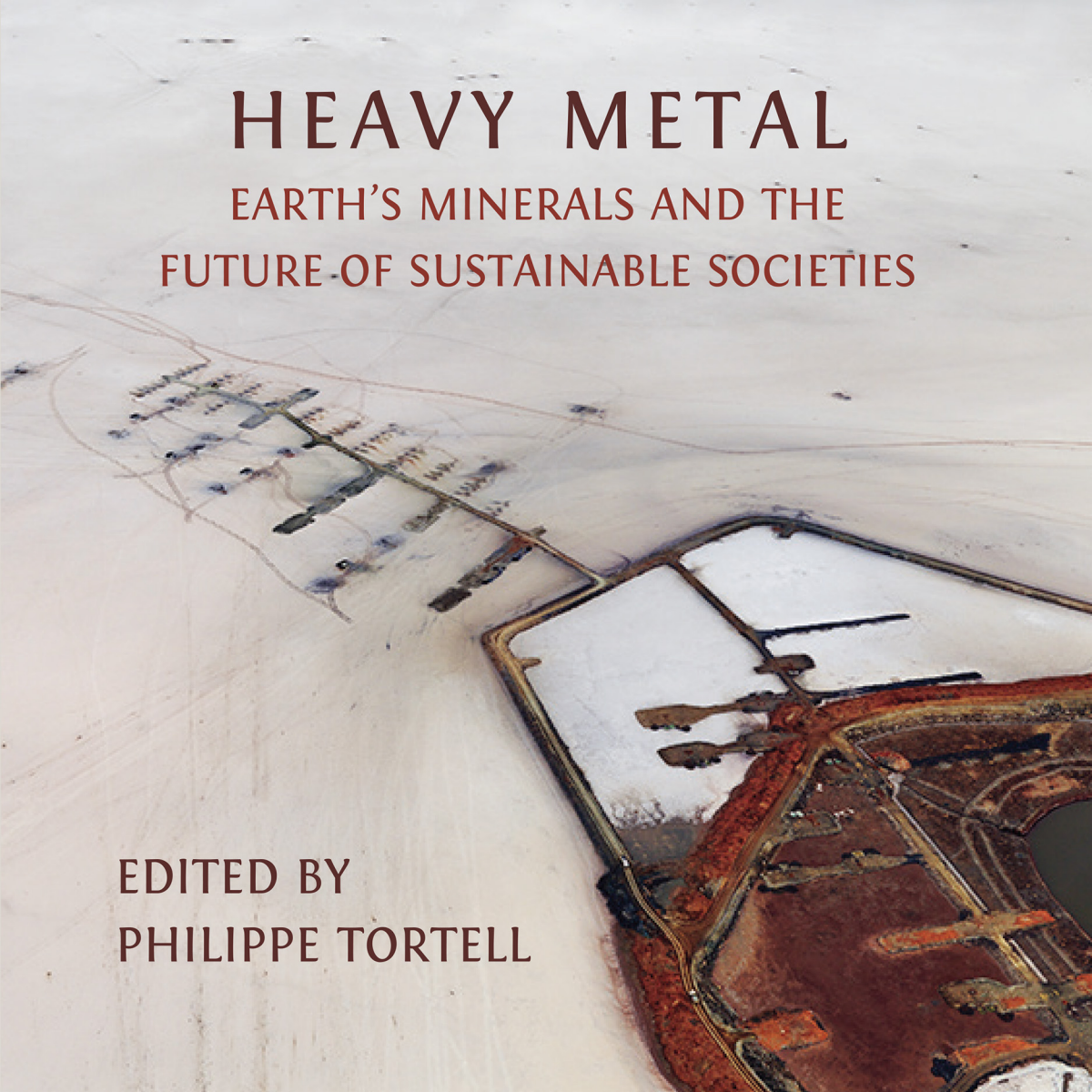
HEAVY METAL

EARTH'S MINERALS AND THE FUTURE OF SUSTAINABLE SOCIETIES



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https://www.openbookpublishers.com

ISBN Paperback: 978-1-78374-956-0
ISBN Hardback: 978-1-78374-958-4
ISBN Digital (PDF): 978-1-80064-977-4
ISBN Digital eBook (EPUB): 978-1-80064-390-1
ISBN HTML: 978-1-80511-043-9

DOI: 10.11647/OBP.0373

Cover image: Edward Burtynsky, *Silver Lake Operations #15*, Lake Lefroy, Western Australia, 2007. Photo © Edward Burtynsky, all rights reserved.

