long associated with prosperity and progress rather than destruction (Aiken, 1994). From a broader historical perspective, popular acquiescence towards extractive industries was probably just as prevalent as dissent or resistance. Whereas numerous studies have produced accounts of environmental protest against resource extraction in the Global South (e.g. Auyero and Swistun, 2009; Kirsch, 2014; Li, 2015), considerably less attention has been paid to instances where environmental harm has not prompted protest. Lora-Wainwright's work on China (2017, p. 14), for example, details how people learn to live with pollution while adopting forms of 'resigned activism', which she defines as efforts 'to counter or avoid pollution' as well as 'the simultaneous processes through which pollution comes to be regarded as a normal and unavoidable part of the environment.' Understanding how industry is both normalised and resisted reveals historical power relations and the values attached to extractive activities (Welker, 2014). As resource extraction is not set to diminish any time soon, it is crucial to trace how people have made sense of their extractive environments over time.

The articles in this special issue seek to further our understanding of how the environmental dynamics of resource extraction have been mediated by specific social, cultural, and political contexts. On a global level, extractive industries have reinforced environmental inequalities. Colonialism, capitalism, and attendant processes of accumulation-by-

dispossession have disproportionately exposed African, Asian, and Latin American extractive communities to environmental harm, while profits flow largely to Euro-American multinationals (Pulido, 2017; Ross, 2017; Yusoff, 2018). Drawing on decolonial thought, as well as on more recent notions of 'sacrifice zones' and unequal ecological flows, the articles that follow examine how resource extraction reinscribes global structures of domination and (post-)colonial hierarchies (Hornborg et al., 2007; Foster et al., 2010; Lerner, 2010; Moore, 2015; Mignolo and Walsh, 2018; Murrey and Jackson, 2020). A core aim is to investigate how these global trends played out on a local level, where intersectional categories of race, class, and gender influence one's exposure to industrial pollution. As Bullard (1990) and Hurley (1995) show for the US, African-American women have structurally been exposed to more severe pollution than white men living in the same city, and the same kinds of structural inequalities shape perceptions of and reactions to mining-induced change in other parts of the world.

Acquiring a more nuanced understanding of these dynamics is crucially important for addressing environmental injustices in extractive localities. Through a 'politically grounded theory of justice in and to the environment', we hope to shed new light on what Low and Gleeson have called the 'social distribution of environmental well-being' (Low and Gleeson, 1998, pp. 201–202). By assembling a range of detailed case studies stretching from Argentina and Peru to Zambia and Gabon, the articles in this special issue emphasise the underlying conditions that facilitate ongoing environmental injustice on global and local levels. Collectively, they examine resistance and opposition to the unequal socio-environmental dynamics ushered in by resource extraction, while also paying attention to how and why resource extraction is not always and everywhere resisted. As important as overt resistance movements are, it is ultimately necessary to extend the focus beyond them in order to gain a fuller understanding of the subtle, spontaneous, ad hoc actions of people to make sense of environmental change. After all, mineral extraction and its various consequences are not going away, and nor are the social and environmental trade-offs that it inevitably entails. Learning more about how people have historically weighed up these trade-offs, and how their judgements have been translated into action, can only help in finding better ways to accommodate both mining and the needs of local communities in the future, as LeCain sets out to do (this volume).

