Christian Danielewitz

Hidden Flow:
Artistic Research on the Frontlines of Extraction
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Hidden Flow: Artistic Research on the Frondines of Extraction
The Royal Danish Academy of Fine Arts

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Supervisor: Frederik Tygstrup
Co-supervisor: Lise Autogena

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Introduction

The geography and geopolitics of interventions into the biosphere and lithosphere remind us that industrialization has been fundamentally based on the predatory colonization of distant environments and peoples and mainly accrued to the benefit of a modest number of northerners and European-derived southerners (Cushman; Cable 2016).

This dissertation is based on fieldwork that has taken place over the last 6 years in China, Senegal, Western Australia, and Brazil. More specifically on the fringes of the Gobi Desert and the West African Sahel, in the Goldfields, and in the mining heartland of Minas Gerais. It revolves around frontiers of resource extraction, and in particular the so-called “hidden flow”. The OECD defines hidden flows as the “displacements of environmental assets without absorption into the economic sphere”, such as mining overburden and toxic tailings. In other words, the hidden flow is the waste material produced by the extraction and processing of the fossil fuels, metals, and minerals that power our societies. But where, then, is the hidden flow located, and in what sense is it out of sight? What is the socioenvironmental impact of the hidden flow, and how can artistic research investigate, articulate, and give form to the elusive but pervasive violence of this impact?

The dissertation discusses two different art projects. Part 1 focuses on the project titled Against the Grain, which was produced in collaboration with artist Anu Ramdas. It revolves around the extraction and processing of rare earth elements in Inner Mongolia, China. The fieldwork for this project was conducted during 6 months in 2016, and the body of artwork was subsequently produced between 2016 – 2020. Part 2 focuses on the project PO4 (Blackout), which was made between 2018 – 2019. This project revolves around the toxic impact of phosphate mining and fertilizer production in Senegal, and was partly produced in collaboration with the Dakar-based art institution RAW Material Company – Center for Art, Knowledge, and Society. A third project was initiated in late 2019, when I spent 5 weeks in Western Australia researching the toxic waste colonialism2 perpetrated by Lynas Corporation, a multinational company that ships the radioactive hidden flow from their mining operations to Malaysia. However, the outbreak of the COVID-19 pandemic meant that I had to cancel a planned second field trip to Australia, as well as my planned research in Malaysia. Thus, the article Desert Drone: Mapping the Rare Earth Frontier in Western Australia (2020) is so far the only published outcome of this specific project. Part 3 of this dissertation consists of this article.

The dissertation discusses methodological and theoretical approaches to both fieldwork and exhibition-making, and situates the two primary projects Against the Grain and PO4 (Blackout) within the vast and complex field of extractivism. Both projects are based on the notion of “material witness” as it is theorized by Susan Schuppli and Eyal Weizman. But while Against the Grain gives form to the entanglement of photographic media, rare earth minerals, and environmental damage (informed by Deleuze and Guattari’s notions on assemblages and territorialization), PO4 (Blackout) focuses more on situated knowledge and embodied accounts of living with toxicity. Against the Grain makes use of what Schuppli calls “mediatic matter”, that is, analogue film, to register and record nuclear radiation, while PO4 (Blackout) looks at matter more broadly. As Weizman points out, built environments (also) register and record invisible forms of hazardous contamination – if you only know how to read them. While Against the Grain (and Desert Drone) document the sites of extraction and hidden flow from different mediatic and technological perspectives, and theorize the

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entanglement of media and minerals as a map-territory relation, PO4 (Blackout) is based on what Macarena Gómez-Barris calls the “submerged perspective”. The submerged perspective, argues Gómez-Barris, “allow[s] us to see local knowledge that resides within what power has constituted as extractive zones” (Gómez-Barris 2017, 11).

Against the Grain and PO4 (Blackout) are obviously related in terms of subject matter, but they take rather different approaches to researching this matter. Both projects are founded in on-location fieldwork and the production of forms of material witness. However, each in their own way, the projects do more than bear witness. The body of work that comprises Against the Grain attempts to situate the viewer (and the artist) in direct relation to the environmental damage. It establishes a link between our ubiquitous digital devices (e.g. smartphones and mapping technologies) and the creation of a death-world (Mbembe 2003) of radioactive hidden flow in Inner Mongolia. Thus, it articulates our (unknowing) complicity in the social and environmental destruction taking place in these rural communities on the edge of the Gobi Desert. PO4 (Blackout) also attempts to establish this type of connection, albeit in a more subtle way, but at the same time emphasizes acts of human and more-than-human resistance, and “the possibility of life in capitalist ruins” (Tsing 2015). In this sense, PO4 (Blackout) was more than an art exhibition. Rather, it was a forum that presented a pluriversity (Mbembe 2015) of knowledge production, embodied experiences and observations, artistic and activist strategies, including a series of panel discussions and film screenings, and an NGO-led workshop. A booklet with texts by researchers on art and environmentalism was published in conjunction with the exhibition (see Appendix).

The dissertation contributes to a growing, multifarious field of artistic research on the violence of extractivism and its uneven, racialized distribution of socioenvironmental damage. Scholars such as Rob Nixon, Achille Mbembe, Elizabeth A. Povinelli, Kathryn Yusoff, Macarena Gómez-Barris, Martín Arboleda, Sandro Mezzadra and Brett Neilson, Julie Michelle Klinger and many others have described how the neocolonial extractivist logic renders mineral rich territories, primarily in the Global South, exploitable resource frontiers (or enclaves), which effectively turns these territories into sacrifice zones. But how can this be a subject of artistic research? Art historian T.J. Demos argues that extractivism – in the broadest sense of the term – has become the dominant paradigm of advanced capitalism, and writes about how the works of artists such as Angela Melitopoulos and Ursula Biemann reveal complex causalities and effects of global extractivism, and propose forms of movement-building and solidarity with those on the frontlines of opposition (Demos 2018). The power of artistic research is perhaps this: to reveal complex causalities and effects by way of situated, material investigations coupled with solidarity. Solidarity means to take sides with those who live in the damaged environments of extraction and toxic waste, but it also means to recognize that knowledge is always partial. None of us remain untouched by toxicity, but some are much more exposed than others. Mine is an outside position with regard to the toxic geographies I research, in the sense that I do not inhabit these environments. Solidarity, then, means to recognize this limited view, and share the spaces we have access to, as artists, writers, and researchers, in order to allow for embodied accounts of living with toxicity.
Prologue: Field of Research

1. The Hidden Flow: Out of Sight to Whom?

*Extraction sustains our society. We rely on energy to power the technology in our lives but are disconnected from the landscapes that must be exploited to yield that energy* (Carlisle; Pevzner 2015).

In 2008, while still an art student, I travelled to the Democratic Republic of Congo to conduct research on the lingering effects of European colonialism. For many years, colonial rule and its economic, political, and cultural legacies have been a central concern in my work. Philosopher and political theorist Achille Mbembe has pointed out that Europe is no longer the world’s centre of gravity, and argues that this is the significant event, the fundamental experience, of our era (Mbembe 2017, 1). However, as Mbembe also points out, the Western presence in the world endures, and we now find ourselves in a third phase, which “is marked by the globalization of markets, the privatization of the world under the aegis of neoliberalism, and the increasing imbrication of the financial markets, the postimperial military complex, and electronic and digital technologies” (Mbembe 2017, 3). It is a phase in the history of humanity, argues Mbembe, that is dominated by the industries of Silicon Valley and digital technology. Industries, that is, whose enormous wealth has in part been facilitated by minerals extracted from mines in DR Congo and elsewhere.

My research initially had a different focus when I arrived in DR Congo: the link between tech hubs in the Global North and resource extraction in the Global South was not my main concern. However, the focus of my research changed during the two weeks I spent in DR Congo, when an NGO offered me the opportunity to visit Goma, the conflict-ridden capital of the North Kivu province in the eastern part of the country. For almost three decades, the mineral rich provinces of North and South Kivu have suffered unspeakable violence at the hands of local warlords and the armed rebel groups they command, a violence that is funded and fuelled by the presence of tin, tungsten, tantalum, and gold. While the wealth of natural resources is not the root cause of the conflict, the extremely lucrative minerals trade has become an incentive for some of the warring parties to continue the bloodshed. International regulations have been enforced in order to tackle the trade in conflict minerals, but metals mined in eastern DR Congo are still finding their way into the global market, embedded in electronics. The Kivus are what Achille Mbembe calls enclave economies: “The concentration of activities connected with the extraction of valuable resources around these enclaves has [...] turned the enclaves into privileged spaces of war and death. War itself is fed by increased sales of the products extracted” (Mbembe 2003, 33).

It was in the eastern DR Congo that I first learned about the horrific suffering caused by a brutal conflict, which is in part funded by the trade in the minerals contained in our digital devices. In Bukavu, the capital of the South Kivu province, I visited the Panzi hospital where female survivors of rape and mutilation are treated. Here I met the director of the hospital, surgeon Dr Denis Mukwege, who explained the link between the violence and the trade in minerals from Congo. Years later, in the foreword to the 2015 report *Digging for Transparency*, published by Global Witness and Amnesty International, Dr Mukwege reiterated:
Democratic Republic of Congo’s minerals are exported, smelted, and sold internationally, where they end up in cell phones, laptops, or as pieces of jewelry. We know that some of these minerals sourced from conflict-areas have funded violence, abuses, and corrupt criminal networks. And yet, the response of international companies and states has been too slow and timid to make the necessary fundamental changes [...] Most of America’s biggest corporations have blind spots in their supply chains – leaving them oblivious to whether the products they sell contain minerals that have funded conflict” (Mukwege 2015, 2).

Indeed, the report revealed that 79 out of 100 US public companies are failing to adequately check and disclose whether their products contain conflict minerals from Central Africa. The problem is that contemporary supply chains are so long and complex that companies don’t know where their resources come from. Consequently, the average consumer has no way of knowing if the battery in her car or smartphone contains conflict minerals. In fact, she has no way of knowing where the minerals come from at all. I have often encountered people who aren’t even aware that their phones and laptops contain certain minerals, that the materiality of our digital technologies is geological matter formed over millions of years before it was wrested from the crust of the earth – in many places with enormous socioenvironmental repercussions. However, it wouldn’t be fair to claim that the enduring violence that has ravaged DR Congo since the 1990s has been completely overlooked by the global news media. For at least a decade or more we have been presented with images of children toiling in mines under terrible conditions, extracting the coltan that is used to produce the millions of products sold by e.g. Apple, Google, Dell, Tesla, and Microsoft. Still, the bloodshed in DR Congo is often called Africa’s forgotten war. Compared to the enormity of the atrocities, the country receives little attention from the international media. But if the situation in the Kivus is underreported and poorly prioritized, where does it leave other damaged territories of extraction that don’t attract any attention at all? Places where the violence is far less visible, but nonetheless deadly. Territories of extraction that aren’t marred by a brutal war, but rather by the slow violence of toxic drift, chemical fallout, and radioactive waste.

Out of Sight to Whom?

Rob Nixon writes that “it is a pervasive condition of empires that they affect great swathes of the planet without the empire’s populace being aware of the impact – indeed, without being aware that many of the affected places even exist” (Nixon 2011, 35). How, then, can these affected places be brought into our view? For a long time, my research has revolved around territories of resource extraction, or death-worlds (Mbembe 2003, 40), and in particular the socioenvironmental impact of the hidden flow: What is it, where is it, and what does it tell us about the world we live in? How can artistic research articulate and give form to the destruction perpetrated by the global industries of resource extraction? Nixon’s book Slow Violence and the Environmentalism of the Poor (2011) has had a great influence on my work. In it he defines slow violence as a form of violence “that occurs gradually and out of sight, a violence of delayed destruction that is dispersed across time and space, an attributional violence that is typically not viewed as violence at all” (Nixon 2011, 2). Suffice it to say, this poses certain challenges with regards to representation. The question this thesis pursues is how to make the slow violence perpetrated by industries of resource extraction not only visible, but also tangible in relation to the materialities that are woven into the fabric of our everyday lives. However, in order to pursue that question, a few other questions must be answered first. Environmental researchers Stephanie Carlisle and Nicolas Pevzner have argued that while our reliance on remotely extracted natural resources only continues to increase, our relationship to the landscapes of extraction recedes ever further from daily view (Carlisle; Pevzner 2015). But from whose view do the toxic territories of extraction recede? When Rob
Nixon defines slow violence as a form of violence that occurs gradually and out of sight, we must ask, as environmental geographer Thom Davies also argues, out of sight to whom? (Davies 2019, 6) Obviously, the damaged environments of resource extraction are not out of sight to the people who actually live in these environments, that is, people whose lives are “deemed sacrifiable in the name of some greater good”, as Julie Michelle Klinger puts it (Klinger 2017, 11). But where, then, are these damaged environments located, and who inhabits these toxic spaces?

With the exception of Western Australia, a common denominator for the zones of extraction I have researched over the years is that they are located in the Global South. However, upon closer inspection Australia isn’t that much of an exception, given the fact that Australian mining corporations have a hideous record of externalizing the hazardous by-products from mineral processing to poorer countries in the developing world. In my article Desert Drone: Mapping the Rare Earth Frontier in Western Australia, I describe, for example, how the Australian rare earth miner Lynas Corporation ships radioactive waste products to Malaysia. In other words, the people who bear the burden of resource extraction in Western Australia are primarily aboriginal communities whose land and sacred sites are destroyed, and Malaysians who are exposed to the radioactive mining waste dumped by Lynas Corporation. It is clearly evident that the dividing line between those who are exposed to the toxicity of resource extraction and those who are not, runs between rich and poor communities, between urban and certain rural areas, and between markers of race and ethnicity. As Thom Davies writes: “In a pattern that is repeated the world over, environmental risks are commonly placed in the path of least resistance, near communities with the smallest reserves of political, economic, and social capital” (Davies 2019, 8). The geographies of resource extraction and toxic mining waste is thus closely bound to the location of minority and low-income communities. Indeed, as Macarena Gómez-Barris points out, “large-scale extractivism assaults peripheral spaces, inflicting uneven pain upon regions where Indigenous majority communities continue to organize life and proliferate it, even in sites of extreme pressure and violence” (Gómez-Barris 2017, xviii).

The notion of invisibility is a central concern throughout Nixon’s book. He argues that “[…] it is those people lacking resources who are the principal casualties of slow violence. Their unseen poverty is compounded by the invisibility of the slow violence that permeates so many of their lives” (Nixon 2011, 4) But this, then, brings up another crucial question: What exactly is it that cannot be seen with regard to the socioenvironmental wreckage of resource extraction? Take, for example, the omnipresence of remote sensing technologies such as Google Earth, which can be utilized to locate and map specific territories of extraction anywhere in the world. Indeed, remote sensing technology is a tool that is used by artists and activists to map and document environmental destruction. The map, however, is not the territory (although from a certain perspective the relation between the two is much more complex than that, as will be discussed in chapter 3). The environmental impact of mineral extraction is elusive and extends far beyond the hole in the ground. As Carlisle and Pevzner write, “physical forms, locked in time and space, rarely tell the full story” (Carlisle; Pevzner 2015). Extraction produces enormous amounts of toxic waste, both in the form of mineral by-products, and in the form of liquid acids that are used to dissolve the mineral ore. The hidden flow is not invisible, it consists of physical matter and very large quantities of this matter are accumulated in so-called tailings dams. These too can be located with remote sensing technologies; they are often located in close proximity to the mines. However, while the hidden flow is not invisible per se, it has, in many cases, certain characteristics that cannot be seen with the naked eye. It emits toxic contaminants and generates chemical fallout, forms of slow violence that evade human perception. However, for people living in the toxic environments of mineral extraction, pollutants such as nuclear radiation and sulphuric acid manifest themselves in certain ways which people who do not live in these environments would likely fail to notice. For most people living
outside toxic geographies, the hidden flow becomes visible only when large accidents happen, accidents that are “immediate in time, explosive and spectacular in space, […] erupting into instant sensational visibility” (Nixon 2011, 2).

**Bursting Dams: The Hidden Flow Becomes Visible**

In 2018 I visited the abandoned remains of Bento Rodrigues in the Brazilian state of Minas Gerais. Minas Gerais has more tailings dams than any other state in Brazil, and for this reason it has been called a “state of ticking time bombs”. Two and a half years prior to my visit, Bento had been buried like a modern-day Pompeii when the Fundão Dam (Fig. 1), a megastructure located uphill from the village, suffered a catastrophic failure and unleashed 50 million tons of toxic mud and iron ore waste. The hidden flow instantly became visible when a monstrous deluge of red sludge crushed the village on its way downhill, where it flowed into the Rio Doce. On the satellite images that soon emerged one could see how the river, now bright red, carried the toxic tailings 650 km downriver, where the slurry eventually reached the Atlantic Ocean. In its wake, 39 municipalities across two states were polluted with deadly heavy metals: mercury, zinc, arsenic, and chromium. It was later revealed that the owner of the dam, the mining company Samarco—a joint venture between two of the largest mining companies in the world, the Brazilian multinational giant Vale and English-Australian BHP—had neglected several warnings of a dam collapse before it happened. When I arrived in Bento in 2018 the village was a ghost town, guarded by Samarco. I had to get past checkpoints to access it, and the only way possible was in the company of former residents. In a neighbouring city I had met three survivors who had offered to take me there. They had lost everything in the deluge, and were now locked in a legal battle with Samarco over compensation. Meanwhile in Bento, vegetation had begun to swallow up the ruins of their former homes. In the centre of the village, 19 wooden crosses had been planted to commemorate the victims. Right next to the crosses, a graffiti on a piece of brick wall that was still standing read: “Samarco quería nos matar”. Samarco wanted to kill us. But Samarco had not exactly wanted to kill the residents of Bento, rather they had let their deaths happen. This is the subtle, but important, distinction Mbembe makes in his essay *Necropolitics*, in which he defines the term as “the capacity to define who matters and who does not, who is disposable and who is not” (Mbembe 2003, 27). In other words, necropolitics is a framework that illuminates how governments assign different values to human life. Necropower is not to make someone die, but to let them die. As Thom Davies points out, no one is being actively killed by pollution or neglect of safety regulations: “Rather, communities who have been ‘designated expendable’ (Nixon 2011, 151) are allowed to suffer the attritional violence of environmental pollution, often through the ‘violent inaction’ of regulating authorities” (Davies 2018, 1540). The slow violence of toxic pollution is thus a form of necropower, and Bento Rodrigues, it seemed, had already been forgotten by the outside world by the time I visited it. A catastrophe that initially erupted into “instant sensational visibility” had quickly turned into an “invisible” instance of slow violence. Shortly after the disaster, the Brazilian Ministry of Environment had declared that Rio Doce, the Sweet River, was temporarily dead, but estimated that it would take only one year for nature to regenerate at the site of the burst dam. The truth, however, is that toxic heavy metals in the soil and water will continue to impact human health and local ecosystems for a long time to come.

When mining disasters such as the Fundão Dam collapse happen, we are suddenly exposed to the otherwise hidden costs of mineral extraction. However, as Prof Stephan Lessenich argues, “[Bento Rodrigues] was a perfectly normal catastrophe – and one that was waiting to happen. For many years, similar incidents have been occurring repeatedly, in Brazil and in other countries around the world with plentiful natural resources” (Lessenich 2019, 2). Indeed, in January 2019 there was another accident in Minas Gerais when the Vale-
Fig. 1: Fundão Tailings Dam, Minas Gerais, Brazil. 2018. Photo: Christian Danielewitz
owned Brumadinho Dam collapsed and released a toxic mudflow of 12 million cubic meters of waste into the environment, which took the lives of 270 people. Lessenich points out that

“whitewashing of an ugly situation like this suits not only the multinational mining corporations operating in the area, but also the general public in the highly industrialized societies of Europe and North America. The people in these countries are deeply implicated in the causal chain leading up to the Brazilian disaster. They – in other words, “we” – are partly responsible for the woes of Brazil and Latin America” (Lessenich 2019, 5).

Vale, Samarco’s co-owner, is the largest nickel-producing mining corporation in the world. We may not spend much time thinking about where the nickel that is used to produce the stainless steel alloys for household objects such as our kitchen utensils comes from, but when spectacular disasters such as the collapse of the Fundão and Brumadinho waste dams happen, Vale’s toxic territories of extraction suddenly become visible for a moment. But for people living outside the disaster areas, the wreckage quickly recedes from daily view again because the toxic aftermath, the slow violence of contaminated water and soil, is of little interest to corporate media, as Rob Nixon rightly argues. Do we even have time to realize what the connections are between the things we surround ourselves with in our daily lives, and the disasters we are presented with on our digital screens? As Davies writes: “In a world of click-bait and 24-hour news, how do we make sense of long-form disasters that do not display themselves in spectacular moments of terror as a single event, but instead quietly accumulate and defer their damage over time?” (Davies 2019, 2).

I obviously agree with Nixon when he argues that artists and writers can play an important role when it comes to mediating slow violence. However, it requires that we learn from what Thom Davies calls “slow observations”. Davies argues that slow violence is not necessarily out of sight to the people it impacts, it can be made knowable by slow observations (Davies 2019, 3). Slow observation is an informal expertise, which is acquired by continuous exposure to the gradual velocity of toxic pollution. It is a form of situated knowledge, and, as Davies argues, “[…] we must not overlook the situated knowledges that people who inhabit toxic geographies embody and live with” (Davies 2019, 10). This, I believe, is one of the most important lessons to be learned when working in the damaged territories of resource extraction.
2. Where on Earth? Rare Earth Mining

*We cannot begin to understand our present rare earth situation without critically examining the sorts of spaces in which rare earths are mined: frontiers* (Julie M. Klinger 2017, 13).

Rare earth elements are a set of 17 different silvery white metals, distinguished by exceptional conductive and magnetic properties. Without them, virtually everything would grind to a halt. They enable both the hardware and the software of contemporary life, making all our technologies lighter, faster, stronger and longer-ranging. Despite their name, they are relatively plentiful in the Earth’s crust. Cerium, for example, is the 25th most abundant element. The first rare earth ore was discovered in 1787 in a quarry close to the Swedish village of Ytterby, which is why a handful of rare earth elements are named after this location: yttrium, ytterbium, terbium, and erbium. Others are named after Scandinavia (scandium), Stockholm (holmium), and Europe (europium), and some are named after gods and goddesses from Greek and Roman mythology. However, none of them are mined anywhere in Europe. In fact, they are mined in only a few, far-off places around the world. The two largest rare earth mines – Bayan Obo in northern China and Mount Weld in Western Australia – are located in desert regions mainly populated by minority communities. Why is that?