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Landscapes of Extraction

Edward Burtynsky

I have come to think of my preoccupation with the Anthropocene—the indelible marks left by humankind on the geological face of our planet—as a conceptual extension of my first and most fundamental interest as a photographer. To this end, I seek out and photograph large-scale systems that leave lasting marks. I believe there is much we can learn from deciphering such marks upon the landscape. It's as if I am creating a visual archeology, but rather than digging into the past, I'm preserving the present moment. One of the things I want to show is the scale of the impact—what is left behind as the human enterprise transforms our planet.

Over the course of my career, the subject of mining has intrigued me over and over again. In the mid-1990s, I was working in Elliot Lake, Ontario, taking photographs of large-scale mine tailings ponds. By the time I got there, more than half of the original uranium mines and tailings management areas in the region were no longer in operation. The year prior to my arrival, four of the biggest mines had been shut down. They were producing uranium—specifically yellowcake—for nuclear power plants, at a time when Russian supplies of this product were saturating the market, making it impossible for other countries to compete. Decommissioning of the remaining uranium mines in Elliot Lake had already begun in 1992, and would continue for a decade, leaving yet another community in financial and environmental devastation.

https://doi.org/10.11647/OBP.0373.08

One of the sites that drew my attention was owned by Denison Mines Incorporated. The mine's tailings pond had a towering wall made of ground quartz. About ten years earlier, a torrential rain had caused a tailings breach, flowing much of that quartzite and other waste material into the landscape, suffocating the trees and other flora in its path. The landscape I captured in my photographs still hadn't recovered after a decade.

Another area that caught my eye was the Copper Cliff Mine in Sudbury, Ontario. The area of this mining complex was expansive, about twenty square kilometers in total, including a tailings pond with walls that reached over seventy meters high in some places along the highway. In 1996, I managed to get access to the top of this tailings area, providing me with an expansive perspective from which to photograph the massively disturbed landscape. When looking at the resulting images—bright orange rivers against a stark black background—a lot of people think the colors are manipulated. They aren't. The orange color results from the residual iron ore left behind in the tailings. During the mineral processing steps, nickel and copper are concentrated out of the mined rocks, along with traces of silver and other precious metals. Iron, however, is much less valuable, and there is no economic incentive to strip it from the ore. The iron oxide gets flooded into the tailings as waste, creating literal rivers of rust.

Not long after my work in Sudbury, I started exploring recycling facilities in Toronto and Hamilton, as an extension of my mining series. Urban mining was intriguing to me, in its approach of going back into our industrial and urban waste streams to harvest materials that have already been taken from nature. In my previous work, I'd focused on primary mining—going to the land, blasting and extracting ores. In contrast, recycling and urban mining represented a source of secondary extraction; rather than harvesting from the earth again and again, it was an opportunity to reclaim high-value materials that already existed in the recycling stream. I was interested to see large-scale e-waste, at a time when businesses were buying post-consumer goods in anticipation of cheap technologies that would enable conversion and repurposing of the embedded copper and other metals. But soon after I took these pictures, the city

forced the closure of the e-waste depot. The recycling technology wasn't available yet, the waste couldn't be burned, and there was no efficient way to process it. Instead, they put it in containers and shipped it to China. Years later, when I decided to do a China project, the journey of urban mining and scrap recycling became one of my subjects. I followed the e-waste halfway around the globe.