4. Mineral extraction and environmental consequences between past and future

Collectively, the papers in this special issue assert the importance of taking a historical perspective towards resource extraction. Not only does such an approach reveal early global entanglements, historical experiences also highlight the diversity of local responses to environmental transformation. The paper by Méndez, Galaz-Mandakovic, and Prieto discusses the unexpected connections between the copper mines of Bingham Canyon in the US and Chuquibambilla in Chile in the first two decades of the twentieth century. The authors argue that in terms of labour, capital, technology, and geology there is a 'tele-production of miningscapes', as the Guggenheim Exploration Company managed both sites. They find striking similarities in how these open-pit mines were worked and transformed, as knowledge, expertise, and mining practices travelled across the globe. Protschky and Morgan equally explore remarkable similarities, but this time between sulphur collection in the Dutch East Indies and lime extraction in Australia in the nineteenth and early twentieth centuries. They focus not on industrial resource extraction, but rather on the labour intensive modes of collecting and foraging that fuelled industry and agriculture in these two localities. Using original photographic sources and studying scenic volcano sites and coastlines, the paper makes an innovative connection between tourism and resource extraction. Peša's paper focuses on the Central African Copperbelt, which straddles the border between Zambia and the Democratic Republic of Congo. This paper asks how large-scale

industrial copper mining has influenced values regarding the environment. By tracing topics such as air, water and waste, health, cleanliness, and pollution over the twentieth century, it becomes evident when and why resignation towards pollution transformed into protest. Mangarella's paper sheds light on the underexplored case of oil drilling in Gabon, asking why the population rarely protested against blatant financial mismanagement and environmental degradation. Mangarella pays particular attention to the conservation attempts in which Shell and various international NGOs have engaged, to examine the link between conservation and environmentalism. Combining approaches from history and political ecology, this paper offers a fresh perspective on theories of the 'rentier state' and the 'resource curse'.

The paper by Martínez-Alier provides an overview of the field of political ecology, grounding it in ecological economics. Martínez-Alier showcases the Environmental Justice Atlas, an open-access database of more than 3000 environmental distribution conflicts worldwide, which is an excellent research tool for comparative political ecology. Are environmental conflicts about uranium mining similar across the globe, for example, or can particular continental trends in protest movements be discerned? Particularly promising is the Environmental Justice Atlas' collaboration with environmental NGOs and grassroots movements. Orihuela takes a similarly comparative approach, asking what informs green state formation in Colombia, Chile, and Peru. Orihuela argues that the environmentalisation of mining in these three countries is similar but different, informed by the specific institutional histories and resource bases of each country. Worldwide, the 1970s and 1990s were pivotal decades in state greening. The paper therefore looks at the international political economy, which diffuses particular norms of environmental governance. National context also matters, though, as state greening is ultimately an unpredictable and idiosyncratic process. Walter and Wagner use the Environmental Justice Atlas to study why in Argentina anti-mining environmental mobilisation has been so successful in suspending or blocking contentious mining projects. Argentinian activism and institutional arrangements deviate markedly from global patterns, making this case extremely intriguing to study. This paper equally suggests that the outcomes of Latin American extractivism (Arboleda, 2020) are not predetermined. Instead, historical trends, institutional patterns, and socio-political forms of mobilisation matter in understanding resource extraction and environmental change.

The final two papers focus on connections between history and future imaginaries. Venovcevs, through an original archaeological approach, examines how in Monchegorsk, a mining town in the north-west of Russia, Soviet legacies influence contemporary urban forms, sociality, and environmental relationships. By examining the infrastructure of industry, the paper asks how people continue to 'live with socialism'. Venovcevs points out that this repurposing of the past also limits which trajectories remain open for the future. LeCain asserts the importance of considering the materiality of minerals. Mining and the products we derive thereof have shaped our culture, societies, economies, and politics. Properly accounting for this, however, requires a radical post-anthropocentric approach. The papers in this special issue collectively argue that historians have a role to play, even in future-orientated discussions about the Anthropocene. By illuminating how environmental inequalities emerged and how values regarding the environmental impacts of mining and oil drilling changed over time, historical examples can provide inspiration for how to deal with the current global crisis of climate change in more equitable and hopefully sustainable ways.

Acknowledgements

We are grateful to the University of Oxford John Fell Fund for granting financial assistance to host a workshop, 'Extractive Industries and the Environment' in Oxford in December 2019. We would like to thank all workshop participants, discussants and audience members for their stimulating thoughts.

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