One of the world’s foremost experts on rare earth geography, Dr Julie Michelle Klinger, points out that the hazards of rare earth mining and processing begin with geology. The conditions under which rare earth deposits are formed are also amenable to the formation of naturally occurring radioactive mineral deposits (i.e. thorium and uranium) which accounts for their frequent coincidence (Klinger 2017, 117). In other words, it is not possible to mine the former without mining the latter, and this tricky geological circumstance is key to understanding contemporary rare earth geography. A brief historical overview is necessary: from the early 1950s through to the mid-1990s, the Mountain Pass mine in the Mojave Desert supplied the world with almost the entire global consumption of rare earth elements. Production expanded greatly in the 1960s to supply the demand for europium, which is used as a red phosphor in colour television screens. However, in the 1980s, the Unocal/Chevron-operated mine began piping wastewater into evaporation ponds located in the Mojave National Preserve. The partially buried pipeline ruptured at least 60 times over the course of 14 years, spilling 2 million litres of radioactive wastewater into the Mojave Desert’s sensitive ecosystem. Faced with enormous fines for environmental violations, as well as price pressure from rare earth mining corporations in China, the Mountain Pass mine closed in 2002. However, as Klinger points out, “[k]ey actors in China were willing partners to profit-maximizing firms seeking to capitalize on the country’s lax labour and environmental regulations, and certain Western counterparts knowingly transferred technology and industry to China despite national security concerns” (Klinger 2017, 114). In other words, US companies were all too eager to outsource the dirty rare earth industry to China, where the environmental damage was safely out of sight. Within a few years, China had acquired a near-monopoly on rare earth elements, and by the end of the first decade in the 21st century, the country supplied the world with 97 percent of the total demand. A staggering 50 percent of all rare earths come from one single deposit: the Bayan Obo mining district located on the edge of the Gobi Desert in China’s Inner Mongolia Autonomous Region. Obviously, the symbiotic
relationship between China’s relentless drive for economic growth at all costs and Western dependence on rare earths, has had catastrophic consequences for certain people and environments.

**Irradiated Bodies and Territorial Assemblages**

As pointed out in the previous chapter, tailings dams are some of the most unsafe constructions. They are built to contain the hidden flow, out of sight, but time and again they burst, releasing millions of tons of hazardous material into the environment. However, a tailings dam does not even have to collapse to have deadly repercussions. Weikuang Dam, also known as the Baogang Tailings Dam, is not a catastrophe waiting to happen, it is a catastrophe that is *already* happening albeit in a seemingly unspectacular way. The waste contained in Weikuang has accumulated since the mid-1950s to the point where it has become the largest rare earth waste deposit in the world, containing 200 million tons of radioactive sludge. At an elevation of more than 1,000 metres above sea level, it sits on the outskirts of Baotou, an industrial hub of 2.5 million people also known as the Hometown of Rare Earths, located some 120 km south of Bayan Obo. The villagers in the immediate area around Weikuang Dam describe it as a ‘hanging lake’ over their heads (Klinger 2017, 121). A hanging lake that doesn’t have any lining to prevent seepage, thus allowing toxic wastewater to sink through the subsoil and contaminate the lower-lying village farmlands. A slow violence indeed. Invisible, were it not for the way nuclear radiation and other forms of pollution impact humans, animals, and crops. The diseases suffered by the villagers are caused by a range of substances besides radioactive thorium and radium: skin lesions caused by arsenic poisoning, malformed bones caused by high levels of fluoride, and respiratory ailments are rife. The villages around Weikuang Dam, which are mainly populated by ethnic Mongolians, a minority in Inner Mongolia, are a death-world in which the villagers are “subjected to conditions of life conferring upon them the status of *living dead*” (Mbembe 2003, 40). This death-world is the hidden cost of our green technologies, medical technologies, and image- and communication technologies.

Referencing Deleuze and Guattari, Julie Michelle Klinger uses the term “territorial assemblages” to describe spaces such as Inner Mongolia’s damaged territories of extraction and waste, which are “characterized by multiple and often antagonistic social orders struggling over the meaning and control of specific landscapes and livelihoods” (Klinger 2017, 83). In relation to territories of extraction, where raw materials are unearthed on an industrial scale to produce electronics, I find the term territorial assemblage to be particularly useful, not only in relation to opposing social orders, but also in relation to the entanglement of minerals and machines, geology and technology. When one employs digital technologies such as drones and satellites to investigate the global geographies of rare earth mining, one must consider the material relation between research methodology and subject matter. In the next chapter, as well as chapter 6, I discuss how this notion of territorial assemblage, or more precisely *map-territory assemblage*, informed the work of Anu Ramdas and myself with *Against the Grain*, in the context of both field research (chapter 3) and exhibition-making (chapter 6).
3. Map and Territory in the Age of Digital Navigation

Google doesn’t just want to catalogue the online world; it wants to know where everything is in the physical world, too (New Scientist 2013).

In his paper A Non-Aristotelian System and Its Necessity for Rigour in Mathematics and Physics (1931), scientist and philosopher Alfred Korzybski remarked that “a map is not the territory” (Korzybski 1994 [1933], 750). The dictum has since been quoted, reformulated, and opposed by numerous scholars across different disciplines. What Korzybski metaphorically pointed out is that words are not the things they represent, claiming that people tend to confuse models of reality with reality itself. However, if Korzybski’s semantic expression is taken literally, there is, with the advent of digital technologies, a profound reason to question what may seem like an axiomatic observation. As Jean Baudrillard already argued in Simulacra and Simulation, the development of electronic media has blurred the line between map and territory by allowing for the simulation of ideas as encoded in electronic signals (Baudrillard 1994 [1981], 1). From this post-structuralist point of view, the map engenders the territory in the sense that a model can generate a real, i.e. a hyperreal, without origin or reality. The map, argues Baudrillard, precedes the territory and not the other way around. However, as artist and scholar Catherine Summerhayes points out in her book Google Earth: Outreach and Activism, we currently live in a moment in time where Baudrillard’s concept of the hyperreal is losing some of its force. As Summerhayes states, “we are once again looking into processes of representation for glimpses, for the fleeting, changing signs of what actually exists ‘beyond representation’” (Summerhayes 2015, 45).

If we look at contemporary image and mapping technologies such as drones and satellites that visualize territories of rare earth extraction, the relation between the map (the digital imaging of a geography), and the territory it represents, should be reconsidered once again: the map does not precede the territory nor the other way around. Rather, they produce each other. In short, the minerals in the physical territory are being deterriorialized from the strata of the earth and embedded in machines that can be used to map the wreckage of that same territory. Thus, the reterritorialization of minerals into lenses and telescopes creates a feedback loop between the earth and the aerial image technologies, which, in a certain sense, points to a lesser-known argument by Korzybski, but one that holds a deeper meaning in this context: a map is (whatever else it may claim to map) a map of the map-maker (Korzybski 1994, xviii). In this chapter I discuss how the use of remote and proximal sensing image technologies such as Google Earth and drones inform my fieldwork, and how the entanglement of the (digital) map and the (geophysical) territory is reflected in my artistic research. Benjamin Bratton’s notion of global computation as a layered stack architecture, as well as Harun Farocki’s notion of operative images are some of the key references.

Colliding Stacks: Google and The Great Firewall of China

Since its inception in 2005, Google Earth has become one of the major players in mapping and data visualizations. According to the founding director of Forensic Architecture, Eyal Weizman, the very practice of cartography has changed with the emergence of Google Earth. As he points out, “it is no longer about triangulation and lines […] but about categories that one associates with images: iteration – sequences of before and after images, resolution […]” (Weizman 2017). A great deal of critical inquiry has been done into Google’s interactive surveillance software, and for good reason. As researcher and Professor of Visual
Arts Anna Munster explains, “Google’s ‘earth’ cannot be separated from the Google enterprise, and it is increasingly difficult for us to separate ourselves from the creep that has been called googlization” (Munster 2013, 46). However, my aim here is not a thorough, critical analysis of the dystopic control wielded by Big Tech. Rather, I utilize Google Earth as a tool of topographical investigation, and as such to think through the map-territory relation as it is defined in the context of my research project. As Weizman argues,

“nobody possesses technology fully. We should see every bit of new technology as a site of struggle: it can be used to either oppress or liberate, sometimes both. But we should not concede anything. Most of what we use to monitor state crimes is the very technology – satellite imagery, the internet, videos and motion trackers – conceived as weapons or as means of control” (Weizman 2017).

In 2016, I spent 6 months in China researching the hidden flow of the rare earth mining industry. It was during this period that I started using Google Earth to locate specific areas of extraction and toxic mining waste, while I was preparing on-location fieldwork. The sites in question were the Bayan Obo rare earth mine and the radioactive waste repository Weikuang Dam (Fig. 2). While I didn’t give Google Earth itself much consideration at the time, I found it to be a useful tool to navigate Inner Mongolia’s territories of extraction, via a VPN, from my studio in Beijing. Google, together with a long list of other search engines, online news media, and social media platforms, is blocked in China. Foreigners living in the country, as well as many Chinese nationals, consequently use VPNs (Virtual Private Networks) to access the forbidden internet services. A VPN works by connecting the user to a network of servers at locations anywhere in the world that are run by a VPN provider, a process known as tunnelling. When a VPN connection is established, all traffic to and from the user’s device becomes encrypted and directed to an intermediary server at a location of one’s choosing. The tunnel, as it were, thus runs under the so-called Great Firewall of China. The ideological reasoning behind China’s attempt to block foreign search engines should be obvious; an authoritarian government must control the flow of information in order to stay in power. But what is more interesting in this context is how to understand technologies, and Google Earth in particular, in relation to geophysical territory, in particular the environments that have been damaged and contaminated by the extraction and processing of minerals. To this end I find Benjamin Bratton’s Stack concept useful.

In his book *The Stack: On Software and Sovereignty*, Benjamin Bratton envisions planetary-scale computation as an accidental megastructure, “one that we are building both deliberately and unwittingly and is in turn building us in its own image” (Bratton 2014, 5). Bratton, a sociologist, architectural theorist and professor of visual arts, calls this megastructure the Stack. According to Bratton, the Stack consists of six layers, or platforms: Earth, Cloud, City, Address, Interface, and User. Each platform is a component within a larger, vertical structure built from hard and soft systems intermingling – not only computational forms but also social, human and physical forces. The world we live in, according to Bratton, appears as an accidental megastructure made up of competing and colluding computational stacks. Planetary-scale computation “perforates and transcends some borders while introducing and re-thickening others at new scales and in greater quantity” (Bratton 2014, 5). The First Sino-Google War of 2009 saw two stacks collide: Google’s transnational stack and the Great Firewall of China. A war between two logics of territorial control, over who or what governs global society. China, argues Bratton, perceives the Internet “as an extension of the body of the state”, while Google sees it as “a living, quasi-autonomous, if privately controlled and capitalized, transterritorial civil society that produces, defends, and demands rights on its own” (Bratton 2014, 113).
At a conference in 2011, one of the main engineers of the infamous Great Firewall, Professor Fang Binxing, presented his new theory on internet sovereignty and reiterated his views on the importance of “border control”. Fang used the example of Google and expressed regret about the fact that its service was still accessible
Fig. 2: Google Earth satellite image of Weikuang Dam, Inner Mongolia, China.
in China, although the company had retreated from the country. He stated that “[i]t’s like the relationship between riverbed and water. Water has no nationality, but riverbeds are sovereign countries, we cannot allow polluted water from other nation-states to enter our country” (Jin Ge, 2011). It is safe to say that this allegory is rather unambiguous, but if one takes the words literally, the pollution of China’s waters is not so much a result of Google’s search engine. Rather, it is a consequence of its material condition.

Google Rare Earth: The Entanglement of Media and Minerals

There is nothing new in using Google Earth to expose environmental wreckage. Activists have used the software to monitor deforestation, oil spills, and mountain top removals. However, there is a different, odd dynamic at play in using Google Earth to locate the toxic mining waste from the processing of rare earth elements. While I was scanning the areas around the city of Baotou with Google Earth, searching for the enormous Weikuang Tailings Dam, it occurred to me that I was employing a technology to locate the hidden waste of the same technology’s own making. As Bratton points out, “there is no Stack without a vast immolation and involution of the Earth’s mineral cavities. The Stack terraforms the host planet by drinking and vomiting its elemental juices and spitting up mobile phones” (Bratton 2014, 83). In other words, Weikuang Dam is the toxic by-product of the mineral-based technology that enables Google Earth. The map, or rather, the hardware that enables the map, thus produces the territory (of waste), and vice versa. The User layer (which is not necessarily human) and the Earth layer seem to inform one another directly (Bratton 2014, 87), and Google Earth is the mediating Interface layer. This observation is indeed intriguing from an artistic point of view, as it creates a direct link, or rather a feedback loop, between the tools at hand (the image technologies) and the subject matter of research (the damaged environments). A feedback loop, that is, which invokes the shape of a coil, with “one end feeding on the other like Ouroboros, the ancient symbol of a snake eating its own tail” (Bratton 2014, 93).

Bratton’s Stack model is, to use a phrase coined by Claude Lévi-Strauss, “good to think with”. But Bratton is never very location-specific about the Earth layer with regard to recognizing concrete territories of extraction and toxic waste, except for his brief mentioning of the horrific exploitation of DR Congo: “[…] the Belgians took ivory, the Americans cobalt, and now billions of Earthlings carry little bits of Africa around with them in their pockets” (Bratton 2014, 82). We don’t get to know much about the people and places who suffer the socioenvironmental repercussions of the “hungry machine”, i.e. the Stack. Media theorist McKenzie Wark rightly points out that “[f]or Bratton (unlike Latour, Haraway, and Tsing) there is no local, only the global” (Wark 2020, 190). But the deeply inequitable global division of toxic hidden flow is far too important to be talked about only in broad, geographical terms. We must look beyond Google Earth’s interface and arrive at the local, that is, the contaminated ecologies. As multimedia cartographer and scholar Brian Holmes argues, “the process of mapping, or of cartography, does not just mean surveying a territory from above, or representing a process that has unfolded in the past, but instead, tracing and effectively fleshing out the contours of a social dynamic, of an event which bears the future” (Holmes 2013 [2004], 412). Indeed, Holmes goes further and argues that “[t]he fundamental power of the interface is to draw the subject’s attention and affection away from the qualities of the world to which the information refers, and toward the qualities of the information itself; its modulation on the screen” (Holmes 2017). This is what media theorist Alexander Galloway calls the Interface effect. Galloway argues that “[d]ata open a door into the realm of the empirical and ultimately the ontological (the level of being), information by contrast opens a door into the realm of aesthetics” (Galloway 2012, 82).
The aesthetics of Google Earth perpetuates Donna Haraway’s “god trick”—the illusion of infinite vision from an all-seeing point of nowhere. In her influential essay *Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective*, Haraway explains that the “god trick” is about enacting a “conquering gaze from nowhere” (Haraway 1988, 581). A gaze, argues Monika Rogowska-Stangret, which

“erases the semiotic-material conditions that enable vision (for example technologies of vision and how they were developed). The vision (as a metaphor) that Haraway proposes is embodied, partial, and accountable/answerable for what one sees and how one organizes what one sees” (Rogowska-Stangret 2018).

But in the case of Weikuang Dam and my employment of Google Earth to locate it, this gaze from nowhere is actually cast upon the toxic residue of its own material condition. Rather than erase it, it exposes it. It seems to ask, and even provide an answer to, the same question that Haraway poses: “With whose blood were my eyes crafted?” (Haraway 1988, 585). Yet we shouldn’t rely on Google Earth’s vision to answer these questions for us. Instead, we should seek, as Brian Holmes suggests (with a reference to Haraway), the “correlation of situated knowledges and experiences” (Holmes 2017). In line with Holmes’s observations, Anna Munster has pointed out that “there is something about Google Earth’s worldmaking— the way in which it sustains itself as a “living-image” system—that signals a profound separation between it and collective (human) sociality” (Munster 2013, 46). In this chapter I have so far argued how the map (the image technologies) and the territory of extraction and toxic waste produce each other. The question then is how to convey this relation into something more tangible. How to direct our attention and affection away from the interface and toward the damaged territories of extraction and waste? Or rather, how to make the intricate connection between the two realms accessible not only as information, that is, as computational aesthetics, but also as tangible experience? How to “flesh out the contours” of this dynamic? As already pointed out we must arrive in the wrecked ecologies. However, as I will discuss in the following, this too might require aerial, machinic navigation—albeit at a higher resolution, and with an image technology that isn’t owned and operated by Google.

**From Map Database to Real-Time Mapping**

In his essay *Phantom Images* (2004), published the same year as Google acquired the software that would become Google Earth, the late German filmmaker and visual artist Harun Farocki writes about images and film recorded from positions human beings cannot normally occupy, that is, a phantom perspective. The essay elaborates on what Farocki calls “operative images”, a concept he introduces in his video trilogy *Eye/Machine I–III* (2001–2003), where he explores the relation between humans, machines and modern warfare by examining image processing techniques such as electronic surveillance and mapping. Operative images, writes Farocki, are “images that do not represent an object, but rather are part of an operation” (Farocki 2004, 17). The main concern of operative images is the execution of spatial tasks, such as guiding smart bombs toward their targets. In fact, they may not point to something beyond themselves at all. With reference to Farocki’s work, visual artist Trevor Paglen has noted that “instead of simply representing things in the world, the machines and their images were starting to ‘do’ things in the world” (Paglen 2018). When one uses real-time images to not only document the wreckage of a territory, but simultaneously to navigate that same territory from a position a human cannot normally occupy, the notion of operative images should thus be considered. I am aware that I use the term in a broader sense than many other commentators on Farocki’s work, such as Martin Blumenthal-Barby, for example, who states that operative images are set apart from
other images in that they are “not originally intended to be seen by humans”; instead, they are supposed to function as an interface in the context of algorithmically controlled guidance processes (Blumenthal-Barby 2015, 329). However, when one digs into the large amount of scholarly work on operative images, it becomes evident that there are various definitions. One can assert, however, that operative images, as Aud Sissel Hoel points out, are “utility images, and as such they belong to a wider family of instruments and tools, which are constructed by humans to serve practical and human purposes” (Hoel 2018, 15).

Farocki’s essay begins with a reflection on film sequences from the 1991 allied war against Iraq, which were “taken from cameras in a helicopter, a plane, and “a drone” — which is how the light unmanned reconnaissance planes have been described” (Farocki 2004, 13). Notice here Farocki’s use of quotation marks around drone, and his following explanation. Prior to the early 2010s, ‘drone’ was not yet a common term, as unmanned aerial vehicles were mainly used for intelligence and military purposes. It is only in recent years that we have seen the prevalence of drones for civilian use, but activists and artists have been quick to take up remote monitoring to document social and environmental injustice. As Karen Anderson and Bradley Garrett point out, there are several important distinctions between using a drone and using Google Earth:

“The highly uneven resolution and up-to-dateness’ (Graham & Hewitt, 2012, p. 5) of geospatial data delivered through portals such as Google Earth expose the structures of power that limit exploration (Kingsbury & Jonas, 2009) for physical and human geographers alike. Hovering quadcopters [a type of drone], in contrast, pull the aerial eye into oblique formations between nadir and horizon under the direct control of the operator” (Anderson; Garrett, 2018, 344).

Drones enable activists to document the progression of socioenvironmental destruction as it happens. However, documenting environmental wreckage with a short-range civilian drone requires that the operator is in relatively close proximity to the actual territory. Anderson and Garrett state that, “these suddenly pervasive machines straddle a divide in geography, being simultaneously an important tool for proximal sensing in physical geography and technology with military origins that human geographers have critically engaged” (Anderson; Garrett, 2018, 341). In my article *Desert Drone: Mapping the Rare Earth Frontier in Western Australia* (see part 3), I describe how I use a drone to navigate through the dense grid of mulga vegetation surrounding Lynas Corporation’s rare earth mining operation at Mount Weld, Western Australia. The images recorded from the drone’s bird’s-eye view are thus both part of an operation concerned with a spatial task, and at the same time map a specific territory that is related to the mineral-based materiality of the drone itself. The purpose of these operative images is thus not to guide remote-controlled missiles toward their targets; their purpose is to guide the drone operator, unseen, through a grid of vegetation toward the open pit mine. The purpose is not to destroy but rather to expose destruction (Fig. 3).

**Vertical Human-Nonhuman Assemblage**

When moving from low-resolution remote sensing (Google Earth) to high resolution proximal sensing (drone), we also move from the ostensibly global to the situated local. “[W]hat you feel is not displacement but extension”, writes Benjamin Wallace-Wells, and argues that drones are more than authoritarian instruments; they are also democratizing tools that enlarge not just the capacities of the state, but also the reach of the individual (Wallace-Wells 2014). On a vast continent like Australia, where mining companies generally operate in remote areas with restricted access, drones have been a game-changer in terms of monitoring environmental wreckage caused by extraction. Drones are deployed by citizen journalists, visual artists, as well as
Fig. 3: Mount Weld rare earth mine, Goldfields, Western Australia. 2019. Photo: Christian Danielewitz
large environmental organisations such as Greenpeace. Currently, only airports have geo-fences that prevent drones from taking flight, but it is most certainly only a question of time before large mining corporations begin to pressure drone manufacturers to put up geo-fences around their operations. However, it is equally certain that activists will find ways to circumvent such measures, in the same way that internet users in China employ VPNs to breach the Great Firewall. But let us leave Google Earth aside; navigating and documenting with a drone establishes a much more autonomous and dynamic relation between human and machine. As Anderson and Garrett write: “[…] drone methodologies offer the researcher the combined benefits of detailed observations with a self-service capability that satellites cannot equal” (Anderson; Garrett 2017, 344).

To this I would add that “drone methodologies” also offer a palpable understanding of the map-territory relation as it is defined in the context of my research project. The human-nonhuman entanglement of the drone-and-operator is an “assemblage with agency”, to use Jane Bennett’s term. However, this agentic human-nonhuman assemblage involves more than human and machine. As Bennett points out, “[a]n assemblage owes its agentic capacity to the vitality of the materialities that constitute it” (Bennett 2010, 34), i.e. the drone-and-operator assemblage also includes the metals and minerals that have been wrested from the earth and embedded in the drone’s hardware. Geographer Jeremy Crampton uses the term *assemblage of the vertical* and explains that drones “constitute a socio-technical assemblage of the sky and vertical space, which means that our focus should not be (only) on their technological development and capacities (important as that is), but (also) on their effects and affects” (Crampton 2016, 137). The feedback loop thus runs between the Earth layer (the exposed strata of the rare earth mine) and the user layer, which is comprised of the drone – collapsing the map-territory dichotomy as it hovers above the open pit (Danielewitz 2020, 86) – and the operator (with an interface) situated at ground level. These are semi-automated operative images that keep the human in the loop.