In 2006, I was approached by the Fremantle Photo Fest, which was commissioning a series of images from Australia. I decided to accept the commission because I saw Australia as very similar to Canada in many ways—a former British colony, largely known for its expanse of natural resources, with a significant focus on mining. I wanted to showcase the Australian mining industry, and ended up visiting Perth and Kalgoorlie in 2007. During my trip, I looked at a variety of different mines, from the super pits in Kalgoorlie to the mines in the Silver Lake area. The Silver Lake Mines are located on salt flats, with a surreal-looking surface. I'd photographed mines for many years at this point, but I wanted to take these pictures differently, shooting them from a helicopter with the door off. I'd already perfected the technique for other projects, and wanted to bring it to the subject of mining.

As luck would have it, an uncommon rainfall had occurred the day before, leaving lots of water sitting on the salt flats. At the same time, the day was unusually cloudy. The combination of the cloudy skies and water on the salt flats presented a serendipitous moment that allowed me to create a body of work that's been very special to me. I remember coming back from this shoot feeling very excited about what I'd seen, and having a whole new way of looking at mining. This was the first successful aerial shoot that produced a complete series, informing the subsequent aerial work I've done over the last thirteen years.

The Australian mining shoot also stimulated my photographic interest in water—the most fundamental aspect of life on Earth. I wanted to find ways to make compelling photographs about the human systems employed to redirect and control water. Through this work, water took on a new meaning for me. I realized that water, unlike oil, is not optional. Without it we perish. Human ingenuity and the development of its

industries have allowed us to control the Earth's water in ways that were unimaginable just a century ago. While trying to accommodate the growing needs of an expanding and very thirsty civilization, we are reshaping the Earth in colossal ways. Not just through mining, but also through agriculture and other large-scale activities.

As my interest in water grew, so did my appreciation for salt and other non-metallic minerals that we extract from the earth at industrial scales. In 2017, I visited the large underground potash mines in Berezniki, Russia. Potash is a combination of the potassium-containing minerals halite, carnallite and sylvite, and is a critically important fertilizer supporting global agriculture. Three hundred and fifty meters beneath Berezniki, massive tunneling machines reveal vividly colored layers from an ancient seafloor. As they dig, the machines leave behind impressions in the soft sedimentary rock that look like fossils of the ancient sea life from which they were formed. Completely enveloped in darkness, these tunnels were incredibly difficult to film. They are stable for the most part, and will leave behind a record of our presence through anthroturbation (large-scale human tunnelling under the earth).

Two years after my trip to Russia, I was in Senegal working on my *African Studies* project. A notable highlight of this work was a 2019 visit to the salt ponds near Fatick, Naglou Sam Sam and Tikat Banguel. Here, small-scale harvesters dig shallow depressions by hand, which are then filled with salt water from nearby canals. Once the water has evaporated, the remaining salt is cleared away, leaving residual minerals, pigments and various algae that combine with reflections of the sky to create a spectacle for the eye. Seeing these landscapes from a bird's-eye view is breathtaking; their intricate, organic structures become almost hypnotic.

Having explored many different types of traditional ore mines, from copper, gold, nickel, salt and coal, I have recently been investigating a new type of mining for rare-earth elements (REEs). These elements have unique magnetic and electrochemical properties that make them extremely useful in a wide variety of new technologies, yielding greater efficiency, performance and durability, while reducing weight and energy consumption. Rare-earth magnets, in particular, are used extensively in a

wide range of applications, from computer hard drives and wind turbines to medical scanners and electric motors.

This year, my interest in these REEs took me to the MP Materials operation in Mountain Pass, California, an open-pit mine on the south flank of the Clark Mountain Range about a hundred kilometers southwest of Las Vegas. The mine first opened in the 1950s, and expanded quickly to supply a growing need for the element europium, which was used in the color televisions that were becoming increasingly common at that time. For several decades, the mine supplied the majority of the world's REEs, before China came to dominate global production in the 1990s. In response to growing geopolitical tensions, mining operations at Mountain Pass have recently re-started, as the United States seeks to secure a reliable domestic supply of these critical elements.

The photographic study of mining illuminates larger truths about humanity's impact on Earth. All living species must take from nature to survive and we are no different; we need water and salt, we need protein, we need calories, we need shelter. That hasn't changed, but what has changed is the incredible technology that we now have at our disposal. The problem is that we have expanded well beyond the limits of what the planet can sustain, and we're waking up to that fact a bit late in the game. We're working at a level that nature never anticipated.

As artists, we can help, visually and intellectually, in understanding a collective human impact that is putting our planet in jeopardy. I feel that by showing those places that are normally outside our experience, but very much a part of our everyday lives, I can add to our understanding of who we are and what we are doing. Ultimately, I'm looking for interesting places and moments to embody my poetic narrative of the transfigured landscape, the industrial supply line and what that means in our life.

Morenci Mine #1

Clifton, Arizona, USA, 2012

Morenci Mine #2

Clifton, Arizona, USA, 2012

Tailings Pond #2

Wesselton Diamond Mine, Kimberley, Northern Cape, South Africa, 2018

Phosphor Tailings Pond #4

Near Lakeland, Florida, USA, 2012

Phosphor Tailings #5

Near Lakeland, Florida, USA, 2012

Highland Valley #8

Teck Cominco, Open Pit Copper Mine, Logan Lake, British Columbia, Canada, 2008

Mines #43

Berkeley Pit, Anaconda Copper Mine. Butte, Montana, 1985

Sishen Iron Ore Mine #2

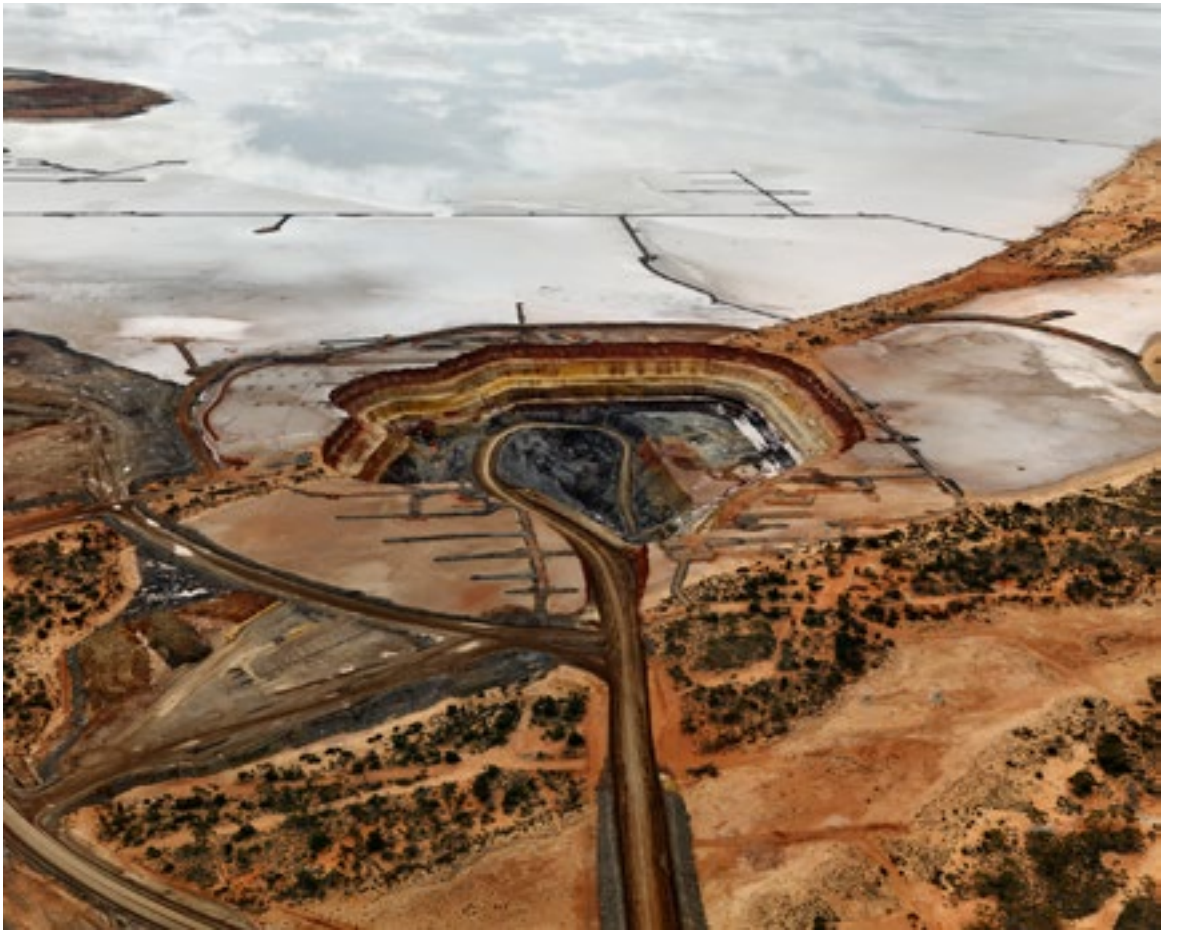
Overburden, Kathu, South Africa, 2018