**The Interface as Passage**

A large amount of academic research on drone technology investigates the often racialized, visual and data-driven surveillance, and the terror and “bureaucratized killing” (Asaro 2013) perpetrated by the military-industrial complex. However, as Bratton points out, “it is a mistake to reflexively interpret all forms of sensing and modelling as ‘surveillance’ and all forms of active governance as ‘social control’. We need a different and more nuanced vocabulary” (Bratton 2020). Jussi Parikka also argues that “operational images emerge from […] analyses and contexts of the military, but it […] works in many other registers too. A good example is environmental imaging and data” (Parikka 2021). Parikka, as well as Trevor Paglen and others, uses the term *operational* instead of operative, but the point here is that we should understand these types of images as being more than just about war, targeting and control. Parikka suggests “that there’s something significant in understanding that the [operational] image is [both] a passage and an interface” (Parikka 2021). Although he seems to speak primarily about fully automated images such as QR codes here, Parikka’s notion is interesting in relation to my attempt at navigating and documenting the grid around Lynas Corporation’s rare earth mine at Mount Weld. In this case, the drone’s control interface generated a real-time map of the geophysical territory (with the minerals from that same territory embedded in the drone’s hardware) that provided me with a (literal) passage through which I could make my way to the mine along narrow dirt tracks, out of sight.

In different ways, drones and satellite vision enable us to map the materiality of the hidden flow in specific geographies, from distant positions. However, neither the digital map generated by Google Earth nor the
drone’s camera is able to visualize the invisible contamination. But these forms of toxicity, such as nuclear radiation and sulphuric acid, manifest themselves in other ways on the surface of things. In the next chapter I discuss my use of photographic media as material witness. As environmental researcher Max Liboiron argues, “it is crucial that we attend to the physical characteristics of matter if we, as researchers, are going to describe problems and contribute to solutions for ‘bad actors’ like pollutants” (Liboiron 2016).
4. Nuclear Radiation: Photographic Media as Material Witness

As part of the Permanent Copernican Revolution that is modernity, the human senses were increasingly confronted with their limits from the late nineteenth century on, as technologies such as film and high-speed photography revealed an optical unconscious beyond human eyesight (Lüticken 2018).

Once you have seen Weikuang Dam you cannot unsee it. The massive waste repository is visible on Google Earth from an altitude of more than 200 km via Copernicus and Landsat satellites. Looking at it from an aerial perspective, on an interface, provides you with a good sense of the scale. It sits on the outer ring of Baotou like an enormous dark grey blight that you can hardly fail to notice. But one must experience Weikuang in reality to be affected by it. When you are standing on the edge of the dam, the foul sludge stretches to the horizon as far as the eye can see. Spend a few hours in the vicinity of Weikuang, and you will eventually feel a mounting pressure in the head and chest.

In 2016, I travelled to Baotou together with my then collaborator Anu Ramdas. In advance, we had hired a driver and a translator in Baotou, but we hadn’t told them about the purpose of our journey. On arrival in Baotou, I showed our designated translator a printout from Google Earth of a satellite image showing Weikuang’s proximity to the city, and asked him if he recognized the location. He looked perplexed. Not only had he never seen Weikuang before, he had been totally unaware of its existence until that moment. Perhaps this is not as strange as it sounds. The repository is not only elevated but also fenced off by a tall concrete wall, which means that it cannot be seen from ground level. It has been “disappeared” in the physical territory, so to speak, but reappears on Google Earth’s digital map. However, in a sense Weikuang is everywhere. In the dry season radioactive dust and sand is whirled up from the repository by desert winds and scattered all over the surrounding villages and farmlands.

On our first visit to Weikuang Dam we documented it with black and white film. We had found a way into the territory of waste through an unguarded gate in the concrete wall. The eerie repository site seemed abandoned, but surveillance cameras on tall poles were monitoring the dam, which was lined with industrial pipes gushing a constant flow of black, liquid waste into it. We got the sense that somewhere someone was observing us. What we did not know at the time is that the sludge in Weikuang Dam contains large amounts of radioactive thorium. However, when the film was developed a few weeks later, we noticed the milky shades on the photographs: traces of radiation (Fig. 4). In her essay The Most Dangerous Film in the World, artist and researcher Susan Schuppli recounts a compelling incident that took place only three days after the Chernobyl disaster. The Ukrainian filmmaker Vladimir Shevchenko was granted permission to fly over the site known as the “Red Zone” in order to document the extraordinary clean-up efforts. When Shevchenko’s 35mm footage was developed, he noticed that the film was heavily pockmarked and exhibited extraneous static interference and noise. Thinking initially that the film stock used had been defective, Shevchenko finally realised that what he had captured on film was the image and sound of radioactivity itself (Shuppli 2010, 127). Shevchenko, who died of acute radiation sickness a year later, explained:

“Radiation is a fatal invisible foe. One that even penetrates steel plating. It has no odor, no color. But it has a voice. Here it is. We thought this film was defective. But we were mistaken. This is how radiation looks. […] Our camera was loaded with black-and-white film. This is why the events of the first weeks will be black and white, the colors of disaster” (Shevchenko 1986).
Fig. 4: Irradiated photograph taken at Weikuang Dam. 2016.  
Photo: Anu Ramdas and Christian Danielewitz

Fig. 5: Against the Grain. Still from 8mm film. 2016.  
Photo: Anu Ramdas and Christian Danielewitz  
See: https://vimeo.com/203124806
Weikuang Dam Revisited

In the late nineteenth century, Scottish physicist Charles T. R. Wilson developed a design for an apparatus that would allow him to study the formations of clouds in moist air. Wilson had been observing the multi-coloured coronas around the sun from an observatory at the summit of Ben Nevis and wanted to replicate the phenomenon in a laboratory. However, he soon realized that his apparatus, known as a cloud chamber (or a Wilson chamber), had a potential that went far beyond the study of weather. In 1896, Wilson fired a newly discovered form of radiation, the x-ray, through the cloud chamber, which left a condensation trail on the photographic plate, showing the particle’s trajectory. Wilson, it turned out, had invented a device that rendered visualizable the subatomic world, i.e. alpha, beta, and gamma radiation. Louise Amoore points out that “[t]he cloud chamber apparatus, conceived for the observation of processes of formation in nature, had become a technique for rendering perceptible the movement of objects beyond the thresholds of human observation” (Amoore 2020, 30). Against the Grain, which I developed with Ramdas in the years following our initial fieldwork at Weikuang Dam, engages not only Google Earth (as discussed in the previous chapter), but also photographic film to record the radioactive contamination at Weikuang. The movements of subatomic particles can be visualized with other means than a cloud chamber; they are also recorded in the photographic emulsion on film. While the digital map locates the territory of extraction and waste, which in turn produces the map (its material conditions), the analogue film makes tangible a specific trait of that territory, i.e. the otherwise invisible radioactivity. The juxtaposition of information and embodiment (discussed more in chapter 5) attempts to create not only a visible, but also a tactile bond between the map and the territory, i.e., between our image technologies and the environmental damage they cause.

In June 2016, four months after our first visit, Anu Ramdas and I returned to Weikuang. We brought 20 envelopes each containing a large format negative wrapped in tin foil, along with a Super 8 film camera produced in the 1970s to document the injection (using a syringe) of waste samples from Weikuang into the envelopes (Fig. 5). Both the waste samples and the Super 8 camera contained thorium, thus pointing to the entangled material relation between minerals, waste, and image technology seen from a historical/media evolutionary perspective. The term “media archaeology” is defined by Jussi Parikka as a field that “exists somewhere between materialist media theories and the insistence on the value of the obsolete and forgotten through new cultural histories that have emerged since the 1980s” (Parikka 2010). Obsolete media such as 8mm film thus provides us with an optic through which we can trace the material development of contemporary media backwards. Thorium, for example, was used as a component in the glass elements of camera lenses from the 1940s until the 1970s to provide better optical properties (high refractivity and low dispersion), and make production cheaper. However, for safety reasons lens manufacturers eventually replaced thorium with the rare earth element lanthanum, which is far less radioactive. Weikuang contains thousands of tons of pulverized radioactive thorium because thorium and lanthanum are found in the same mineral ores: the former is separated from the latter in the purification process and washed out into the repository with enormous amounts of sulphuric acid.

A film dosimeter (also known as a film badge) is a portable device for monitoring cumulative doses of ionizing radiation. The device, developed during the Manhattan Project, consists of a piece of photographic film contained inside a badge worn by people working in environments where there is radioactivity: when exposed to radiation the silver halide emulsion on the film blackens. But film badges would have been of no use at Weikuang Dam. They detect x-rays, and beta and gamma radiation. Thorium, however, emits alpha particles. Due to their inability to penetrate the skin, external exposure to alpha particles is the least

3. See: https://vimeo.com/203124806
dangerous form of radiation. But if alpha-emitting radionuclides enter the body (through inhalation or injection) it is the most destructive form of ionizing radiation. On location at Weikuang we injected the waste samples of thorium directly into the envelopes, while the radioactive dust was whirling all around us as the desert winds lifted the pulverized matter and carried it far beyond the confines of the repository. Inside the envelopes grains of thorium reacted with the grains of the film, creating subatomic explosions of light on the negatives. The black and white images which comprise the series titled *Thorium 232/Weikuang I-VI* (Fig. 6) evoke both astronomical phenomena and nuclear blasts. Or, as one German critic wrote about the works in a review, “[i]t looks like an x-ray image of a body that is about to go up in flames and burst” (Llanque 2019). But *Thorium 232/Weikuang I-VI* is more than a series of representations of an event. Irradiated images are, to use Susan Schuppli’s operative concept, a material witness.

**Material Witness**

Material witness, according to Susan Schuppli, regards the evidential role of matter in both registering external events and exposing the practices and procedures that enable matter to bear witness. In her extensive analysis of Shevchenko’s irradiated footage, Schuppli argues that if read radiologically, the film “collapse[s] the gap between representation and the real, form and content, signification and affect, so that the ontological dimensions of the film extend beyond their accepted role as indexical trace and enter into a feedback loop with the actual material residue of the world” (Schuppli 2010, 128). If the map is an index of the real (the territory), one can also argue that irradiated images collapse the gap between map and territory. In the previous chapter I explained how digital image technologies such as drones and Google Earth enter into a feedback loop when mapping territories of rare earth extraction. However, the feedback loop that ties together irradiated film (the map) and radioactive residue (the territory) is of a somewhat different nature. Schuppli, quoting Deleuze, writes that “the map expresses the identity of the journey and what one journeys through. It merges with the object, when the object itself is movement” (Schuppli 2010, 128). The moving “object” made visible in the series *Thorium 232/Weikuang I-VI* is nuclear radiation. The images can thus be viewed as a kind of maps that traces and merges with the invisible movement of the radioactive territory. Schuppli writes of Shevchenko’s irradiated footage that it “becomes a *de facto* material witness to the industrial accident, one that is ontologically inseparable from the fatal landscape that it simultaneously pictures and maps” (Schuppli 2010, 129). Irradiated footage is not a representation of nuclear radiation, rather the film itself has become radioactive and as such it must be perceived as an actual event. Schuppli writes:

> According to Deleuze, the (filmic) event does not ‘trace something that came before rather it actively creates the terrain it maps’ (O’Sullivan 2006, 35). Likewise, for Jacques Derrida it is the trace of writing itself that comes before language (speech), so that what is being traced is not a discursive supplement to the materiality of the world but the movement of the world as it performs its own choreography” (Schuppli 2010, 128).

Material witness comes into being by recording the movement of the world as it performs its own choreography. As Schuppli points out, “Shevchenko’s film records the immediate aftermath of the Chernobyl nuclear accident [...] but in carrying actual traces of the toxicological within its emulsive layers, it also produces an archival double, as the epistemological dimensions of the event are folded into its ontological meta-matter” (Schuppli 2010, 131).
Fig. 6: Thorium 232/Weiquang. 2016. Photo: Anu Ramdas and Christian Danielewitz
Toxic Drifts: From Northern China to Western Senegal

In chapter 3 I argued that we must look beyond Google Earth’s interface and arrive in the contaminated environments in order to flesh out the contours of certain dynamics and hazards. How can artistic practice-based research give form to invisible hazards? Since the late 1890s photographic media have been used to record nuclear contamination, but what matters here is the specific context. Weikuang Dam is not a physicist’s laboratory, rather it is an enormous accumulation of toxic sludge that confronts us with the hidden flow of a tech-saturated world based on a deeply inequitable, global division of toxic waste. It is a socio-environmental disaster that few people in the affluent Global North have heard about, although its formation is a direct consequence of the extraction and processing of the minerals that enable our technologies. Rob Nixon argues that different kinds of disaster possess unequal heft:

“Falling bodies, burning towers, exploding heads, avalanches, volcanoes, and tsunamis have a visceral, eye-catching and page-turning power that tales of slow violence, unfolding over years, decades, even centuries, cannot match. Stories of toxic build-up, massing greenhouse gases, and accelerated species loss due to ravaged habitats are all cataclysmic, but they are scientifically convoluted cataclysms in which casualties are postponed, often for generations” (Nixon 2011, 3).

The slow violence that Nixon addresses is “neither spectacular nor instantaneous, but rather incremental and accretive, its calamitous repercussions playing out across a range of temporal scales” (Nixon 2011, 2). Exposing photographic film to the toxicity of Weikuang is one way of capturing the pervasive but elusive violence of radioactive waste. As already pointed out, the film becomes a material witness to the contamination, rather than a representation of it. It is marked by the radioactive territory itself. I agree with Schuppli when she argues that Nixon’s demand for new kinds of “slow representations” could perhaps be met by “environmentally damaged and dirty pictures” (Schuppli 2016, 206). However, as Schuppli also points out, it is not only mediatic matter that records the toxicity of environmentally damaged territories of extraction and waste: material witness includes “matter more generally and in particular toxic ecologies” (Schuppli 2016, 206). In Part 2 I will discuss what this means in relation to my research into the environmental damage caused by phosphate mining and fertilizer production. However, in the next chapter, the last in Part 1, I will discuss exhibition-making in relation to Against the Grain.
5. White Cube: The Exhibition as a Map-Territory Assemblage

There is an assemblage whenever it is possible to identify a coupling made of an ensemble of material relations (content) and a specific regime of signs related to it (expression) (de Assis 2021, 12).

While the previous chapters have focused on my field research, this chapter is concerned with my exhibition-making practice. The notions of assemblage, diagram, and displacement are key concepts with which I theorize my exhibition-making practice and thinking through of the relation between map and territory, sensing and sense-making, inside the exhibition space. Especially since the turn of the century, assemblage theory has influenced numerous scholars. It has been applied in various disciplines and emerged as a central concept for addressing transformations with regard to social, political, economic, philosophical, and aesthetic phenomena. Also, as Paulo de Assis points out, one could add that the emerging field of artistic research is another area of practice where uses and appropriations of the concept of assemblage are currently observable (de Assis 2021, 18). As de Assis writes: “On the one hand, the artist-researcher scrutinises the materiality and the connectors of her or his objects of practice (as a symptomatologist), while, on the other, he or she invents new relations, interactions, and transversal paths between them” (de Assis 2021, 22).

Hidden Flow in the White Cube

The concept of assemblage comes from Deleuze and Guattari’s notion of “agencement”, which, according to Manuel DeLanda, is “a term that refers to the action of matching or fitting together a set of components (agencer), as well as to the result of such an action: an ensemble of parts that mesh together well” (DeLanda 2016, 1). Several scholars have pointed out that the translation of the French word ‘agencement’ to the English assemblage is problematic because it creates the incorrect impression that the concept refers only to a final product and not a process (de Assis 2021, 18). However, as DeLanda clarifies it can refer to both an ensemble (of parts) and a process. In practice, writes Ian Buchanan, the assemblage is the productive intersection of a form of content (actions, bodies, and things) and a form of expression (affects, words, and ideas) (Buchanan 2015, 390).

In A Thousand Plateaus: Capitalism and Schizophrenia, Deleuze and Guattari make a distinction between “machinic assemblages of bodies” (also called concrete machines) and “collective assemblages of enunciations” (also called abstract machines). This distinction constitutes “two poles of the assemblage” – “enunciations” and “bodies” – which provides an associative bridge to Michel Foucault’s distinction between “words” and “things” (de Assis 2021, 15). In turn, it also recalls the map-territory relation. Machinic assemblages, writes de Assis, belong more to the actual and are attracted towards the so-called pole strata that is highly coded and territorialized, while collective assemblages pertain more to the virtual and are attracted towards the diagram, which is decoded and deterritorialized. However, between these two poles, there are infinite intermediate states and phases, contributing to the heterogeneity of the components of the assemblage (de Assis 2021, 12). This, I would argue, is where Against the Grain as an exhibition takes place: between the damaged territory of extraction (a machinic assemblage) and the diagram (a collective assemblage of enunciations). Deleuze and Guattari point out that every assemblage is “simultaneously and inseparably a machinic assemblage and an assemblage of enunciation” (Deleuze and Guattari 1987, 504). This means that in addition to the material components that are brought together and arranged to produce a co-functioning entity,
there are other components, seemingly immaterial, which require materiality to be enacted: discourses, memories, and affects. (Hamilakis 2019, 172).

*Against the Grain* constitutes a map-territory assemblage of bodies and enunciations, of deterritorialized and reterritorialized matter: radioactive residue, material witness (irradiated photographic negatives), minerals (contained in electronic devices), and maps, all intertwined. Deterritorialization is defined by Deleuze and Guattari as the movement by which one leaves a territory, also known as a “line of flight”, or a line of escape. In the process of extraction and production, argues Jussi Parikka, “minerals are being deterritorialized and reterritorialized in machines that define our technical media culture” (Parikka 2015, 35). Deterritorialization thus “constitutes and extends” the territory. As I argued in chapter 3, the territory maps itself, in a specific sense, when one employs the mineral-based technologies of Google Earth or a drone to locate Weikuang and Mount Weld. But what happens when the territory of extraction and waste extends into the exhibition space? When not only the material flow, but also the hidden flow enters the exhibition space? Consider, for example, the piece Black Square (Residue) (Fig. 7). It is part of the larger body of work that makes up *Against the Grain*. It consists of a transparent display case, which contains an iPhone placed on a layer of radioactive thorium extracted from Weikuang. The iPhone loops a recorded video of a slurry pipe discharging the same thorium, in liquid form, into the tailings dam (see https://vimeo.com/203129854). The piece thus presents the viewer with a coupling of heterogenous elements that constitutes a toxic ensemble of decoded material relations: a phone and the radioactive by-product of that phone. The hidden flow becomes visible, not only as a digital representation on the screen but also as actual hazardous presence behind the screen.

**Artistic Research and Territories of Extraction as Machinic Assemblages of Desire**

Julie M. Klinger defines territoriality “according to Deleuze and Guattari’s (1987, 174; 180-182) formulation which holds that territorialization is also de- and reterritorialization […]” What emerges then are territorial assemblages, or in other words a space characterized by multiple and often antagonistic social orders struggling over meaning and control of a specific place” (Klinger 2015, 83). A territory of extraction is a machinic assemblage of desire which provides the material components for our electronics, and in doing so de- and reterritorializes local ecologies. In *Anti-Oedipus*, Deleuze and Guattari use the word “desiring-machines” instead of assemblage. Guattari writes that these are machines that have nothing to do with gadgets: “Or rather, they are related but from the opposite direction, because gadgets […] are the residue of desiring-machines […]” (Guattari 2009 [1973], 90). One can read this notion as adding another layer to Black Square (Residue): the residue in the tide refers not only to the radioactive tailings (the thorium), but also to the device itself (the iPhone) as both are forms of residue of the desiring machine.

Desire, in Deleuze-Guattarian terms, has to do with production rather than longing. Desire is thus a drive, a force with real, actual effects in the world (Hamilakis 2019). Given Deleuze and Guattari’s use of certain associative words and expressions, it is obvious to perceive a territory of extraction as a machinic assemblage of desire. As Ronald Bogue explains, “such machines penetrate all strata and assemble men, women, animals, plants, and minerals in heterogeneous, functioning circuits that link man and nature, the organic and inorganic, the mechanical and non-mechanical, in a single sphere of interaction” (Bogue 1989, 129). However, as already pointed out, the concept of assemblage is not limited to ensembles of e.g. actions, bodies, and things. They also include forms, expressions, and ideas (enunciations), and, as Yannis Hamilakis suggests, sensoriality and affectivity (Hamilakis 2019). In other words, concepts that are associated with art. But which modes of territorialization and deterritorialization, which strata, diagrams, and bodies are, then, at work in
Fig. 7: Black Square (Residue). 2016. Photo: Kim Fristedt Malmberg
artistic research? In chapter 3 I referred to the drone-and-operator as a vertical human-nonhuman assemblage enabled by, inter alia, minerals that have been deterritorialized from the earth’s strata and reterritorialized in the drone. The drone-and-operator assemblage is entangled with the machinic territory-of-extraction assemblage, but the drone-and-operator desire is at the same time antagonistic to the territory-of-extraction desire (cf. Klinger’s notion of “territorial assemblage”). Jeremy Crampton argues that drones constitute a socio-technical assemblage of the sky and vertical space, which means that our focus should not be only on their technological development and capacities (important as these are) but also on their effects and affects. One could say that my investigation of the environmental impact of electronic devices is the drone-and-operator’s Deleuze-Guattarian desire, and that this drone-and-operator assemblage is part of a larger machinic assemblage of desire called artistic research, which also includes exhibition-making.

Diagramming: Between Concrete and Abstract Machines

Against the Grain is, as already mentioned, a body of work comprised of several pieces produced between 2016 and 2020. It consists of the series of images made with radioactive thorium (Thorium 232/Weikuang I-VI) described in chapter 4, as well as Black Square (Residue). Moreover, it includes a black and white film recorded on 8mm (titled Against the Grain). Taken together these pieces form an entire body of work that gives rise to a diagram of sorts. According to art historian Jacob Zdebik, a diagram is commonly understood as a sketch, a drawing, or map that explains a thing by outlining its parts and their relationships — basically, by delineating its inner workings (Zdebik 2012, 1). In this sense, Against the Grain can be seen as an assemblage of bodies and things that engender a kind of diagram, which delineates the entangled relationship between the material conditions of our technologies and their hazardous environmental repercussions. It decodes the relation between the material flow and the hidden flow. It is a map-territory assemblage which enables us to glimpse the slow violence that unfolds beyond the digital interface in the actual territory of extraction, in order to situate ourselves in relation to the environmental damage. Exhibition-making is an act of staging evidence, aesthetically and diagrammatically. The diagram, as Zdebik points out, is an artistic strategy that operates through a desire to express information as a relationality that must be converted by a subjective viewer. It is “a method of visualization that navigates between the concrete and the abstract, the virtual and the actual” (Zdebik 2018). The diagram, in other words, navigates between the visible and the invisible, between the map and the territory.

The Map-Territory Assemblage as a Theatre of Proof

The one element in Against the Grain that the viewer — any viewer — can identify with certainty is the iPhone, which is part of Black Square (Residue). It is the first piece one encounters when entering the exhibition, and the device thus establishes an immediate connection with the viewer. The phone is the final product in a long and obscure supply chain that connects it with the territory of extraction in a retrograde movement. From Black Square (Residue) one moves through a milieu of found, industrial objects, images, maps, and a grainy b/w film recorded on-location at Weikuang (Figs. 8, 9, and 10). Bruce Janz writes that “[m]ilieus are the meanings of objects, while the territory is the expression that becomes possible through the objects” (Janz 2002, 396). The territory of extraction and toxic waste and its relation to the viewer is thus articulated in the exhibition space through this milieu, i.e. the map-territory assemblage. Black Square (Residue) condenses this map-territory assemblage as the material flow is layered on top of the hidden flow as two intertwined strata. When one moves further into the exhibition space, one is confronted with the series of black and
Photos: Kim Fristedt Malmberg
Fig. 10: Against the Grain. Installation view of the exhibition “From the Mundane World” at He Art Museum, Foshan, China. 2020-2021. Photo: He Art Museum
white images titled *Thorium 232/Weikuang I-VI*. These images are evidence of the radioactive nature of the hidden flow, or rather, as I argued in chapter 4, they can be viewed as maps that trace and merge with the invisible movement of the radioactive territory. One could also say that this milieu constitutes a Latourian “theatre of proof”.

In his book *The Pasteurization of France*, Bruno Latour introduces the notion of the “theatre of proof”, arguing that scientists have always had to theatricalize evidence in order to change perceptions. Latour recounts the story of the chemist and microbiologist Louis Pasteur’s efforts to convince the French public of the link between invisible microbes and diseases in the 1880s: “Pasteur invented such dramatized experiments that the spectators could see the phenomena he was describing in black and white” (Latour 1988, 85). In Latour’s actor-network terminology, microbes and bacteria are invisible non-human actors, or actants, that enter the world of humans causing illness and death. In order to identify these actants one must create a special environment in which they can be studied. As historian of modern science Frédérique Aït-Touati argues in her reading of Latour:

“The true contribution of the Pasteurians is that they transferred the diseases to the only domain under their control: the laboratory. The Pasteurian laboratory is set up to make invisible actors perceptible by offering them an optimal developmental milieu where there is no competition with other living beings: It is a «theater of proof» in the primary sense of the word «theater», a space of visibility. (...) But, above all, it is a space in which the microbes are exposed and thus finally visible” (Aït-Touati 2020).

The analogy here between the scientist and the artist, between the laboratory and the art space, should be obvious. The invisible contamination that is made visible by way of the irradiated negatives in the exhibition space (the only domain under the artist’s control), are not microbes but rather radioactive waste. However, much in the same way as the experiments in Pasteur’s laboratory are described as a theatre of proof, I also regard exhibition-making as producing a kind of theatre of proof that testifies to the relation between our technologies (the map) and the socioenvironmental damage (the territory) perpetrated by the industries of extraction. Latour points out that in the time of Pasteur, diseases like anthrax (rife in carcde) were typically not thought to be related to laboratory science. However, Pasteur set up a makeshift laboratory on a farm site and conducted fieldwork in the contaminated environments: “On the farm, big animals are parasitized in seemingly random order; in Pasteur’s makeshift lab, the micro-organisms are made visible to the observer’s eye” (Latour 1983, 145). Pasteur’s fieldwork is a prerequisite for his work in the laboratory. From the countryside, the microbes are transferred to the scientist’s laboratory in Paris (in this context analogous to the exhibition space), where Pasteur’s staged lab experiments with anthrax bacillus attracted the attention of the public. He grew them in such large numbers that, although invisible, they became visible. The bacillus culture which was grown (and staged as evidence of cause and effects) in Pasteur’s laboratory was a microcosmos that was studied to gain knowledge of a broader issue outside of the laboratory. This is what Fuller and Weizman call “field causality” (a notion which will be further discussed in chapter 8). In a sense, exhibition-making is similarly an attempt at producing an assemblage that can be studied to gain knowledge about field causalities. *Against the Grain* thus shares some similarities with the Pasteurian laboratory, in the sense that both are set up to make invisible actors perceptible. However, as Fuller and Weizman point out, there are also some notable differences between the scientific lab and the artists’ studio (or exhibition space). Whereas the lab is the site for the isolation and testing of phenomena according to the strict protocols of scientific practices, the studio sets up a space for elaboration, imagination, and composition:
“Each thus offers infrastructure for different kinds of sense-making and testing of propositions and ideas. Both have their own grammar of action and sometimes develop a different kind of striving for their own independence or conatus. Both are sites where problems and propositions are worked on with a set of internally coherent protocols and with different modes of connection, but also of seclusion” (Fuller; Weizman 2021, 288).

Seclusion is necessary in order to focus attention, argue Fuller and Weizman. Along the same lines, Aït-Touati points out that the Pasteurian laboratory “makes it possible to take an element out of the real world and plant it in a new yet beneficial milieu, where nothing else interferes with our view” (Aït-Touati 2020). In the next chapter, the first in Part 2, I discuss the research behind PO4 (Blackout) and elaborate on some of these notions.
6. Where on Earth? Phosphate Extraction

In the twenty-first century, phosphorus has a shape-shifting identity as it travels an engineered life course from mined rock, to bagged fertilizer, to crop biomass, to supermarket commodity, to human body, to blooms of toxic algae, to Anthropocene sediments on the bottom of the sea. Its circulation is omnipresent yet invisible—an essential operational element of our modern, industrial creative apparatus (Caple; Cushman 2016).

Phosphorus is arguably the most precious of all mineral resources. It is one of the six elements that is needed in large quantities to produce all life on Earth. Every living cell requires it. In addition, phosphorus is the rarest of those six elements, the others being carbon, oxygen, hydrogen, nitrogen, and sulphur. It is obtained from phosphate rock, which, like rare earth elements, is mined extensively in only a few places around the world, primarily in north-western Africa, the US, and China. If it can be said of rare earth elements that they are indispensable in the production of our technologies, it can be said of phosphorus that it is equally indispensable in the production of our food. Most of the mined phosphate rock is used to produce agricultural fertilizers to feed the soaring world populations; phosphorus is the fuel that drives the Green Revolution. Some types of lithium-ion batteries (and therefore the computer and mobile phone market) also require phosphate, and so does a host of other synthetic compounds from plastics to pesticides. Phosphorus makes possible a seemingly endless supply of cheap food and consumables. As environmental researchers Zachary Caple and Gregory T. Cushman explain, “[p]hosphorus is a key constituent of the technosphere—the human mobilization of materials, energy, and environments into technological systems of planetary scale and impact” (Caple; Cushman 2016). However, phosphate is a finite resource, and many of the remaining reserves are starting to be depleted. It was an article featuring an interview with biologist James Elser that initially spawned my interest in the bleak prospects regarding phosphorus. In it, Elser bluntly states that “phosphorus is the biggest problem you’ve never heard about” (Coll 2010). Elser is mainly concerned with peak phosphorus, that is, the point in time when humanity reaches the maximum global production rate of phosphorus. Some researchers expect this to occur around 2030. Others have estimated that reserves will be depleted in 50-100 years’ time,⁴ while some suggest that supplies will last for several hundred years. For this reason, the EU has added phosphate rock to its list of critical raw materials. But the depletion of phosphate rock should not be our only concern when it comes to phosphorus. The mining and processing of phosphate produces enormous amounts of hidden flow, and the problem is not only the dirty industry of extraction, but also the toxic pollution caused by the fertilizer production itself. As it turns out, the Green Revolution has a flip side.

While writing this chapter, in early April 2021, I was following a developing story in the news about a waste reservoir in Bone Valley, Florida, one of the largest phosphate mining regions in the world. The waste reservoir sits in a stack of phosphogypsum, a radioactive waste product from fertilizer manufacturing, and was on the verge of collapse. 2.6 billion litres of wastewater, potentially laced with radioactive elements, would flood

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the surrounding areas if the containment walls burst. People were being evacuated, while the Florida National Guard was airlifting pumping equipment into the area, which would be used to discharge millions of litres of contaminated wastewater into Tampa Bay’s ecosystem in order to relieve the pressure on the reservoir’s walls. The crisis was about to turn into a full-blown spectacular catastrophe, and corporate media covered the story for several days until the situation was reported to be under control. By this time almost half of the reservoir’s wastewater had been pumped into Tampa Bay, where it could potentially lead to eutrophication, that is, oxygen depletion caused by toxic algae bloom, also known as dead zones. Meanwhile, on the other side of the Atlantic Ocean, another crisis caused by phosphate mining and fertilizer manufacturing had been slowly unfolding for decades with devastating impact. This one, however, attracts little attention, if any.

Like Florida, Senegal is home to some of the world’s largest phosphate mines. In 2018 I was invited to Dakar by RAW Material Company – Center for Art, Knowledge, and Society to do an artist residency focused on the socioenvironmental impact of phosphate mining. I arrived in Senegal directly from Brazil, where I had been researching the lingering effects of the Fundão dam collapse. With the destruction of Bento Rodrigues and the survivor testimonies still vivid in my mind, I wasn’t exactly sure how to approach my research in Senegal. Mining zones are securitized areas and notoriously difficult to access without official permission – and, in my experience, requests are either turned down or go unanswered. On several occasions I have trespassed on areas of extraction and waste in order to document the environmental destruction, but this is obviously a risky approach. After my arrival in Dakar, I spent the first couple of weeks driving around the countryside north of the capital, where the white, mountainous heaps of mined phosphate rock dominate the landscape. Once one enters the Niayes area in the Thiès region, the heartland of Senegal’s phosphate industry, one passes mine after mine, guarded and operated by different corporations, both foreign multinationals and local companies. The industrial complex “Industries Chimique du Sénégal” (ICS) is the largest producer of phosphate fertilizer in Sub-Saharan Africa. It operates some of the largest mines, and has exploited the enormous Taïba deposit since 1960, coinciding with the acceleration of the Third Agricultural Revolution, also known as the Green Revolution. During this period, between 1950 and the late 1960s, phosphorus, as Caple and Cushman argue, “become[s] a fetish of the capitalist sciences: how to find, mine, and refine it; how to ship it, mix it, spread it; how to price it; how to market it; and – lest we forget – how to flush it” (Caple; Cushman 2016). The main components of the Green Revolution are pesticides, insecticides, and fertilizers, all containing phosphate/phosphorus in one form or another. As media theorist Jussi Parikka writes,

“[t]he agricultural metaphor of ‘culturing’ is in the scientific age part of the development of chemical means of manipulation of the soil. The history of the geological impact of humans is also about the isolation of ingredients such as phosphorus (1669), nitrogen (1772), and potassium (1807)” (Parikka 2014, 47).

Industries Chimique du Sénégal was acquired by the Singapore based, multinational behemoth Indorama Corporation in 2014. With a host of fertilizer producing chemical plants in Africa, India, and Central Asia, Indorama’s stated goal is to bring about a green revolution in “various parts of Africa and the world at an affordable cost”.5 However, if we look beyond the market price of Indorama’s fertilizers, there is another hidden cost to the same fertilizers: the social and environmental repercussions of toxic pollution in the villages adjacent to the phosphate mines and the chemical plants.

Enter Gad Gomene

Gad Gomene is a rural village of around 200 people located on the edge of one of the Taiba mines operated by ICS/Indorama. The village is on the verge of being swallowed up by the open pit, which continuously expands. The mining frontier is a territory in movement where the mining corporations gradually appropriate more land and water resources. In Thiès thousands of villagers have been displaced in this process of deterrioralization. At some point, more than a decade ago, Gad Gomene too was offered resettlement and compensation by ICS, but the villagers turned the offer down. Through generations they have cultivated the land, and their ancestral ties to it are strong. However, today the villagers have changed their mind. The area has become too polluted, but the offer is no longer open, and Gad is left to its own survival. The dirt road leading to the village is owned by the mining company and one must pass through an ICS checkpoint to get there. On the first of my several visits to Gad, I made friends with Seni Dieng, who is the son of the village chief. Seni took me on a walk around the village and the smallholder farmland, where he showed me mango trees that were ripe with contaminated fruits. Such is the toxicity in Gad Gomene that it renders the produce inedible. This is the tragic paradox that I point out in my article *Phosphate Mining and the Paradox of Abundance*. While plantations and farms flourish across the globe through the use of fertilizers, the means of production of these same fertilizers are destroying dozens of villages (and their component smallholder farms) in phosphate mining areas (Danielewitz 2019). This paradox can perhaps best be illustrated through the juxtaposition of the two images on the opposite page (Figs. 11 and 12). The image above is taken from Indorama’s webpage, and the image below is a photograph I took of Seni holding some contaminated mangoes. The two images illustrate the cause and (unwanted) effects of phosphate mining. However, contaminated mangoes are not the only evidence of the pollution in Gad Gomene. In the next chapter, I discuss how the built environment also registers and records the pollution, and how we can approach these traces of pollution on the surface of things as a form of material witness.
Fig. 11: Phosphate fertilizer: “Pour la prospérité de l’Afrique”
Screenshot from Indorama’s webpage

Fig. 12: Seni Dieng with contaminated mangos, Gad Gomene, Senegal. 2019. Photo: Christian Danielewitz
7. Corrosion: The Built Environment as a Recording Device

Each person, substance, plant, structure, technology and code [...] records in a different way
(Fuller; Weizman 2021, 11).

Sulphuric acid is a main ingredient in phosphate fertilizer. This highly corrosive acid, which leaks from the chemical plants into the atmosphere in large quantities, is both colourless and odourless, but the corrugated zinc roofs (Figs. 13 and 14) of the buildings in Gad Gomene bear witness to the invisible toxic drift. Sulphuric acid attacks so-called reactive metals such as iron, aluminium, zinc, magnesium, and nickel. Oxidation of metals occurs when an ionic reaction with acidic substances happens on the surface of the metal in the presence of oxygen. Electrons move from the metal to the oxygen molecules, which in turn generate negative oxygen ions that enter the metal and corrode it. In “A Life of Metal”, from her book Vibrant Matter, Jane Bennett writes that objects appear as fixed and stable bodies because their becoming proceeds at a speed or a level below the threshold of human discernment (Bennett 2010, 58). While this might be the case in a general sense, the life of metals in Gad Gomene is arguably much less fixed, and much more unstable, than in most other places. The roofs in the village act as a proto-photographic assemblage, which, in the words of Schuupli, “documents ongoing change internally within its material substrates and molecular rearrangements, as well as externally as visible transformations” (Schuupli 2016, 200). In the essay Dirty Pictures, Schuupli turns her attention to what she calls the “geo-photo-graphic”, in considering polluted environments as vast photosensitive arrays that register and record the changes caused by modern industrialization. She argues that “anthropogenic environments are documenting their own damaged condition”, and that “their mode of expression or method of narration includes an aesthetic dimension that operates according to certain image-making practices” (Schuupli 2016, 200). Material witnesses, writes Schuupli, “are non-human entities and machinic ecologies that archive their interactions with the world, producing ontological transformations and informatic dispositions that can be forensically decoded and reassembled back into a history” (Schuupli 2016, 2016).

In a different context (but one that also looks at roofs as recording devices), Weizman uses the expression “violence at the threshold of detectability” (Weizman 2015), which refers to the use of satellite imagery to document drone warfare. He explains that

“[s]een from above, the hole in the roof is the only visible trace that the building was attacked by drones. But this hole, and the violence it evidences, are also at the threshold of detectability. This is because the size of the hole that a missile makes in a roof is smaller than that of a single pixel in the resolution to which publicly available satellite images are degraded” (Weizman 2015).

Here, Weizman points to the limits of “remote witnessing” when it comes to recording certain forms of violence. The holes made by drone strikes in the roofs of targeted houses can barely be documented by way of satellite imagery. Instead, Weizman suggests that we perceive buildings as recording devices. As he explains, “[t]he beam and wall will record if you only know how to read it” (Weizman 2018). In this sense, albeit at a different speed, the zinc roofs in Gad Gomene act like devices that record the rapid oxidation process advanced by the high levels of sulphuric acid in the atmosphere. The zinc plates record the invisible atmospheric pollution in Gad like the film negatives record the radiation at Weikuang Dam. As Susan Schuupli points out “[…] damaged matter harbours many of the technical capacities – chemical processes and optical
Fig. 13 and 14: Dismantling the corroded zinc roof on the mosque in Gad Gomene. 2018. From the catalogue to PO4 (Blackout). Photos: Christian Danielewitz
properties – identified with the lens-based technologies of film and photography” (Schuppli 2016, 200). But while the negatives clearly show exposure to radioactive matter, one must know how to “read” the zinc roofs. If Seni had not explained to me that their severe state of deterioration was caused by air pollution, I would not have known. Thus, this crucial piece of information is based on Seni’s situated knowledge (more on this in chapter 8). It is based on an experience that involves sensing (or slow observation) and sense-making, i.e. “the capacity for such sensing to become knowledge [...]” (Fuller; Weizman 2021, 54).

All matter, as Schuppli argues, “that has undergone a transformation of some kind acts as a sensor that can record its contact and interaction with external agents and forces” (Schuppli 2016, 197). Along the same lines, Weizman explains that buildings continuously record the environment. They are like sensors, a recording device: “it is not only humans that perceive but [also] matter; walls, roofs, different parts of buildings” (Weizman 2018). Where remote sensing technologies fail to detect and record, “matter is capable of narrating its histories if we realign the modes by which we, humans, attend to its particular forms of expression” (Schuppli 2016, 200). The question, then, is how to realign the modes by which we attend to matter as evidence. When forms of slow violence unfold at the threshold of detectability, lacking the intensity that characterizes e.g. warzones and spectacular natural disasters, we must think of ways to approach what Susan Schuppli calls “aesthetic rearrangements” (Schuppli 2016, 208). Weizman has stated that Forensic Architecture “tries to hyper-aestheticise material surfaces”, to understand in minute detail what the building says about the scene of the crime (Weizman 2018). He argues that presentation of evidence is a creative act, as it always involves a certain theatricality (cf. Latour’s “theatre of proof”). The socially engaged strains of investigative aesthetics and research-based artistic practice can thus open a possibility where, rather than being illusory trickery, art can help us analyse the present (Weizman 2018). However, we shouldn’t necessarily rely on material witness to analyse corporate environmental violence. In their book Investigate Aesthetics, Matthew Fuller and Eyal Weizman argue that “aesthetics can [...] be a collective practice which assembles the multiple varied and sometimes seemingly incompatible situated experiences – of different individuals and groups, of matter and code – into a poly-perspectival rendering of a situation, combining multiple views from within” (Fuller, Weizman 2021, 55). In the next chapter I will discuss this in relation PO4 (Blackout) as an exhibition.
8. Black Cube: The Exhibition as a Sensing and Sense-Making Assemblage

As we reflect on [...] human-made environmental catastrophes, two additional insights must be added [...]. First, with the livability of so many ecologies under threat, it is no longer possible to advocate for a political philosophy that addresses only human relations with other humans. Second, the insights, commitments, and mobilizations of people other than British and American philosophers will be essential (Tsing 2016).

The project I produced in collaboration with RAW Material Company, as a response to the slow violence of phosphate mining and fertilizer production in Senegal, would not have been made if it wasn’t for Seni Dieng. Not only did he agree to replace the zinc roof on the village mosque so it could serve as a material witness in my exhibition POA (Blackout), he also accepted our invitation to come to Dakar and take part in a panel discussion, where he gave a first-hand account of the plight of Gad Gomene to a full audience at RAW Material Company (Fig. 15). Seni’s situated observations of the physical manifestations of the pollution in his village countered the notion of slow violence being invisible. As evidence, he brought some of the contaminated produce from the village farmland and laid out the blackened and poisoned mangos and cashews on the table in front of him. Thøm Davies points out that it is not the slow violence which is invisible, rather “it is the people themselves [that is, those who live in toxic geographies] who are reduced to invisibility; their stories, perspectives, and lives become overlooked and unnoticed, to the point that they are rendered expendable” (Davies 2021, 29). But, as Anna Tsing rightly argues in the epigraph to this chapter, the insights of people other than British and American philosophers is essential if we want to counter human-made environmental catastrophes. The quote is from a statement Tsing wrote as a response to the toxic mine tailings spilling over First Nations lands in British Columbia and Colorado in 2014 and 2015. The key challenge ahead, writes Tsing, “is to form productive alliances between struggles for more-than-human livable ecologies and struggles for political enfranchisement among humans” (Tsing 2016). In this chapter I join Anna Tsing and Donna Haraway and argue for the necessity of involving first-hand, situated experience in our deliberations. Haraway writes that “[p]ositioning is [...] the key practice in grounding knowledge organized around the imagery of vision” (Haraway 1988, 587). The question, then, “is how one should be positioned in order to see, in this situation of tensions, resonances, transformations, resistances, and complicities” (Haraway 1988, 588).

Environmental Activism and No-Nonsense Accounts of the Real World

When speaking about environmental destruction the local is all too often overlooked. But as I argue throughout this thesis, we must arrive in the actual, physical territories of environmental damage in order to help make visible the contours of the dynamics that shape these places. “What if, instead of thinking about slow violence at the global or metaphorical level, we brought place and locality back into the conversation?”, asks Thøm Davies and continues: “Perhaps all this focus on time has made us lose sight of place” (Davies 2021, 28). Bringing actual toxic waste and/or material witness of specific, damaged geographies into the exhibition space is one way of focusing on place. This is what I described as a map and territory assemblage in the previous chapter. Another approach is to invite those who inhabit toxic geographies into the exhibition space to voice their perspectives, observations, and experiences. As Haraway writes, we need, simultaneously, a critical practice for recognizing our own “semiotic technologies” for making meaning, and a no-nonsense
Fig. 15: PO4 (Blackout) public talk program at RAW Material Company. With Fary Ndao, Dr. Iba Fall, Seni Dieng, and curator Marie Hélène Pereira. 2019. Photo: Christian Danielewitz
commitment to faithful accounts of a “real world” (Haraway 1988, 579). With PO4 (Blackout) we wanted to include both material witness and first-hand accounts. My exhibition was thus only one part of the project; the other parts consisted of workshops, film screenings, and open panel discussions, organized by RAW Material Company. Besides Seni, the series of public events included local artists and filmmakers as well as environmental activists and scholars. A host of different perspectives, experiences, and voices were included, and RAW Material even invited a representative from the mining company to take part in one of the panel discussions. However, it didn’t come as a surprise that ICS declined the invitation.