Densified Oil Filters #1

Hamilton, Ontario, 1997

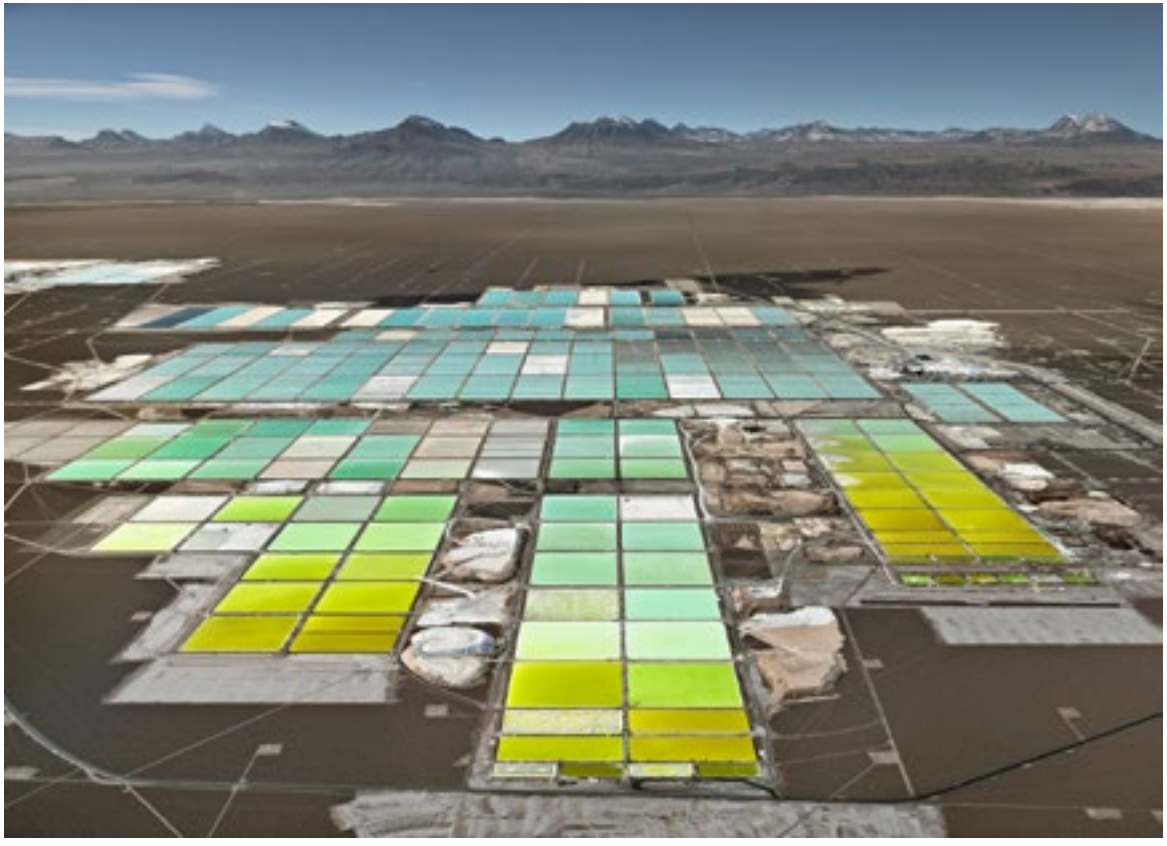
Non-Ferrous Scrap Metal #5

Hamilton, Ontario, Canada, 1997



Silver Lake Operations #5

Lake Lefroy, Western Australia, 2007

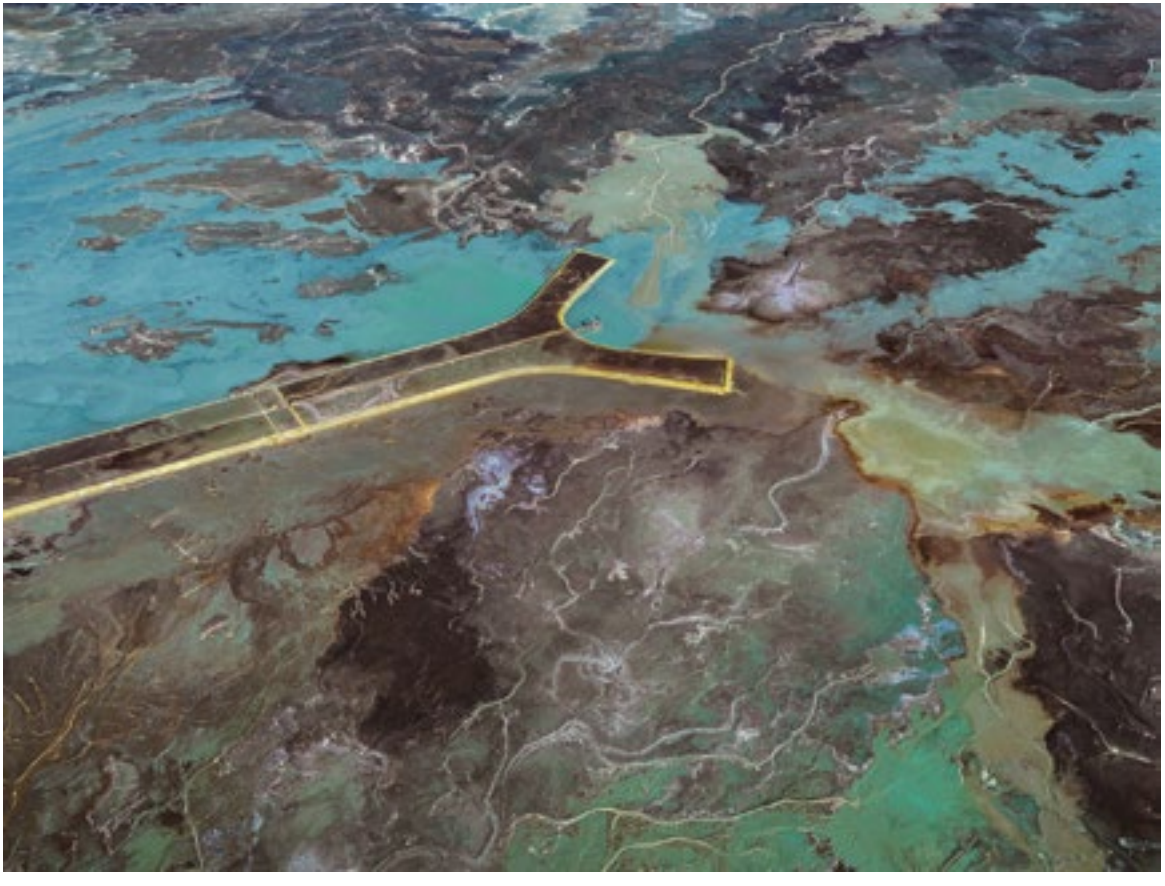


Lithium Mines #1

Salt Flats, Atacama Desert, Chile, 2017

Uralkali Potash Mine #4

Berezniki, Russia, 2017



Gold Tailings #1

Doornkop Gold Mine, Johannesburg, South Africa, 2018

MP Materials #6

Mountain Pass Mine, Mountain Pass, California, USA, 2023