Haraway argues “for the view from a body, always a complex, contradictory, structuring, and structured body, versus the view from above, from nowhere, from simplicity. Only the god trick is forbidden” (Haraway 1988, 589). Admittedly, my methodological use of Google Earth and drones, as described in previous chapters, enacts this “forbidden” god trick. But at the same time — given the subject matter of my research on rare earth minerals — my employment of these image technologies also recognizes our complicity, as consumers of digital devices, in the damage. In that context these technologies do not erase their semiotic-material conditions. On the contrary, when used to document sites such as Weikuang Dam and Mount Weld, they spell out the environmental repercussions of their own material conditions. However, as I have already pointed out, documenting environmental destruction is not just about surveying and mapping a damaged territory from above. I agree with Haraway when she argues that embodied epistemologies (i.e. local knowledges) have to be present within the charged webs of knowledge and power. With PO4 (Blackout) we wanted to set a stage for a variety of situated knowledges combining material witness (the exhibition), scholarly research (a publication), and no-nonsense accounts of the real world, i.e. the actual, embodied experience of living in a toxic geography. RAW Material Company also made an open call for a workshop on environmental activism, which was conducted by the two local NGOs Forum Civil and Publiciz Ce Que Vous Payez. The open call received a surprisingly large number of applications from students, journalists, activists, and artists. Of these, RAW chose 15 applicants to take part in the workshop, which included a fieldtrip to Gad Gomene, where Seni talked about the plight of the village and shared his situated observations of the ways in which the toxic emissions manifest themselves. The exhibition and the public programme ran for 3 weeks but prompted by the public’s interest in the subject matter, RAW Material Company decided to keep its premises open for an indefinite term in order to facilitate regular meetings between activists and others with an interest in environmental issues. At the time of writing the institution still provides local activists and scholars with a space to discuss environmental legislation and activist strategies.

Sensing and Sense-Making

Fuller and Weizman argue for an anti-hegemonic approach to investigations (of e.g. environmental destruction), which draws out and combines individual recordings to form a collective (an assemblage) of different photographic and video images (or other material witness) in which each becomes a hinge or a doorway to other sources of information, thus opening possibilities for political contestation and sense-making activism (Fuller; Weizman 2021, 18). Their argumentation clearly owes a lot to Haraway’s notion of situated knowledge. As they write “[the book] argues that aesthetics is a mode of perception, a combination of sensing and sense-making, one scaffolded by assembling multiple perspectives and situated registers” (Fuller; Weizman 2021, 48). Because it starts from an incident, investigative aesthetics is grounded in experience, and the perspective it brings to bear is openly partial, embedded, activist or militant, rather than a “disinterested” or neutral view from nowhere (Fuller; Weizman 2021, 28). One of Fuller and Weizman’s interesting and indeed useful points about investigative aesthetics is that they view it as a matter of developing the sensibilities of
extremely careful looking and noticing. In the case of PO4 (Blackout), one could say that the exhibition was intended to do just that: to make us look carefully and notice how the slow violence of toxic emissions manifests itself on the surface of things in the villages around the phosphate mines, and at the same time question how other ways of being might be possible.

The centrepiece in the exhibition (Figs. 16, 17 and 18) was an installation in the shape of a house containing soil (which reeked of ammonia) and seeds, and a particular tree which was lit by a lamp powered by LiFePO4 (lithium-iron-phosphate) batteries. This assemblage in the shape of a house reflected the deterritorialization and reterritorialization taking place in mining zones, i.e. the displacement of people and property, and the destruction of the villagers’ ancestral land. The batteries drained over the course of the exhibition period, shrouding the ecosystem in darkness – hence the title PO4 (Blackout). Mounted on one wall, a text in neon read “Chaque Cellule Vivante” (Eng.: Every Living Cell) referring to the circumstance that all life on Earth – every living cell – requires phosphorus to sustain itself. Projected onto the opposite wall was an image showing the supernova remnant Cassiopeia A. In 2013, astronomers detected phosphorus in Cassiopeia A, which confirmed that the chemical element is forged inside supernovae through so-called nucleosynthesis – that is, end-of-life explosions. A video playing in a loop on an iPad, mounted on the wall between the neon text and the satellite image, showed a conveyor belt transporting phosphate rock through the countryside on the outskirts of Gad Gomene. The metallic sound was heard throughout the exhibition space as a monotonous soundtrack. The various organic and inorganic elements in the assemblage thus activated several senses: sight, sound, and smell. It revolved not only around the acute problem of toxic pollution, but also around notions of deep time, the entanglement of organic life and inorganic rock, and humanity’s (lost) connection with the natural world. One element in particular needs a more thorough introduction. In the following paragraph I will take a closer look at the peculiar tree that featured in the exhibition.

Reverse Phenology

In June 2019, two weeks before the opening of my exhibition, I was back in Gad. It had only been a year since my last visit but the aluminium plates on the mosque, which had replaced the zinc sheets that were now about to become part of the exhibition in Dakar, already looked as if they had been there for decades. Time itself seems to pass at a different speed when the pollution eats away at the built environment with such ferocity. I was in Gad to talk with Seni about his participation in one of the panel discussions at RAW Material. During our conversation he mentioned a tree which grows on the farmland adjacent to the village. In Niger it goes under the name gao, in Mali the Bambara people call it balanzan, and the Serer people of Senegal call it saas. Its Latin name is Faidherbia albida. Native to the continent, the tree has an almost sacred status in parts of Africa. It figures prominently in local creation mythologies as a primeval tree with divine powers: a tree of life and fertility. It is also one of a few living organisms that is unaffected by the toxic atmosphere in Gad. This tree can withstand anything, Seni explained, as we dug up a small, thorny specimen, growing on the village farmland. While crops are destroyed by the pollution, and metals corrode at a rapid speed, the Faidherbia albida flourish. Indeed, it is a tree with a unique and peculiar agency.

Phenology is the study of biological life cycles (such as the emergence of leaves and flowers) and how these are influenced by seasonal and interannual variations in climate. Faidherbia albida’s phenology is the reverse of almost all other trees. Contrary to other species, it is fully foliated in the dry season, and sheds its leaves in the rainy season. It doesn’t compete with other crops for water, light, and nutrients. The root system of Faidherbia albida is nearly as big as its branches, and – very unusually – it draws nitrogen from the atmosphere.
Figs. 16, 17 and 18: PO4 (Blackout). Installation view from RAW Material Company. 2019. Photos: Anna Wane
to fertilize the soil. Used along with mineral fertilizers, crop yields growing under the canopy of *Faidherbia albida* double, and the soils nourished by the tree holds water better, ensuring a better crop in drought years. Initially, I wanted to include the tree in the exhibit because of its defiance: a symbol of resistance to toxic environments of resource extraction. However, as I learned more about the tree and its biological cycle, it struck me that it was more than a symbol. For example, in some parts of the Sahel region, which is one of the global hotspots for climate change, farmers rely solely on *Faidherbia albida* as an agricultural conservation technique when synthetic nitrogen and phosphate-based fertilizers are not available (Ventola 2013). The tree is an indigenous technology with the potential to reduce the use of artificial fertilizers and thus counter the toxic industry of phosphate extraction. In the exhibition, the juxtaposition of corroded metal and the reverse phenology of *Faidherbia albida*, invited the viewer to reflect on causes and effects, on evidence and agency (both human and nonhuman), and on the importance of situated knowledges. Anna Tsing has pointed out that “because plantations have shaped how contemporary agribusiness is organised, we tend to think of such arrangements as the only way to grow crops” (Tsing 2012, 148). One of the questions *PO4 (Blackout)* begs, however, is exactly this: how other ways are possible. The project is thus situated within a larger context, i.e. the structure of contemporary plantation systems.

**On Plantations and Field Causalities**

In their article *Plantation Legacies*, Sophie Sapp Moore et al. argue that the plantation invites a powerful and necessary critique of the Anthropocene because of its ability to centre

> “histories of colonialism, capitalism, and racism” in order to “make visible the power relations and economic, environmental, and social inequalities that have made ways of being in a world undergoing rapid climate change, accelerated species extinction, and growing wealth disparity more precarious for some human and nonhuman beings than others” (Moore et al. 2019).

While I agree with the authors, I argue in my article *Phosphate Mining and the Paradox of Abundance* that the link between phosphate mining and plantations is an overlooked aspect in the growing body of scholarly work on the Plantationocene, a term coined by Tsing and Haraway to draw attention to the planetary effects of extractive practices and monoculture development. My main point is that if the term Plantationocene is taken as a diagnosis of the unevenness of anthropogenic climate and environmental change, then the mining of phosphate should be regarded as both source and symptom (Danielewitz 2019). In other words, there are no plantations without phosphate extraction. This realization situates the case of Gad Gomene in a critical discourse about the worldwide economy based on destructive plantation worlds and their exploitation of land, labour, and natural resources. It is important here to point out the link between plantations and the hazardous pollution of Gad, because it points to a larger picture. Fuller and Weizman use the term “counter-investigation” about the practice of working with both minimal causation and field causality. The authors define minimal causation as a crystallization of larger and more pervasive environmental, social, cultural, and economic forces. Minimal causation thus refers to the mechanics of a specific incident (e.g. the impact of toxicity on a local community) while field causality refers to e.g. economic inequality, and racist bias (Fuller; Weizman 2021, 226). Counter-investigations, they argue, consider both minimal causality and field causality in order to analyse how “a jumble of scattered phenomena come to be seen as a set of related events […]. What are the effects of a slow build-up of distinct forces in crystallising a break, a fissure, in an ongoing process? And how, once that break has occurred, might we read back from it into its determining fields” (Fuller; Weizman 2021, 227). Counter-investigations follow material threads from specific incidents
to the scale of broader events and processes, and, as Fuller and Weizman also point out, we sometimes need to present the same evidence in different fora: in courtrooms, in art and cultural institutions, in multiple media, in the field etc. (Fig. 19) (Fuller, Weizman 2021, 299).

In recent years there has been an increased focus on the lack of minority and indigenous voices in green movements. The people who are affected the most by environmental destruction and toxic pollution have rarely been invited to the table to voice their views and opinions. The same point, I would argue, can be made in relation to art institutions. A large number of contemporary art works address environmental destruction, but how often do we see art institutions provide those who live in the damaged environments with a platform to speak for themselves? When I invited Seni to come to Dakar to talk at RAW Material Company, he was hesitant at first because he didn’t believe that his account would bring about any change. In one sense, he was right in thinking so: the residents of Gad Gomene are still breathing toxic air. But Seni’s participation in the panel discussions marks another form of change that should be embraced by artistic, academic, and environmental institutions and organizations alike. Latour writes that “to be a subject is no longer to act autonomously in front of an objective background, but to share agency with other subjects that have also lost their autonomy” (Latour 2014, 5). Sharing agency, then, should mean that scholars, artists, and writers who conduct research on anthropogenic environmental degradation, include in their deliberations and institutions those who bear the burden of the damage.

Fig. 19: Fieldtrip to Gad Gomene as part of the workshop on environmental activism. 2019. Photo: Christian Danielewitz
Part 3: The Map and Territory Revisited

This part consists of a previously published article. *Desert Drone: Mapping the Rare Earth Frontier in Western Australia* (2020) was originally published in a special issue of the journal Periskop – Forum for Kunsthistorisk Debat, produced by the Department for Arts and Cultural Studies at the University of Copenhagen. This issue, titled *Unruly: Artistic Research Between Disciplines and Becoming,* focused on artistic research understood as practices that offer an unruly entanglement between material, technological, affective, and sensuous experimental forms. The original format of the article has been kept, but the page numbers have been changed to follow the pagination in this thesis.

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6. See: https://tidsskrift.dk/periskop/issue/view/8920
Desert Drone
Mapping the Rare Earth Frontier in Western Australia

Sacrifice zones are where the so-called negative externalities are located. They are not ephemeral or intangible: they have a specific geography that can be mapped. The destruction of landscapes and lives in pursuit of rare earth mining has generally been considered a fair price to pay, generally by those who do not live in the sacrifice zone.

Klinger 2017, 11

A few weeks before the devastating peak of the 2019-20 Australian bushfire season, colloquially known as the black summer, I arrived in Leonora, a small mining town located in the outback of the Goldfields-Esperance region of Western Australia. Leonora is only a little more than an hour’s flight from the state capital Perth, but the geography is entirely different. The Goldfields is sparsely populated, with less than 40,000 inhabitants in an area larger than the US state of Texas. Deserts form a major part of it, with the Little Sandy Desert and the Gibson Desert in the north, and the Great Victoria Desert in the southeast, but it is one of the most geo- and biodiverse regions in the world. The sand dunes and salt lakes are host to endemic species, and the abundance of minerals is staggering. I was here to do fieldwork at Mount Weld, a mining site located some 120 km east of Leonora, which contains one of the richest deposits of rare earth minerals in the world.

For years now, my artistic research has revolved around the global mining industry, and in particular the geography of rare earth extraction. Remoteness is a key feature. The three largest rare earth mines are located in desert regions: the Mountain Pass mine in California’s Mojave Desert, the Bayan Obo in the Gobi
Desert, and Mount Weld in the Goldfields. Most people are probably oblivious to these locales, but the minerals that are mined here are used in everything from mobile phones to hybrid car batteries, flat-screens, guided missile systems, and wind turbines. In short, rare earth elements enable all our hardware and software, making it lighter, faster, stronger, and longer lasting. Without these minerals just about everything would come to a standstill.

Contrary to popular belief, rare earths are not rare. But why then are the minerals mined in only a few far-off places around the world? One of the world’s foremost experts on global rare earth geography, Dr. Julie Michelle Klinger, argues that we cannot begin to understand the rare earth situation without critically examining the sorts of spaces in which rare earths are mined. According to Klinger, the spaces of rare earth extraction are often cast as frontiers “imagined as empty of (indispensable) people yet full of the particular variety of riches fancied by extralocal actors” (Klinger 2017, 13). The rare earth frontier, Klinger explains, “is found in borderlands and hinterlands, in places where local landscapes and lives are deemed sacrificial in the name of some greater good” (Klinger 2017, 11). Evidently, another key feature of rare earth mining is social and environmental destruction.

**From the Gobi Desert to the Goldfields**
The research presented in this article is based on fieldwork at Mount Weld, but my preoccupation with rare earth extraction initially began elsewhere. In 2016, I travelled to Baotou, also known as the rare earth capital of the world, to document the infamous tailings dam Weikuang (Danielewitz et al. 2016). Baotou is an industrial hub located on the edge of the Gobi Desert in the Chinese province of Inner Mongolia. Ore from the Bayan Obo mining district, which is the largest rare earth mine in the world, has been processed at the refineries on the outer ring of the city since the 1950s. Here, on the outskirts of Baotou, lies Weikuang, an enormous mineral waste repository containing more than 200 million tons of radioactive sludge: the by-product of rare earth processing. Once you have seen Weikuang, you cannot unsee it. This is the hidden cost of a tech-saturated world based on a deeply inequitable, global division of toxic labor and waste. Cancers and respiratory diseases are rife in the villages around Weikuang as the toxic waste sinks into

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Weikuang dam. Google Earth satellite image.
the soil and contaminates farmlands; the villages are mainly inhabited by ethnic Mongolians.

The steppe of Inner Mongolia has been a rare earth frontier for decades. As Klinger points out, “its history of border-marking and resource extraction has been ‘written in blood’” (Klinger 2017, 14). But as rare earth minerals have taken centre stage in the escalating trade war between the US and China, the geopolitical landscape is changing and thus the toxic waste of rare earth production is flowing—and returning—to other parts of the Global South. In 2010-11, a Chinese embargo caused an explosion and subsequent meltdown in prices on rare earth elements. At the time, more than 90% of the global consumption of rare earths was produced in China. Beijing argued that the move to cut exports had to do with domestic environmental concerns, but the blocking of shipments conspicuously followed a territorial dispute with Japan. Whatever the reasons, the embargo created the perfect conditions for rival producers to enter the global market. In 2001, the Australian mining company Lynas Corporation had begun to focus on developing a particular rare earth deposit following the closure of the Mountain Pass1 mine in California, which had been the last remaining rare earth mine outside China. In the heat of the late 2010 tensions between China and Japan, Lynas stepped in and signed an agreement for a three thousand ton export with a Japanese rare earth trading company; extraction began at Mount Weld in 2011.

“Rare earths in, surplus waste out”
When I arrived in Leonora by the end of the decade, Lynas had become the second largest rare earth miner in the world. With Mount Weld, the Australian outback has seen the opening of a new rare earth frontier, and this is a frontier that extends beyond the continent. The supply chain links Mount Weld to Leonora, where containers with rare earth oxide are transferred onto a train and transported to the Port of Fremantle, south of Perth. From there the containers are shipped to Lynas Advanced Materials Plant in Kuantan, Malaysia, where cracking and leaching processes refine the oxide and separate contaminants, such as radioactive thorium and uranium. Thus the operation follows the cynical rationale of the advanced political economies of the Global North, described
by professor of sociology Stephan Lessenich as “externalization societies”. Lessenich argues that the Global North systematically transfers the consequences of its excessive consumption to other world regions, that is, the poorer countries in the Global South: “Rare earths in, surplus waste out—thus runs the import-export strategy of the externalization society” (Lessenich 2019, 68).

Before Lynas began to operate in Malaysia, the country already had a history of radioactive contamination caused by rare earth processing. Through the 1980s, a processing plant, partly owned by Mitsubishi, was dumping thorium in an open waste facility close to the village of Bukit Merah, which led to a health disaster with reported cases of leukemia and birth defects. The plant was closed in 1992 but it took almost another 20 years before a clean-up was effectuated. When it was revealed that Lynas had been granted a new license to refine rare earth oxides, it triggered Malaysia’s largest environmental campaign ever: the “Save Malaysia, Stop Lynas” petition. The campaign gathered more than a million signatures. But that didn’t stop Lynas. Despite massive protest, the company has been piling up thousands of tons of radioactive residue in a repository on the outskirts of Kuantan.

Professor in environmental studies Rob Nixon uses the term “slow violence” to describe the socioenvironmental impact of e.g. climate change, toxic drift, and deforestation. Slow violence takes place gradually and often invisibly. Consequently, a major challenge according to Nixon is how to represent it: “How to devise arresting stories, images, and symbols adequate to the pervasive but elusive violence of delayed effects?” (Nixon 2011, 3). As an artist working across a range of media and formats in different geographical and cultural contexts, I have been grappling with questions of representation for a long time, but to confront slow violence poses a particularly difficult challenge. It requires, as Rob Nixon points out, “that we plot and give figurative shape to formless threats whose fatal repercussions are dispersed across time and space” (Nixon 2011, 10).

The road to Mount Weld

In the weeks prior to my arrival, it had proven difficult to find someone in Leonora to assist me on my trip to Mount Weld. I intended to film the mining site with a drone, which meant that I had to find a way to access Lynas’ territory. The fact that I didn’t have official permission to enter the area eventually narrowed down potential assistants to just one person: a retired schoolteacher who had once before, some 40 years earlier, visited Mount Weld. In a four-wheel drive vehicle, we set out from Leonora to Laverton through a landscape of red dirt, salt lakes, and mulga bushland.⁵
Laverton, formerly known as British Flag, is a small town located on the edge of the Great Victoria Desert. Once infamous for its frontier location, with a reputation as one of the wildest settlements in the Goldfields, it is now the westernmost gate to the great Outback Highway, and the closest town to Mount Weld. The desert, more than any other place, evokes the notion of a frontier, and Laverton still prides itself on being a frontier settlement. When we left the town and drove south on a dirt road leading into mining territory, the vegetation appeared to grow thicker. The road, lined with black slurry pipes, was intersected by other dirt roads going in different directions, some of them with signs warning that unauthorized vehicles would be reported. On the way we passed the Sunrise Dam and Granny Smith gold mines located on the eastern margins of Lake Carey, a large Tertiary salt lake that has been used by the indigenous Wongatha people for thousands of years, but is now affected by the discharge of waste water from mining activity.

At one point, we realized that we were somewhat lost. We had been on the road for a couple of hours since we left Laverton and had not encountered any other people during that time, but as we got out of the car we noticed a white truck coming towards us. It turned out to be an aboriginal family acquainted with my assistant, which was no strange coincidence given the fact that he had been teaching for almost 50 years at different schools and missions in the area, including the Mount Margaret Aboriginal Community on the northern shore of Lake Carey. The older woman in the front passenger seat was holding a rifle. While native title rights to Mount Weld have never been claimed, the area around it has been used extensively by indigenous Australians as a hunting ground since long before it was turned into a zone of extraction.

Some 30 years ago an ethnographic survey had been conducted, apparently in consultation with the indigenous communities, to determine aboriginal areas of significance in relation to Mount Weld. The survey concluded that mining activity would not “disturb any areas of cultural significance.” In the face of the predatory corporate power wielded by mining companies, the Native Title Act is merely a “right to negotiate” land rights. Since the 1970s, a series of legislative acts supposed to protect aboriginal land rights have been passed, but at the same time, hundreds of sacred sites have been destroyed by mining companies. In May of 2020, the mining giant Rio Tinto—a company with a downright appalling record of human rights violations—blasted the 46,000 years old rock shelters at Juukan Gorge in the northern part of Western Australia, after receiving ministerial consent. It was from Rio Tinto that Lynas acquired the rights to extract Mount Weld's rare earth deposits in 2001. Before we parted with the family, they pointed us in the direction of the mine.
Enter the grid

Julie M. Klinger points out that “the frontier narrative, when invoked, represents a set of spatialized intentions to transform a place that is unknown and ungoverned into the known and disciplined: to penetrate the impenetrable, to transform untapped minerals into wealth and power” (Klinger 2017, 13). Seen from above, the area around Mount Weld indeed appears like an orderly grid of dirt roads cutting through the dense vegetation, crossing one another. There is a main road on the outer western fringe of the mining site which leads to the main entrance, but we had to get off this road to approach the open pit from what we figured was the rear side, that is, the opposite side of this entrance. When we entered the gridlike maze of mulga trees, the offline GPS app I was using showed a blank space devoid of topographical features. Neither the narrow dirt tracks we were following nor the mine itself showed on the digital map. Only the main road, which we had left, was still visible.

In their article “Entering a Risky Territory: Space in the Age of Digital Navigation,” Valerie November et al. argue that “far from increasing the feeling of dematerialization, digital techniques have rematerialized the whole chain of production” (November et al. 2010, 584). The GPS is generated by satellites in orbit around the Earth sending signals to the phone, which are produced with minerals (i.e. rare earth elements) that may well have been extracted from the actual territory (the open pit mine at Mount Weld) we were searching for. Or to put it another way, the minerals that are extracted from the hidden territory we were trying to locate are contained in the technologies we were trying to locate it with. The rare earth frontier is “out there,” but it transcends local geographies and extends into our technologies. As professor and new media theorist Jussi Parikka writes, “media history conflates with earth history; the geological materials of metals and chemicals get deterritorialized from their strata and reterritorialized in machines that define our technical media culture” (Parikka 2015, 35).

The map and territory revisited

“The map is not the territory” is a well known expression coined by scientist and philosopher Alfred Korzybski in 1931. However, in the age of digital mapping the relation between map and territory—this particular territory—becomes entangled in such an intricate way that we must reconsider the relation. Once inside the maze, I changed the mode of navigation to drone view. The advent of drones has been a game-changer for activists mapping and documenting large-scale corporate destruction of natural environments, particularly in the forestry, agricultural, and mining sectors. With a double-click anyone can visit every mining
site with Google Earth, but drones have enabled activists to get up close and expose environmental wreckage as it happens. On a vast continent like Australia, where the economy is heavily dependent on extraction industries that generally operate in remote areas with restricted access and limited regulatory oversight, drones have become aerial agents of resistance. Currently, only airports have geo-fences that prevent drones from taking flight, but it might only be a matter of time before mining corporations start pressuring drone manufacturers to put geo-fences up around their operations.

Mount Weld did not (yet) have a geo-fence, which made it possible to navigate the area from above. By way of this double vision, simultaneously at ground level and bird’s-eye view—creating a vertical loop of entangled material flow and signals between drone, phone and underground—we followed the dirt tracks deeper into Lynas’ territory until we reached the large mounds of overburden surrounding the open pit. There, from the drone’s point of view at an altitude of 130 meters, the pit itself was revealed like a wound in the landscape. The geological matter flowing from the open cut mine, which is sprawled across a two-billion-year-old spent volcano, is divided into multiple flows of dirt and minerals.
with different destinations once it is unearthed. The toxic flow, also known as
*hidden flow* in mining terminology, parts into *domestic* hidden flows (e.g. the
evermous mounds of excavated soil called *overburden*) and *foreign* hidden flows
(the toxic matter which is externalized through the process of refining at Lynas' plant in Malaysia). The hidden flow is the byproduct of the so-called *material
flow*, that is, the entire market-driven supply chain from the extraction of raw
materials to the production of, *inter alia*, image- and communication technolo-
gies, such as drones, phones, cameras and satellites. Documenting the socio-
environmental destruction wrought by rare earth mining thus becomes an act of
utilizing the material flow to uncover the hidden flow. As the drone hovers high
above the mine, the dichotomy between map and territory collapses. The map
does not lie outside the territory; rather “the map animates the mediated rela-
tionship between technologies and worlds” (Hind, Lammers 2016, 80).

**Fieldwork between artistic research and activism**
The sacrifice zones of rare earth production are located in specific geographies
that can be mapped, as Klinger points out in the epigraph to this article. However,
mapping the toxic flows of rare earth production with digital image technologies
cannot be done without recognizing the intricate material connection between
those technologies and the territories that are mapped. But how, then, do we
communicate this recognition? “How do we both make slow violence visible yet
also challenge the privileging of the visible?” asks Rob Nixon. When the media
tend to venerate the spectacular, he writes, how can we convert into image and
narrative the disasters that are slow moving and long in the making? (Nixon
2011, 3). In his book, Rob Nixon emphasizes the importance of environmental
writer-activists: “[...] writers, filmmakers, and digital activists may play a medi-
ating role in helping counter the layered invisibility that results from insidious
threats, from temporal protractedness, and from the fact that the afflicted are
people whose quality of life—and often whose very existence—is of indifferent
interest to the corporate media” (Nixon 2011, 16).

Visual artists working in vulnerable geographies may also play a mediating
role in making unseen and imperceptible forms of slow violence visible and
indeed tangible. And even more so, I would argue, when it comes to the soci-
environmental impact of the production of tech minerals such as rare earths.
As an artist working primarily with mineral-based image technologies in terri-
itories of mineral extraction, my intention is thus not only to document the
wasted landscapes, but also to investigate the inextricable intertwinement of
technology and geology, map and territory, image and materiality. Rare earth
frontiers are located in specific geographies that can be mapped, but the truth is that it is almost impossible for end consumers of digital devices to escape some form of—more or less oblivious—complicity in the market-driven supply chains of raw materials. Even social enterprises such as Fairphone, which has done a great deal of research to map unethical suppliers of minerals, admit to having enormous difficulties with tracking the labyrinthine global network of supply chains behind our tech. An artistic approach might not overthrow unjust policies anytime soon, but it has a powerful potential to engender a more profound visual apprehension of the complex entanglement between technologies and ecologies, and the devastating social and environmental repercussions of the current modes of extraction and production.

NOTES
2 A mulga is a small Australian acacia tree.
3 See Native Title Act 1993.
4 Quoted from The Public Environmental Review for the Mt Weld Rare Earths Project by Ashton Rare Earths Ltd, 1992. Section 8.1.8.
5 Alfred Korzybski’s original phrasing “A map is not the territory it represents, but if correct, it has a similar structure to the territory, which accounts for its usefulness”, first appeared in print in the paper “A Non-Aristotelian System and Its Necessity for Rigour in Mathematics and Physics” from 1931. The paper was reprinted and published in his book Science and Sanity, 1933, pp. 74-761.

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DESSERT DRONE: MAPPING THE RARE EARTH FRONTIER IN WESTERN AUSTRALIA
Conclusion

There can be no address of the planetary failures of modernism or its master-subject, Man, without a commitment to overcoming extractive colonialism (Yusoff 2018, 61).

Throughout this dissertation I have argued for the importance of on-location fieldwork in making elaborate observations of the specific ways with which different materials register and record elusive forms of pollution in territories of mineral extraction. This hands-on approach has been the modus operandi of my artistic research for several years now. It is based on the conviction that research on this critical issue requires a physical presence in the damaged environments in question. The outcome of this mode of fieldwork can rarely be planned in advance. It depends as much on coincidence and chance encounters as it does on intellectual considerations. The work Anu Ramdas and I made at Weikuang Dam would have turned out differently if we hadn’t documented the waste on analogue film: the traces of radiation were a determining revelation. Likewise, the outcome of my research in Gad Gomene was to a great extent shaped by Seni Dieng’s observations about the impact of pollutants on both the built and the organic environment. These situated perspectives cannot be facilitated through a digital screen, they must be learned through direct interaction with people and local ecologies. But this interaction is not only a precondition for the artistic work; it is what makes the research as a whole worthwhile. In this conclusion, I will elaborate on the primacy of fieldwork as an artistic research methodology.

Fieldwork as Performance

In a situation of crisis, knowledge itself is in crisis, argues professor Kristoffer Gansing (2020), head of the International Center for Knowledge in the Arts. We live in an era of post-truth related conflicts between science, media, politics, and culture – amplified by e.g. climate change and the current pandemic. But as Gansing writes, “this only highlights artistic research’s importance as precisely a discipline that does not claim objectivity from the get-go but that rather intervenes, enacts, and performs knowledge in singular settings ranging from the stage, exhibition, and printed matter and the digital” (Gansing 2020). This era of post-truth conflicts, I would add, also highlights the importance of fieldwork as an artistic research methodology. Fieldwork is usually defined as a process of observing and collecting data according to strict protocols. As Gansing points out, however, artistic research does not claim objectivity, and thus artistic fieldwork can afford to take a much more imaginative approach which, for example, articulates material entanglements and feedback loops between drones and rare earth mines, or obsolete image technologies and radioactive tailings dams. The mode of conducting fieldwork thus becomes the artwork. The artist, then, cannot – and does not want to – claim to be an objective observer who documents the damaged environments with a neutral image technology. Rather, this mode of fieldwork not only documents the hidden flow, it also reveals the links between the hidden flow and the image technologies employed by the artist to document it. The fieldwork itself becomes a performance, a notion which is accentuated in the 8mm film Against the Grain (see https://vimeo.com/203124806), in the article Desert Drone, as well as in the black and white images that document the dismantling of the zinc sheets from the mosque in Gad Gomene (see Appendix). This mode of fieldwork as performance interacts with places to reveal something about them that would otherwise remain hidden to a larger public. As already emphasized, fieldwork is dependent on the knowledge and observations of locals. In this sense, the fieldwork often conveys – or performs – local knowledges by way of aesthetic interventions.
As Gansing argues, artistic research “does something that is valuable to society at large” because it “performs transversal knowledge assemblages for further reflection on where we want to take society and its different domains of knowing next” (Gansing 2020). If artistic research does something that is valuable to society at large, fieldwork – as an artistic performance – reveals something that is valuable to society at large.

From Baotou to Narsaq

In 2016, our field research and images from Weikuang began to emerge online in interviews, reviews, and articles. A year later, a Guardian journalist reported from the small town of Narsaq in southern Greenland that “the scale of environmental degradation [in China] has given open pit mining a bad reputation. Concerned locals in Greenland invoke images of wasted landscapes and pools of toxic and radioactive waste, gleaned from a Google search” (Walsh 2017). Whether or not it was our images that had been gleaned by the residents of Narsaq is not the point. What is important is that images of environmental damage taking place in one part of the world can decisively sway opinions in another. Narsaq is a small town located near the Kuannersuit/Kvæfjord mountain, which is thought to contain one of the world’s richest rare earth deposits. In the years leading up to the elections in Greenland on 6 April 2021, the mining of Kvæfjord became a dominant issue to the extent that some called it a “rare earth mining election”. The citizen activist group Urani Naamik (Uranium No Thanks) was campaigning against the Australian and Chinese mining companies, which were already well advanced with their plans to mine Kvæfjord when the activists began posting information about Weikuang Dam in online fora, in order to alert fellow citizens about the risks of rare earth mining. Urani Naamik feared that mining Kvæfjord would turn Narsaq into an industrial hub contaminated by radioactive dust, much like Baotou. Whether or not these posts about Weikuang were decisive in the outcome of the election is a speculative question. In any case, the election was won by the left-green party Inuit Ataqatigiit, which pledged to oppose the mining of Kvæfjord. A majority voted for a government which won’t allow rare earth extraction to happen in Greenland, and it is safe to say that this decision was at least to some extent informed by images of the environmental disaster in Inner Mongolia.

Revealing the hidden flow of our electronic devices, fertilizers, and everything else we consume, can provide us with some useful reflections on where we want to take society. If, in addition to this, artistic research shares agency with those who bear the burden of the hidden flow, as well as with those who rally against the prospect of living in toxic and damaged environments of extraction, it can perhaps provide more than merely useful reflections. The components of this research project – the fieldwork, exhibitions, articles, workshops, and panel discussions – have been motivated by an ambition both to provide the field of artistic research with reflections on fieldwork and exhibition-making, and to share agency with those who don’t normally have a voice in this field. As Kathryn Yusoff argues, there can be no address of the planetary failures of modernism without a commitment to overcoming extractive colonialism. Yusoff’s statement is a call for both reflection and action. The point Yusoff is making is obviously not that mining the earth must stop. Rather, it is to let those who live in mineral-rich environments decide whether, and under what terms and conditions, concessions to extract raw materials can be granted. For the people living in the villages around Weikuang it was never an option to vote for a clean environment, nor was this an option for the residents of Gad Gomene. The demand for rare earth elements, phosphate, and other minerals is only increasing and will consequently create more death-worlds. Thus, more artistic research, more fieldwork and sharing of agency is needed. Perhaps the reflections and methods presented in this dissertation can provide something useful to this end.

8.  See for example https://www.facebook.com/groups/799280280117642/
9.  See for example Lise Autogena and Joshua Portway’s film Kuannersuit/Kvæfjord from 2017
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Abstract

This dissertation discusses two different art projects and the theory, methodology, and fieldwork that have shaped and informed them. Both projects revolve around the socioenvironmental damage caused by the extraction of some of the minerals which are most essential to modern society: rare earth elements (used in electronics) and phosphate (primarily used in agricultural fertilizers). The mining of these minerals is a notoriously toxic enterprise. Thus, the extraction predominantly takes place in locations populated by marginalized groups and ethnic minorities – far from the affluent Global North. Taking both material witness (such as irradiated photographic negatives) and environmental discourses/activism as strategies, the dissertation discusses how fieldwork-based artistic research can materialize and articulate pervasive but elusive forms of toxic pollution in key mining zones. The primary sites in question are the radioactive mineral waste deposit Weikuang Dam in northern China, and the contaminated village Gad Gomene in western Senegal. Between 2016 and 2019 I visited both sites several times. The dissertation’s main proposition is that the primacy of fieldwork as an artistic research methodology is the shift in perspective from an external and somewhat detached vantage point, to an internal position that engenders a much more intimate knowledge and connection with ecologies, agencies, and people. Fieldwork is thus driven by a hands-on desire to investigate and expose the hidden flow (i.e. toxic drifts) from within the damaged environments of extraction and waste. However, the dissertation also makes the case that fieldwork is to a large degree informed and shaped by local knowledge and observations. Thus, undertaking fieldwork means to share agency with those who live in the toxic environments, and to include in our deliberations and institutions the voices of people whose perspectives are too often excluded. Moreover, the dissertation discusses how my fieldwork is engaged with various philosophical and theoretical ideas in a continuous dialogue, which produces both operative and discursive terms with which to think through the entanglement of materialities: the mineral-machine feedback loop and the map-territory assemblage are two key terms developed during this PhD research project, which are applied in both my fieldwork and my exhibition-making.
Resumé

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Appendix

Christian Danielewitz: PO4 (Blackout)

Exhibition booklet published by RAW Material Company

Editors: Marie Hélène Pereira and Dulcie Abrahams Altass

52 pages with b/w ill. (All images © Christian Danielewitz)

2019
Christian Danielewitz

PO4 (Blackout)

07/06 — 28/06 /2019
Aux habitants
de Gad Gomene

To the residents
of Gad Gomene
7 Commissarier le micro vers un pouvoir accessible / Curating the micro towards an attainable power
- Dulcie Abrahams Altass et / and Marie Hélène Pereira

15 Toute vie – chaque cellule vivante
/ All life – Every Living Cell
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23 L’art de l’Anthropocène : Rapport sur des courants et réalités contemporains
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- Dana Liljegren

31 L’impact négatif de l’économie prédatrice sur le développement local : Le cas des industries Chimiques du Sénégal en zone « Niayes »
/ The predatory economy’s negative impact on local development: The case of the Industries Chimiques du Sénégal in the “Niayes” zone
- Dr Iba Fall

41 Intendance, gouvernance, gestion et usage des territoires, terres et ressources naturelles
Extrait de la Living Convention
/ Stewardship, governance, management, and use of territories, lands and natural resources
Extract from the Living Convention – Natural Justice
Commissarier
le micro vers un
pouvoir accessible

À l'issue de CURA — deux mois d'études intenses et très éclairées sur le commissariat d'exposition et le rôle du commissaire aujourd'hui — nous sommes forcées de re-penser en profondeur notre propre pratique, son importance et sa pertinence dans une èpoque et un contexte donnés. Surtout si l'on considère que les commissaires peuvent être clés dans l'élaboration d'un lien entre la nature privée de la pensée de l'artiste et le public. RAW Material Company est conçu et a été défini comme un centre pour l'art, le savoir et la société, destiné à informer et à intervenir dans le monde qui l'entoure. Penser la pratique de commissariat d'exposition en relation avec la société est un élément central, d'où l'engagement de RAW envers une série de programmes spécifiques qui mêlent pratique artistique et (re)construction d'une société meilleure.

Tout au long de l'histoire, l'art a eu le pouvoir de changer la société. En tant qu'êtres humains, nous avons la possibilité d'utiliser notre imagination à la réflexion abstraite aussi bien pour construire que pour détruire. Nous sommes aussi bien capables de créer de la magie à travers l'art que de mettre la terre en feu. Nous sommes responsables d'une destruction environnementale sans précédent sur cette planète. À l'ère de l'Anthropocène, il est désormais essentiel d'envisager notre environnement non seulement dans son état physique actuel, mais aussi de manière à créer un espace pour des vies qui pourraient se développer dans un environnement mieux préservé.

Curating the micro towards an attainable power

Stepping out from CURA — two months of intense and well informed study sessions on curating and the role of the curator today — one is forced to deeply think about their own practice, its importance and relevance in a given era and context. All the more considering that curators can be instrumental in building a bridge between the private nature of the artist's mind and the public. RAW Material Company is conceived and has been established as a center for art, knowledge and society that informs and intervenes in the world around it. Thinking the curatorial in relation to society is central, hence RAW's commitment to a range of dedicated programs that marry artistic practice and the (re)construction of a better society.

Throughout history, it has been the case that art has had the power to change society. As human beings, we can use our capacity for abstract thinking to build but also to destroy. We can make magic in art but also fire on earth. We are responsible for unprecedented environmental destruction on the planet. In the age of the anthropocene, it becomes essential to rethink our environment not only on a physical and present level, but also in a way that leaves space to expand on the possibilities of potential lives that could exist in a better-kept environment. Art-making can create this space. But what are the limits of a curatorial or artistic approach and initiative when the power to take decisions rests in the hands of the few?

As such, there is a pressing need for a diversification of power in Senegal, despite
La pratique artistique peut créer cet espace. Mais quelles sont les limites d’une approche et d’une initiative artistique ou curatoriale quand le pouvoir de prendre des décisions demeure dans les mains de quelques-uns ?

Il y a ainsi un besoin pressant d’une diversification des réseaux de pouvoir au Sénégal, bien que le pays bénéficie depuis son indépendance d’une relative sécurité et stabilité politique. Il existe de nombreuses explications qui justifient cette stabilité. L’une des plus répandues est l’hypothèse selon laquelle les forces extérieures étaient peu enclines à semer les germes d’une crise dans ce petit pays d’Afrique de l’Ouest en raison de leurs faibles motivations économiques. En d’autres termes, le Sénégal a peu de ressources naturelles qui sont utilisées aux multinationales, gouvernements étrangers, milices, ou si on veut être plus radical, à son propre État ou à sa propre population. C’est une explication simple et alléchante, mais elle masque une réalité plus complexe. La zone côtière sénégalaise constitue une des eaux de pêche les plus riches au monde, et alors que la pêche artisanale y a toujours existé, les communautés de pêcheurs doivent aujourd’hui rivaliser avec les chaînons internationaux qui détruisent les écosystèmes et leurs moyens d’existence. Les villages de pêcheurs autour de Dakar constituent depuis plusieurs décennies le point de départ de migrants dont le mode de vie a été fragilisé et n’est plus viable à cause de la présence de ces mastodontes. Dans la partie tropicale du sud du pays, la déforestation illégale est courante et elle nourrit et finance une rébellion sécessionniste centenaire et bouleverse la biodiversité d’une des régions les plus fertiles du Sénégal. Bien qu’il n’y ait pas de guerre civile qui puisse, le temps d’un instant, faire des mots titres de la presse internationale, les exemples de nature d’autres mettent en exergue une destruction à la fois lente et violente des vies des Sénégalais.e.s ordinaires.

Dans des sociétés dirigées par des représentants qui considèrent comme un grand privilège les partenariats qui souvent affectent de manière négative les modes de vie, s’investir dans une telle « bataille » devient une mission considérable. Comment pouvons-nous à partir de microstructures mettre en place un changement en faveur

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it being a country that has enjoyed a post-independence era of relative political stability and security. There are numerous theories as to the existence of this stability. One of the most oft-touted is the claim that external forces have had little motivation to sow the seeds of crisis in this small West African country for lack of economic motivation. Put in other words, Senegal has few natural resources that are of use to multinationals, foreign governments, militias or if we want to think radically, its own state or population. This is an attractively straightforward explanation, but one that masks a more complex reality. Senegal’s coast represents some of the richest fishing waters in the world, and while artisanal fishing has always existed here, fishing communities today have to compete with international trawlers who destroy ecosystems and livelihoods. Fishing villages around Dakar have for several decades now become departure points for migrants whose way of life has been made critically fragile and unsustainable by the presence of these behemoths. In the tropical south of the country, illegal deforestation is rife, fuelling and funding a century-old secessionist rebellion and upsetting the biodiversity of one of Senegal’s most fertile regions. While there may be no civil war to briefly occupy the headlines of the global press, these examples amongst others point to a quiet yet violent destruction of the lives of ordinary Senegalese people.

In societies led by state officials who place great privilege on partnerships that often negatively affect ways of living and being, it becomes a considerable mission to invest in such a “battle”. How can we go from microstructures able to operate change to a more general framework in which capitalist visions are rethought and reframed to better serve the common interest of human beings? It is important to think today about alternative ways of collaborating in order for germination to happen in its most fruitful ways. Within Senegal, there are a number of active initiatives that contribute to such a mission: Portes et Passages du Retour in Mbour, an artists’ led association that places an emphasis on art and creativity to ensure the vital, necessary relationship between man and nature for holistic well-being and intellectual and creative sovereignty.
d’un cadre plus global, où les concepts capitalistes peuvent être réévalués et redéfinis pour mieux servir l’intérêt commun des êtres humains ? Il est aujourd’hui important de penser à des modes alternatifs de collaboration afin de permettre que cette germination puisse se produire de la manière la plus fruitueuse. Au Sénégal, il y a de nombreuses initiatives actives et engagées qui y contribuent ; Portes et Passages du Retour à Médijane, une association menée par des artistes qui met l’accent sur l’art et la créativité pour garantir le lien vital et nécessaire entre l’Homme et la nature, afin de favoriser le bien-être global ; ainsi qu’une souveraineté intellectuelle et créatrice à l’intérieur de la société ; Lieux Communs, un projet de l’association Kakar qui œuvre depuis plusieurs années à préserver le patrimoine du quartier traditionnel de Niayes Thiock, situé au cœur du centre de Dakar et soumis aux transformations d’un modernisme menaçant et Hahatay, une initiative communautaire qui utilise l’art comme un outil d’émancipation pour les jeunes de Gondol à Saint Louis et pour endiguer le flux de l’immigration illégale en provenance de cette région. Cette attention portée à l’environnement immédiat est importante, dans la mesure où nous avons travaillé au fil du temps à établir le dialogue et à créer des plateformes de réflexion sur des problèmes spécifiques et sur les restrictions auxquelles sont confrontées les communautés avec lesquelles nous sommes associés.

PO4 (Blackout) de l’artiste Christian Danielewitz s’inscrit dans cette démarche et fait partie des programmes de RAW Material Company qui mettent en avant les interventions proposées par des initiatives locales soucieuses de l’avenir de leur environnement. Lors de sa résidence à RAW en 2018, les recherches entreprises par Christian Danielewitz ont amené à se pencher sur l’industrie des mines de phosphate au Sénégal et, après des refus répétés d’autorisation d’accès aux sites miniers, il est tombé sur le village de Gad Gomene dans la communauté rurale de Taïba Ndiaye. Isolé au milieu d’une zone d’extraction minière, les habitants de Gad sont victimes de la destruction environnementale causée par les compagnies minières, facilitée par le

within society; Lieux Communs, the Kakar association project that has for several years been working to preserve the heritage of the traditional neighborhood of Niayes Thiock, situated in the heart of downtown Dakar and subject to a great number of modernity’s more dangerous manifestations and Hahatay, a community building initiative using art as a tool to empower the youth of Gondol in Saint Louis and to stem the flow of illegal immigration from the region. This focus on our immediate environment is important, as we have worked over time to establish dialogues and create platforms for reflection on specific issues and limitations faced by the communities with whom we share society.

PO4 (Blackout) by artist Christian Danielewitz builds on this work, and can be read against a backdrop of programs at RAW Material Company that highlight interventions made by local initiatives who care about the future of their environment. During his residency at RAW in 2018, Danielewitz’s research led him to look into the phosphate mining industry in Senegal and after repeated refusals of entry into mining sites, he fell upon the village of Gad Gomene in the rural community of Taïba Ndiaye. Stranded within an extraction zone, the residents of Gad Gomene are victims of the environmental destruction caused by the mining companies and facilitated by the Senegalese government. Throughout his research Christian developed strong relationships with the people of Gad Gomene and together we have honoured this, creating a space in which they can operate together and search for possible solutions. Investigating such instances around the world and attempting to give shape to these quiet tragedies is a driving force behind his practice. This exhibition attempts to highlight the vicious cycle of extraction, destruction, production and exclusion that is governing life for communities in phosphate mining regions – a cycle that will only ever when phosphate reserves are exhausted and the mines’ transport tracks stop rumbling with the weight of rocks but become an even greater runaway train of disaster whose impact will be felt across the planet. We can read this reality as an irony of catastrophic levels; The same mineral that is mined for fertilizer, a life giver, is responsible for the weakening of chains of nutrition on a local level.
gouvernement sénégalais. Tout au long de ses recherches, Christian a noué des liens étroits avec les habitants de Gad Gomene, ce que nous avons respecté en créant un espace où ils peuvent travailler ensemble et chercher d’éventuelles solutions. L’étude de cas similaires à travers le monde et la tentative de donner forme à ces tragédies silencieuses sont au cœur de sa pratique artistique. Cette exposition vise à mettre l’accent sur le cercle vicieux qui se met en place à travers l’ extraction, la destruction, la pollution et l’exclusion et qui régit la vie des communautés situées dans les régions des mines de phosphate – un cycle qui s’achèvera uniquement lorsque les réserves de phosphate seront épuisées et lorsque les chemins de transport utilisés par les mines cesseront de faire résonner le bruit des roches, mais dont la dérive désastreuse deviendra alors plus incontrôlable encore et dont l’impact se fera sentir sur toute la planète. Nous pouvons considérer cette réalité comme un paradoxe attestant un niveau catastrophique ; le même minerai extrait pour produire de l’engrais, destiné à donner vie, est responsable de l’appauvrissement de la chaîne alimentaire à un niveau local.

Christian Danielewitz présente cette ironie et l’impact qu’elle engendre à travers une installation immersive qui témoigne de la dévastation subie par Gad. Le toit en zinc de l’installation, de structure peu solide et en état d’oxydation avancé, faisait auparavant partie de la mosquée de Gad. Il protège un sol où se trouve des graines d’acacia, ces mêmes cultures qui font actuellement défaut à Taiba, incorporées dans de l’engrais provenant de la même région et se développant sous la lumière artificielle de néons fonctionnant avec des piles au lithium, fabriquées elles-mêmes à partir de phosphate. Au cours de la durée de l’exposition, lorsque le niveau de phosphate dans les piles va s’épuiser, la lumière du néon – indiquant Chaque cellule vivante – va vaciller puis disparaître, compromettant ainsi la croissance durable de l’écosystème mis en place dans la galerie et plongeant l’installation dans la pénombre. Construite à échelle humaine, l’installation offre ainsi une double nouvelle vie à la mosquée de Gad. Bien que n’abritant plus les fidèles,

Danielewitz exposes this irony and its impact in an immersive installation that bears witness to the devastation experienced in Gad. The installation’s zinc roof, structurally unsound and in a state of advanced oxidation, was previously part of Gad Gomene’s mosque. It shelters a bed of soil holding acacia seeds, the very crops that are now failing in Taiba, embedded in fertilizer from the same region and given light for life by way of neon powered by lithium batteries, themselves developed using phosphates. Over the course of the exhibition, as the phosphate levels in the batteries run down, the neon light – reading Chaque cellule vivante (Every living cell) – will eventually flicker and fade, jeopardizing the sustainable growth of the ecosystem built within the gallery, and shrouding the installation in darkness. Built on a human scale, the installation also gives a double new life to the mosque of Gad. Although no longer sheltering worshippers, the zinc plates continue to exist in a monument to the cultures and traditions that are threatened by industries of extraction. Throughout most of Senegal, a country with a 95% Muslim population, small mosques and open-air prayer sites constitute the central node of both village and city life, and are spaces for sacred communion that host the daily ritual of prayer as well as life’s rarer events; baptisms, marriages, deaths. The accelerated physical degradation of Gad’s mosque is more than a metaphor, it is evidence of the impact phosphate mining has on human beings. Furthermore, in preparation for the exhibition the artist contributed to building a new, more secure roof for the mosque, ensuring the continuity of its existence for a few more years yet. That is, if Gad’s residents are able to continue living on their land.

An image of the supernova remnant of Cassiopeia A is projected against the far wall of the gallery, drawing an arc between the earth we walk upon and within which our food gestates, and the cosmic origins of phosphorus that has found its way to earth by way of meteorites. While the phenomenon of climate change denial and widespread apathy on the issue proves the extent to which we as humans have the capacity to ignore the reality and interconnectedness of the world around us, thinking and living in symbiosis
with the cosmos is even greater of an ask for societies educated on a diet of Cartesian philosophy. This exhibition toys with the natural question that follows; do we have to see to believe? The photograph, taken by astronomers, is free for use and reproduction, in stark contrast to investigations made into the phosphate industry in Senegal which are regularly subjected to censorship. In light of this information black-out, the installation reproduces the materiality of the situation, combining organic materials with humankind's ingenious inventions that, for a finite period only, facilitate life. In curating PO4 (Blackout) we attempt to use the generative space of the artwork to expose material conditions that are usually hidden from view. Visitors can see the facts — Chaque cellule vivante — and watch the stars. Until the neon loses its last glow and we will have to go beyond the blackout for the truth.

1 We make reference here to the repeated refusals to visit the sites of the ICS and SEPHEOS mines received by Christian Danielowitz during his research in June 2018. He speaks about these episodes in his text within this publication.

In order to then make space for visitors to become actors of change, to give space to the voices of those most concerned and to broaden the potential impact of the exhibition, PO4 (Blackout) is accompanied by a public program that invites activists, academics, filmmakers and lawyers to share strategies and struggles. Similarly, this reader is designed to provide both context and concrete resources relating to environmental issues in Senegal and beyond. Christian Danielowitz's text eloquently and powerfully draws an arc between the cosmic origins of phosphate, its indispensibility for life on earth and the abominable situation in Gad Gomene. Scholar and high school teacher Iba Fall, a native of the Taliba region, explores the social and environmental issues surrounding the mining industry in Senegal. Writing from an art historical perspective Dana Lajegren reflects on the wider landscape of art-making and ecology on a more global scale, referencing alternative strategies for confronting environmental disaster. Finally, we have republished an extract of the phenomenal Living Convention, a document produced by Natural Justice, an organization

1 Nous faisons allusion ici aux refus répétés pour visiter les sites de mines des ICS et de SEPHEOS que Christian Danielewitz a accusés pendant ses recherches en juin 2018. Il revient sur ces épisodes dans son texte dans cette publication.
situation, combinant la matière organique et les inventions issues de l'ingéniosité du genre humain, qui, pour une période déterminée seulement, facilitent la vie. À travers le comissariat de PO4 (Blackout), nous cherchons à utiliser la capacité générative de l'œuvre d'art pour révéler des situations matérielles qui sont d'habitude cachées. Les visiteurs peuvent voir les faits — Chaque cellule vivante — et regarder les étoiles. Jusqu'à ce que le néon perde ses derniers éclats et que nous ayons à aller au-delà du black-out pour chercher la vérité.

Pour permettre aux visiteurs de devenir acteurs du changement, pour laisser parler les voix de ceux qui sont les plus concernés et pour renforcer l'impact potentiel de l'exposition, PO4 (Blackout) s'accompagne d'un programme à destination du public, invitant activistes, universitaires, réalisateurs de films et juristes à partager leurs luttes et leurs stratégies. Ce recueil est également conçu pour fournir un contexte et des moyens concrets par rapport aux questions environnementales au Sénégal et ailleurs. Le texte de Christian Danielewitz établit un lien entre les origines cosmiques du phosphate, son caractère indispensable à la vie sur terre et la situation terrible dans laquelle se trouve Gad Gomene. Iba Fall, universitaire et natif de la région de Taiba, analyse les questions sociales et environnementales autour de l'industrie minière au Sénégal. En écrivant à partir d'une perspective d'histoire de l'art, Dana Lijegren propose une réflexion sur le champ plus large de la pratique artistique et de l'écologie à l'échelle internationale, en mentionnant les stratégies alternatives permettant de faire face au désastre environnemental. Enfin, nous avons publié un extrait de l'extraordinaire Living Convention, un document produit par Natural Justice, un organisme qui cartographie les lois internationales relatives aux droits des peuples autochtones et communautés locales.

À la fin de cette publication les lecteurs peuvent trouver une liste d'organisations, de centres de recherche et de fondations qui sont pertinents aux thématiques de PO4 (Blackout) au Sénégal. Cette liste ne revendique pas l'exhaustivité mais existe plutôt comme un geste d'encouragement vis-à-vis des futurs engagements envers des causes environnementales.

At the end of this publication readers can find a list of organisations, research centers and foundations that are relevant to the themes of PO4 (Blackout) in Senegal. The list does not claim to be exhaustive but is rather a gesture to encourage future engagement with environmental causes.
Toute vie – chaque cellule vivante

Dans le monde organique, par exemple, les tissus mous (gels et aérosols, muscles et nerfs) régnaient sans partage jusqu’à il y a 500 millions d’années. À cette période, certaines agglomérats de matière-énergie chamae qui constituaient alors la vie se minéralisèrent soudainement et une nouvelle matière émergea pour la fabrication de créatures vivantes : l’os.1

Manuel De Landa
A Thousand Years of Nonlinear History

Le lien entre l’os et la pierre dans l’ontologie de Manuel de Landa semble être un point de départ approprié pour un essai sur le niveau de criticité d’une des ressources minérales les plus essentielles sur Terre : le phosphate. En effet, la population entière de la planète dépend du phosphate, qui, à quelques exceptions près, s’obtient à partir du minerai de phosphate, principalement extrait dans seulement quelques pays. Le phosphate est un élément indispensable à toute vie. On le retrouve dans l’ADN, l’ARN, les membranes cellulaires et la molécule de transfert énergétique ATP – adenosine triphosphate. Le phosphate est le deuxième minéral présent dans notre corps, constituant 25% de la matière minérale dont nous sommes faits. Mélange au calcium, il forme

All Life – Every Living Cell

In the organic world, for instance, soft tissues (gels and aerosols, muscle and nerve) reigned supreme until 500 million years ago. At that point, some of the conglomerations of fleshy matter-energy that made up life underwent a sudden mineralization, and a new material for constructing living creatures emerged: bone.1

Manuel De Landa
A Thousand Years of Nonlinear History


The relation between bone and rock in Manuel De Landa’s ontology seems to be an appropriate starting point for an essay on the criticiality of one of the most essential mineral resources on earth: Phosphate. Indeed the planet’s entire human population depends on phosphorus, which, with a few exceptions, is obtained from phosphate rock mined extensively in only a handful of countries. Phosphorus is an indispensable building block in all life. It is found in DNA, RNA, cell membranes, and the energy transfer molecule ATP – adenosine triphosphate. Phosphorus is the second most abundant mineral in the human body, making up a full 25% of all the mineral material we consist of. Combined with calcium, it forms the crystalline structure hydroxyapatite that gives strength to bones.
la structure cristalline hydroxyapatite, qui confère sa solidité aux os et aux dents. L’os, écrit Manuel de Landa, "est le matériau vivant qui se pétérifie le plus facilement, qui est le plus prêt à repasser la frontière pour se retrouver dans le monde des pierres. C’est pour cette raison que la plupart de l’histoire géologique se trouve inscrite dans des os fossiliés. L’endosquelette humain est l’une des nombreuses productions de cette ancienne minéralisation."

Le phosphore est également un élément clef de l’agriculture moderne. Depuis le début du vingtième siècle, la dépendance croissante de l’alimentation alimentaire mondiale à l’égard des engrais a transformé le phosphore en une ressource vitale. Il y a une centaine d’années, la plupart du phosphore qui était sur le marché international provenait d’os d’animaux (une des principales importations anglaises à l’époque) et du guano, extrait des îles du Pacifique où les oiseaux laissaient leurs excréments, contenant du phosphore, depuis des millions d’années. Mais les os ne font plus tellement

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3 Fred Pearce: Phosphate: A Critical Resource Misused and Now Running Low, Yale Environment 360, 7 juillet 2011
4 James Elser: The Future of Phosphorus, The New Yorker, 7 janvier 2010

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and teeth. Bone, writes De Landa, "is the living material that most easily petrifies, that most readily crosses the threshold back into the world of rocks. For that reason, much of the geological record is written with fossil bone. The human endoskeleton was one of the many products of that ancient mineralization."

Phosphorus is also a key ingredient in modern agriculture. Since the beginning of the 20th century the global food supply’s increasing dependency on fertilizer has turned phosphorus into a critical resource. A century ago much of the world’s internationally traded phosphorus came from animal bones (a major English import at the time) and guano, excavated from Pacific islands where birds had been defecating phosphorus for millions of years. But bones are not traded much anymore, and most of the guano islands are now mined out.3

The depletion rates of phosphate rock in contemporary key mining zones in North Africa, the Middle East, Florida and China are raising concerns about the future of phosphorus. Some researchers have calculated that peak phosphorus, that is, the point in time when humanity reaches the maximum global production rate, will occur around the year 2030, and reserves are estimated to be depleted in 50-100 years. Given the fact that more than 85% of mined phosphorus is used to produce fertilizer to feed the world’s growing populations there is serious reason to worry. Biologist James Elser has stated that “phosphorus is the biggest problem you’ve never heard of.”4

However, as Arno Rosemarin and Oliver Gantner argue, "a calculation of phosphorus criticality has to be calculated as the criticality of a specific type of phosphorus in a specific field with its specific value chain, its conditions, processes, functions and structures. The fertilizer industry and the lithium-ion battery production (and therefore the computer and mobile phone market)
both rely on phosphorus. An assessment of their criticality will lead to different results based on widely varying factors. But such an assessment, that is not based on the actual element, but rather on its industrial, political, juridical and economic framework highlights yet another problem in the prediction of phosphorus future availability: Data.  

Upon my first visit to the small village of Gad Gomene in June 2018 it was not so much the specific data on the future accessibility, or the various industrial applications of phosphorus I had in mind. Rather, it was an environmental report I had read a few days prior, that revealed the horrific extent of toxic pollution in villages situated near the open-pit phosphate mines at Taiba, in the Thies Region of north-western Senegal. Since my arrival in the country a month earlier, I had been sending e-mails and letters to mining companies, asking for official permission to visit their sites of extraction, but to no avail. The location of Gad, a village of around 200 people, landlocked in the middle of an ICS (Chemical Industries of Senegal) exploitation and manufacturing zone, offered a different approach. 

For more than a decade the villagers have been involved in a legal battle with the ICS – the largest producer of phosphate fertilizer in Sub-Saharan Africa – over rights to be compensated and relocated. They can no longer cultivate their fields of mango and acacia trees, which are either land-grabbed by the company, or destroyed by toxic elements in the groundwater and in the air. In 2014 a major leak of sulphuric acid contaminated the entire village. The villagers suffered from visual disturbances, persistent chest pains and chronic headaches, and miscarriages and neonatal deaths in the aftermath of the accident have been reported. But the slow disaster unfolding in Gad doesn’t make headlines. In a sense the village is invisible. It cannot be seen from the main roads that cut through the industrial hinterland, which is dominated by mountainous white heaps of mined phosphate rock. There are no signs indicating the location of Gad, but if one
toxiques présentes dans les nappes phréatiques et dans l’air. En 2014, une fuite importante d’acide sulfurique a contaminé tout le village. Les villageois ont souffert de troubles visuels, de douleurs persistantes à la poitrine et de maux de tête chroniques, et des laissages-couches et des enfants morts-nés ont été à dépouiller à la suite de l’accident. Mais le long désastre qui se met en place à Gad ne fait pas les gros titres. En un sens, le village est invisible. Il n’est pas visible depuis les routes principales qui traversent l’arrière-pays industriel, qui est dominé par des montagnes constituées des amoncellements de déchets de minachy Caple phosphaite. Il n’y a pas de panneau indiquant le village de Gad, mais si l’on sait où tourner, on peut atteindre le village par une route non-goudronnée, principalement utilisée par les camions de l’ICS, loin de l’autoroute.

Abdou Aziz Diao, le coordinateur de l’accord régional de la coalition des organisations de la société civile, a déclaré que les habitants de Gad « vivent le paradoxe de l’abondance ». Les villageois sont abandonnés à une grande pauvreté, tandis que les industries minières gagnent des milliards de francs CFA. 6 Gad et plusieurs autres villages se retrouvent sacrifiés dans le cycle mondial de l’extraction, de la production et des déchets, pour une recherche de profit maximum, que la demande croissante de phosphore pour la production alimentaire liée à l’explosion démographique mondiale permet d’obtenir. Dans les pays en voie de développement tels que la Chine et l’Inde, la classe moyenne émergente consomme de plus en plus de viande, ce qui fait exploser la demande en engrais, le bétail étant moins efficace au point de vue phosphore que les plantes. « Le phosphore » écrivent Zachary Caple et Gregory T. Cushman, « est devenu l’obsession des sciences capitalistes : comment le trouver, l’extraire et le raffiner ; comment le transporter, le mélanger, le répandre ; comment fixer son prix ; comment le commercialiser ; et – de peur de l’oublier – comment l’évacuer ».


knows where to take a turn, the village can be reached by a dirt road, mainly used by ICS trucks, off the highway.

Abdou Aziz Diao, coordinator of the Regional Agreement of the Coalition of Organizations of Civil Society, has said that the residents of Gad are “living the paradox of abundance”. The villagers are left in extreme poverty, while the mining industries make billions of West African francs. 8 In the global cycle of extraction, production, and waste, Gad – and several other villages – is sacrificed in the pursuit of maximum profit, made on the increasing demand for phosphorus to sustain food production for a soaring world population. In developing countries such as China and India the emerging middle classes are consuming more meat, causing the market for fertilizer to expand drastically, as livestock is less phosphorus-efficient than plants. “Phosphorus” writes Zachary Caple and Gregory T. Cushman, “has become a fetish of the capitalist science: How to find it, mine, and refine it; how to ship it, mix it, spread it; how to price it; how to market it; and – lest we forget – how to flush it”. 7 The human, as De Landa points out, is a mineral extension of the earth’s strata. In 2013 astronomers detected phosphorus in Cassiopeia A, which confirmed that element P with the atomic number 15, is forged by nuclear reactions in supernova explosions. Our bones are, in other words, made up of a material byproduct of exploding stars, that were carried to earth via meteorites. But the geologic, as Kathryn Yusoff notes, “is more often than not a forgotten strata in our becoming. As such, the fossil unearths the process of sedimentation that accretes around and is historicized within the concept of the human, while also reminding us of the longevity of our geologic life and our inhuman origins.” 8 The invention of agriculture at the
L’humain, comme le souligne De Landa, est une extension minérale de la couche terrestre. En 2013 des astronautes ont détecté du phosphore sur Cassiopée A, ce qui confirme que cet élément P, de nombre atomique 15, provient des réactions nucléaires dans les explosions « supernova » d’étoiles. Nos os sont, en d’autres termes, issus d’une substance produite par les explosions d’étoiles, qui fut transportée sur la terre par les météorites. Mais, ainsi que le fait remarquer Kathryn Yusoff, la géologie « constitue la part du temps une strate oubliée dans notre devenir. En tant que tel, le fossile de la vie humaine se situe au cœur des processus de sédimentation qui s’est accumulé et fait partie de l’histoire de l’humanité, tout en nous rappelant également l’ancienneté de notre vie géologique et de nos origines non-humaines ».8 L’invention de l’agriculture au début de l’Holocène y a environ 12 500 ans a déclenché une révolution au niveau de la relation entre le phosphore du sol et la fertilité humaine. Mais si l’on revient à notre époque, les mines de phosphore sont devenues des destructeurs environnementaux, produisant environ 150 millions de tonnes de rejets toxiques par an. L’environnement ravagé autour des plus grandes zones minières est visible jusqu’à des dizaines de kilomètres, tandis que les gros excavateurs à pelle traitante, les énormes canalisations, les monceaux de déchets et la destruction du paysage reflètent l’intérieur du corps dévasté aux organes contaminés et abîmés par la pollution. L’ICIS est le plus gros complexe industriel au Sénégal. En 2014, deux mois avant la suite d’acidité à Gad, la majorité des actions de la société furent acquises par Indorama Corporation, une multinationale indienne gérée avec des entreprises chimiques dans toute l’Afrique et l’Asie du Sud-Est. L’un des objectifs revendiqués d’Indorama est de déclencher une révolution verte dans les pays en voie de développement, obtenue grâce à l’emploi d’engrais artificiel. Mais l’ironie tragique de l’agriculture industrielle moderne, et de ses moyens de production, 

8 Kathryn Yusoff : Geologic Life : Prehistory, Climate, Futures — or do fossil fuels dream of geologic life?, Lancaster Environment Center, Lancaster University, p.6

n'est nulle part plus évidente que dans les plantations flétries de Gad Gomene. L'atmosphère toxique et le manque d'irrigation – dans la mesure où les ressources en eau sont utilisées pour l'extraction de phosphate – ont transformé ce qui était autrefois un jardin fertile riche en arbres fruitiers en une zone tampon désormais morte entre le village et les mines. Dans leur article Plantation Legacies (Héritages des plantations), les auteurs (Sophie Sapp Moore et al.) écrivent que « le monde des plantations, passé ou présent, nous rappelle avec acuité que les problèmes environnementaux ne peuvent être détaillés des histoires relatives au colonialisme, au capitalisme et au racisme, qui ont rendu certains êtres humains plus vulnérables que d'autres au réchauffement climatique, à la montée du niveau de la mer, aux expositions toxiques et à l'expropriation des terres, à travers le monde ». Dans la lignée de Donna Haraway et Anna Tsing, les auteurs nous invitent à contester le système de pensée en fonction des espèces propres à l'Anthropocène, mettant en avant l'argument selon lequel le terme Plantationcène pourrait être un terme plus approprié pour désigner l'ère dans laquelle nous vivons : « Les plantations rendent visibles les relations de pouvoir et les inégalités économiques, environnementales et sociales qui ont fait que, dans un monde qui subit un changement climatique brutal, une extinction des espèces accélérée et une disparité des richesses de plus en plus importante, la vie est plus fragile pour certains êtres humains ou non-humains que pour d'autres ».

Si le terme Plantationcène est perçu comme un diagnostic, alors le cas de Gad doit être considéré comme un symptôme. Lors de ma première visite, le fils du chef du village m'a emmené faire le tour des environs. Alors que nous marchions dans les plantations arides, il m'a dit que ICS avait essayé d'éloigner les journalistes de la zone. Face à une situation qui semblait irréversible, les villageois ont demandé

inequalities that have made ways of being in a world undergoing rapid climate change, accelerated species extinction, and growing wealth disparity more precarious for some human and nonhuman beings than others”.

If the term Plantationocene is perceived as a diagnosis, then the case of Gad must be regarded as a symptom. On my first visit to the village chief’s son, took me on a tour around the neighborhood. As we walked through the arid plantations, he told me that ICS had been trying to keep reporters away from the area. In the face of a seemingly irreversible situation, the villagers have demanded that the mining company employ them, but ICS prefers to recruit the majority of labor from India. The future of Gad is uncertain and the villagers know this. But whatever the fate of Gad will be, it doesn't seem likely that they will get help from the authorities to leave the village. Meanwhile, the toxic atmosphere is taking its devastating toll on humans, animals, crops, and materials alike. When we passed by the village mosque in the center of Gad, the village chief’s son pointed to the roof made of zinc sheets, which was clearly in a severely oxidized and deteriorating state. He explained that this was due to the toxic vapors coming from the sulphuric acid employed to dissolve phosphate rock. The same product, used to obtain phosphorus, was also dissolving the zinc sheets on the buildings in Gad.

Phosphorus was originally discovered and named by the German alchemist Henning Brand 350 years ago, in a part of the world far from the village of Gad Gomene. Brand discovered the element by accident, while he was searching for the so-called philosopher’s stone – a substance which at that time was believed to have the ability to turn base metals into gold. In this process he did an experiment with urine, which he boiled down until it evaporated, leaving a white material that gave off a faint glow. He named it phosphorus mirabilis; the miraculous bearer of light. However, the mythological origins of the name phosphorus are ambiguous. In Greek mythology Phosphorus is the name for the planet Venus, also known as the Morning Star. But in Latin, the Morning Star is called Lucifer – the rebellious archangel that was


10 ICS
que la mine puisse au moins les employer, mais l’ICS préfère recruter la majorité de sa main d’œuvre d’Inde. L’avenir de Gad est loin d’être assuré et les villageois le savent. Mais quelque soit le destin de Gad, il est peu probable que les autorités les aident à quitter le village. Entretemps, l’atmosphère toxique poursuit ses ravages, que ce soit sur les Hommes, les animaux ou les matériaux. Lorsque nous sommes passés devant la mosquée du village de Gad, le fils du chef de village a montré le toit fait de feuilles de zinc, qui était clairement dans un état d’oxydation sévère et était très détérioré. Il a expliqué que c’était dû aux vapeurs acides venant de l’acide sulfurique employé pour dissoudre les rochers de phosphate. Ce même produit, utilisé pour obtenir du phosphore, était aussi en train de dissoudre les feuilles de zinc sur les bâtiments de Gad.

Le phosphore fut découvert et nommé par l’alchimiste allemand Henning Brand il y a 350 ans, dans une partie du monde située loin du village de Gad Gomene. Brand découvrit l’élément par hasard alors qu’il était à la recherche de la soi disant pierre philosophale — à l’époque une substance que les gens pensaient avait la capacité de transformer le vin métal en or. Pendant ce processus il créa une expérience avec de l’urine qu’il chauffait jusqu’à son évaporation, laissant une matière blanche d’où émanait une faible lueur. Il la nomma phosphorus mirabilis, le porteur miraculeux de lumière. Cependant, les origines mythologiques du nom phosphore sont ambiguës. Dans la mythologie grecque, Phosphorus est le nom de la planète Vénus, aussi appelée étoile du matin. En latin, l’étoile du matin s’appelle Lucifer – l’archange rebelle qui fut précipité sur terre. Phosphorus, ainsi que Lucifer, signifie « celui qui amène la lumière ». Mais tandis que Vénus était la déesse romaine de la fertilité, Lucifer est devenu synonyme du diable : le tentateur qui est responsable de la chute autodestructive de l’humanité.

cast to earth. Phosphorus, and Lucifer, mean “light-bearer”. But whereas Venus was the Roman goddess for fertility, Lucifer has become synonymous with the Devil: The Tempter who is responsible for humanity’s downfall.
L'art de l'Anthropocène : Rapport sur des courants et réalités contemporains

Notre environnement planétaire est en train de changer, c'est une réalité indéniable à laquelle artistes contemporains, anthropologues et théoriciens critiques sont de plus en plus sensibles et qu'ils perçoivent de manière toujours plus aigüe. La production artistique et le savoir en histoire de l'art au vingtième siècle — notamment dans la dernière décennie — sont toujours plus inextricablement liés à des causes politiques ou disciplinaires universitaires qui étaient auparavant considérées comme distinctes du domaine des sciences humaines et sociales. Alors que la relation entre l'art et l'expression politique est depuis longtemps profondément ancrée dans les récits de l'histoire de l'art, le crescendo actuel de l'activisme environnemental au niveau international suscite un intérêt croissant pour des domaines tels que l'écologie, la géologie, et la biologie de la part des artistes aussi bien que des historiens ou anthropologues.

Relié, tout en étant distinct, à la branche du Land Art des interventions conceptuelles qui émergèrent au cours des années 60 et 70 — dont le plus célèbre exemple est la Spiral Jetty (1970) de Robert Smithson — l'art environnemental s'est emparé plus ouvertement du milieu à la fin du vingtième siècle, des questions sociales et sociétales.

Anthropocene Art: Dispatch on Contemporary Currents and Conditions

Our planetary environment is changing, an undeniable fact to which contemporary artists, anthropologists, and critical theorists are becoming increasingly, acutely, attuned. Artistic production and art historical scholarship in the twenty-first century, particularly in the past decade, are growing more tightly intertwined with political causes and academic disciplines that previously have been regarded as separate from the realm of humanities and social sciences. While the relationship between art and political expression is longstanding and deeply embedded within art historical narratives, the current crescendo of environmental activism around the globe is prompting a growing attention to the fields of ecology, geology, and biology from artists, historians, and anthropologists alike.

Related to yet distinct from the land-art branch of conceptualist interventions that emerged during the 1960s and ’70s — the most celebrated example of which is Robert Smithson’s Spiral Jetty (1970) — environmental art since the mid to late twentieth century more overtly undertakes social and societal issues as they pertain to the natural world. More recently, from South America to Asia, across Africa and Europe, artistic responses to humanity’s ecological impact are moving to the fore.

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2. Maria Broccosho et Azadeh Ansari, "Landfill’s closure changing lives in Ro \\


   In Dhaka, artist Sarker Protick (b. 1986) serves as a faculty member at the Pathshala South Asian Media Institute and creates portraits, photographs, and video-based series that frequently visualize the volatile interactions between the natural world and its human inhabitants. *Of River and Lost Lands* (2011-2018) is a haunting depiction of Bangladesh’s mystic Padma River and the destructive effects of flooding. In a dramatically different but equally impactful project, satellite imagery rendered by NASA’s Earth Observatory has documented the transforming size, shape, and location of the Padma over the past thirty years, noting the resulting loss and displacement of land, homes, and lives. Photography

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obsédante de la brumeuse rivière Padma au Bangladesh et des effets dévastateurs des inondations. Les images satellites générées par l’Earth Observatory de la NASA ont, d’une manière complètement différente mais tout aussi percutante, retranscrit les transformations subies par la rivière Padma, au niveau de sa taille, de sa forme et de sa situation, durant les trente dernières années, en notant les disparités qui en ont résulté, en termes de terres, d’habitations et de vies.4 Les œuvres photographiques et les vidéos de l’artiste malaisien Sherman Ong (né en 1971, vit et travaille à Singapour), analysent le phénomène connexe des moussons et ses conséquences envers le sol et l’activité humaine, accentuant ainsi le triste paradoxe d’une région saturée d’eau, où les bénéfices qui pourraient être tirés de l’utilisation de l’eau de pluie demeurent encore à exploiter.5

Dans plusieurs pays africains francophones, la technique artistique dénommée récupération – une méthode qui ne peut pas uniquement être réduite à l’assemblage de déchets ou au recyclage, mais qui s’apparente aux deux par le recyclage de matériaux mis en œuvre – se fait de plus en plus présente et visible à Dak’Art, la biennale d’art contemporain de Dakar, depuis plus d’une dizaine d’années.6 Parmi les praticiens de cette technique et de méthodes similaires, se trouve le sculpteur sénégalais Meissa Fall (né en 1954), un artiste-mécanicien qui crée des œuvres fantasistes et respectueuses de l’environnement en réutilisant des pièces de vélos ; l’artiste béninois Romuald Hazoumé (né en 1962), dont les « masques » provocateurs réalisés à partir de vieux bidons d’essence font référence à la fois à des objets africains traditionnels et aux déchets de la production pétrolière à travers le continent ; et l’artiste éthiopien Elias Sime (né en 1968), dont la technique mixte d’assemblage évoque les œuvres de Fall.7

and videographic work by Malaysian artist Sherman Ong (b. 1971), based in Singapore, examines the related phenomena of monsoons and their consequences for terrain and human activity, accentuating the grim irony of a waterlogged region where the potential benefits and uses of rainwater have yet to be harnessed.5

In various francophone African countries, the artistic technique referred to as récupération – a method not entirely reducible to junk assemblage or recycling (le recyclage), but which has aspects of both in its reuse of existing materials – has gained greater ubiquity and visibility at Dak’Art, Dakar’s contemporary art biennial, for more than a decade.6 Practitioners of this technique and similar strategies include Senegalese sculptor Meissa Fall (b. 1954), an artist-mechanic who crafts whimsical, environmentally conscious works using reclaimed bicycle components; Beninese artist Romuald Hazoumé (b. 1962), whose provocative “masks” made from reused plastic fuel cans simultaneously reference traditional African objects and the detritus of oil production throughout the continent; and Ethiopian artist Elias Sime (b. 1968), whose mixed-media assemblages evoke aerial landscapes and urban sprawls through the use of such disparate found materials as buttons, bottle caps, and repurposed electrical wiring.7 Emphasizing processes of renewal, these artists and their modes of production illuminate the creative potential of transformation while reflecting – even resisting – the insidious conditions of global consumerism.

Meanwhile, various artists based in Europe and the U. S. are developing increasingly itinerant practices that move, quite literally, from individual points of origin to widespread locations and diverse subjects.

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Armin Linke (b. 1966), raised in Milan and trained in New York, has traveled the world for the last twenty years while creating large-scale images of spaces and places at which human manipulation of the natural landscape is most conspicuous. Ski Dome, Tokyo, Japan (1998), a chromogenic print more than two meters wide, depicts patrons at a manmade ski slope, an indoor snowscape in which the seasonal cycles between winter, spring, summer, and fall appear arrested and irrelevant. 7 Belgian-Beninese photographer Fabrico Monteiro (b. 1972) collaborated with Dakar fashion designer Doubuy for the series The Prophecy (2015); together, their images offer striking views of an imagined West African landscape in which fantastical figures traverse dystopian cities and littered seashores, overwhelmed by the dregs of human wastefulness.

In dialogue with such artists are the critics and curators addressing these currents and environmental realities in writing and through exhibitions. The forthcoming 16th Istanbul Biennial, slated for the fall of 2019 and curated by Nicolas Bourriaud, is titled The Seventh Continent, a reference to the mass of floating marine debris also known as the "Great Pacific Garbage Patch." 8 Bourriaud proposes a consideration of artworks as "active beings," actants within a rhizomatic network of objects, animals, and technology through which contemporary artists are conceiving a new form of anthropology — a "molecular anthropology" that analyzes the imprints of human activity on the planet and the "molecular structures" of social interaction. 9 It is no longer enough, Bourriaud suggests, for art to merely represent the world; rather, artists


10 These remarks come from a public talk by Bourriaud on the 16th Istanbul Biennial. Nicolas Bourriaud, "The Seventh Continent," public lecture, Curator's Perspective from Independent Curators International, co-presented by the James Gallery and Center for the Humanities at the Graduate Center, CUNY, New York, March 8, 2019.
today search for and investigate those points at which "molecular transformation" occurs, thereby offering expressive insight into, and a critique of, human impact on the myriad forms of non-human existence.11 Bourriaud’s curatorial perspective is echoed not only as a present shift in the visual arts, but also in recent texts from the fields of sociology and critical theory. Scholars and philosophers including T. J. Demos, Donna Haraway, Bruno Latour, and Elizabeth Povinelli, have taken up the Anthropocene as the inescapable stage at which, or on which, our current human dramas are played out, a proposed geological period and mode of existence of which industry and capitalism are among the primary driving forces.12

Indeed, Demos argues that the frequently universalizing rhetoric of Anthropocene discourse, which implicates all undifferentiated human activities in the planet’s ecological transformation, obscures the responsibility of what he calls the “military-state-corporate apparatus,” thereby depoliticizing the urgent ecological plight at hand.13 In contrast to Bourriaud, who frames contemporary artistic practice within a “post-cultural” mode of production and a shared physical reality, Demos suggests that the unifying tendency of related “world perspectives” is predicated on an antipolitical nullification of the same global conflicts that exacerbate and accelerate environmental destruction.14

What these visual and scholarly contributions to Anthropocene theory reveal is an ongoing tension between the local and the global, the specific and the universal: the established artistic media of photography,


10 Ces réflexions sont tirées d’une intervention de Nicolas Bourriaud à propos de la 16ème Biennale d’installation, The Seventh Continent, conférence publique, Curator’s Perspective from Independent Curators International, co-organisé par la James Gallery et le Center for the Humanities at the Graduate Center, CUNY, New York, 8 mars 2019.

11 Ibid.


13 See Demos, Against the Anthropocene, 19-21.

les principales forces motrices. En effet T.J. Demos démontre que la rhétorique fréquemment universaliste du discours sur l'Anthropocène, qui impute à toutes les activités humaines indifférenciées la transformation écologique de la planète, brouille la responsabilité de ce qu'il nomme « l'appareil militaro-économico-corporatif », dépolitisaînt ainsi le problème écologique impérial qui se pose. À l'opposé de Nicolas Bourriaud, qui situe la pratique artistique contemporaine à l'intérieur d'un mode de production « post-culturel » et d'une réalité physique commune, T.J. Demos suggère que la tendance à l'unification des perspectives du monde connexes est basée sur une annulation.


13 Voir T.J. Demos, Against the Anthropocene, 19-21.

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video, sculpture, even large-scale installation, calibrated to (or arguably limited by) human capabilities of perspective and perception, often succeed in documenting or representing only a segment of the bigger picture or a relatively brief moment within an epochal expanse of time. While a single portrait captured within a Brazilian landfill bears an evident regional and temporal specificity, we, as viewers and intermediaries of such images, may protract them outward, inward, forward, through dialogue, critique, and circulation.

Perhaps, therefore, what art in the Anthropocene asks of us is participation in this form of perspectival duality, a toggling between awareness of one's immediate surroundings and the shared planetary environment in which those local settings are integrated and interconnected. By proposing a view of living in which an individual footprint is both one's own mark and a contribution to a collective set of actions and consequences, these artistic currents and attendant theorizations extend an invitation — even a charge — to a collaborative pursuit of systemic change for ecological and human welfare.

l'intérieur, plus avant, à travers le dialogue, la critique et en les diffusant.

Peut-être, par conséquent, ce que nous demandons de l'art de l'Anthropocène est de prendre part à cette forme de dualité, une alternance entre la prise de conscience de notre environnement immédiat et de l'environnement planétaire commun dans lequel ces paramètres locaux sont intégrés et interconnectés. En proposant un mode de vie où chaque empreinte laissée par un individu est à la fois sa propre marque et une contribution à un ensemble d'actions collectives ainsi qu'à leurs conséquences, ces courants artistiques et leurs théories connexes invitent à — et même nous imposent de — continuer à collaborer en vue d'une modification des systèmes pour le bien-être humain et celui de l'écologie.
Dr Ibra Fall

L'impact Négatif de L'économie Prédatrice sur le Développement Local : Le Cas des Industries Chimiques du Sénégal en Zone « Niayes »¹

*Thème général : Protection de l'environnement et exploitation des mines*

Introduction
Les rapports de force entre les peuples nous ont suffisamment révélé l'instinct d'acquärement qui meut l'Histoire universelle. Dans le cadre de la géopolitique, on peut rappeler les courses successives vers la conquête de l'espace, l'hégémonisme recherché à travers la détention de la puissance atomique, les enjeux autour du nucléaire et les polémiques sur l'uranium. Aujourd'hui, on parle de l'Homme comme un « homo-économicus » pour désigner la domination mondiale.

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Dr Ibra Fall

The Predatory Economy's Negative Impact on Local Development: The Case of the Industries Chimiques Du Sénégal in the "Niayes" Zone¹

*General theme: Environmental protection and mining operations*

Introduction
Power relations between peoples have sufficiently revealed the profit-seeking instinct that has driven universal history. Within the geopolitical framework, one only need mention the successive races to conquer space, the hegemony sought in the possession of atomic power, the issues surrounding nuclear technology, and the controversies surrounding uranium. Today, we speak of humans as "homo-économicus" in reference to the liberal economy's.
par l’économie libérale, portée par la mondialisation. On est à l’âge des guerres économiques illustrées à travers la course vers les ressources naturelles. Cette situation place tous les pays dotés de richesses naturelles dans la convoitise permanente.

Au plan local, ces rapports de forces, portés par la mondialisation, ont eu des répercussions et un impact réel sur le développement endogène : destruction de l’environnement sous le coup d’une surexploitation, déstructuration des systèmes traditionnels de production et de transformation économiques du monde rural, disparition de suivi des recommandations techniques suite aux études d’impact environnemental, absence de prise en charge réelle et d’investissements au plan socio-médical et infrastructural, fragmentation des structures familiales et appauvrissement des populations victimes de dépossession (champs, domaines, activités). L’exemple des Industries Chimiques du Sénégal (ICS) met en jeu trois acteurs dont les rôles, les responsabilités et les situations sont très disproportionnels : les décideurs politiques, les populations et les bailleurs.

Nous essayerons, en effet, de répondre à trois questions. D’abord, qu’est-ce qui justifie le contraste de l’exploitation des Niayes et la misère de ses populations ? Ensuite, l’option économique statique est-elle réellement émergente ? Enfin, quelles sont les dynamiques de resistance locale pour réhabiliter les Niayes ?

I/ Situation, Contexte Et Justification
La dégradation de l’environnement et la dépossession des populations par l’accaparement, pour le cas du Sénégal, ont été, ces dernières décennies, intensifiées par la découverte et l’exploitation de richesses naturelles de son sous-sol (pétrole, gaz, zircon, or, phosphate, espaces d’exploitation...). Coincident avec un contexte international de “croissance infinie et incontrôlée” marqué, d’une part, par la crainte de l’épuisement des réserves d’énergies non-renouvelables et par une inclination encore baïnitive vers les énergies alternatives et renouvelables d’autre part, lesdites richesses, à cause de leur immensité, attirent de plus en plus les convoitises de lobies affairistes,

domination of the world, driven by globalization. Ours is the era of economic wars, as illustrates the race for natural resources. This situation makes all countries endowed with natural riches the object of constant covetousness.

Locally, this power struggle engendered by globalization has had repercussions and a tangible impact on endogenous development: the destruction of the environment due to over-exploitation; the dismantling of the rural world’s traditional systems of economic production and transformation; a failure to instigate the technical recommendations of environmental impact studies; a lack of real cover and investment on a socio-medical and infrastructural level; the fragmentation of family structures; and the impoverishment of populations victim to expropriations (of fields, homes, and activities). The example of the Industries Chimiques du Sénégal (Chemical Industries of Senegal, ICS) brings into play three actors whose roles, responsibilities, and situations are highly unequal: the political decision-makers; the populations; and the financial backers. This article will attempt to address three questions. First, what justifies

the contrast between the exploitation of the Niayes and its populations’ impoverishment? Secondly, is the state economic option truly taking off? Finally, what are the dynamics of local resistance that seek to rehabilitate the Niayes?

I/ Situation, Context, And Justification
The degradation of the environment and the dispossesssion of the population caused by land grabbing have, in Senegal’s case, been intensified over the past few decades by the discovery and exploitation of its natural resources (oil, gas, zircon, gold, phosphates, exploitation zones...). Coinciding with an international context of “infinite and uncontrolled growth” characterized, on the one hand, by the fear of a running-out of non-renewable energy reserves, and by a still incipient incline towards alternative and renewable energy on the other, the said riches are, by virtue of their immensity, increasingly coveted by business, economic, financial
économico-financiers et politiques. Ce phénomène vise, particulièrement, les Niayes qui regorgent d'une bonne partie de ces richesses. Toutes les répercussions que nous avons énumérées y sont, en effet, repérables aujourd'hui. Voilà pourquoi il est intéressant d'interroger la responsabilité établie dans ces transformations sociales et économiques et leurs conséquences.

* Ces dernières années, l'Afrique est devenue l'une des locomotives de la croissance économique mondiale, grâce principalement à l'exploitation de ses immenses richesses naturelles. Dans le contexte d'une crise économique du capitalisme, le continent africain est une des principales cibles de l'impérialisme,


3 La référence au contexte international ne peut « justifier » l'impuissance supposée des autorités de nos pays à stopper l'exploitation de la misère de leurs populations. Nous pointons, d'abord, du doigt la responsabilité de l'élite politique locale qui manque

and political lobbies. This phenomenon particularly targets the Niayes, which is brimming with a sizeable portion of this wealth. All the above-listed repercussions can indeed be witnessed there today. This is why it is interesting to question the state's responsibility in social and economic transformations and their consequences.

“Those past years, Africa has become one of the locomotives of world economic growth, thanks mainly to the exploitation of its immense natural resources. In the context of the economic crisis of capitalism, the African continent is one of the main targets of imperialism of the emerging economic powers, and even of South African sub-imperialism. [...] Capitalism is accumulation by exploitation and dispossession, but, in its current stage — neo-liberalism — accumulation through dispossession sheds [...] its subaltern position to become the dominant form of accumulation: widespread dispossession of public services, of traditional know-how, of land and natural resources, etc. It is thus no surprise that economic performance is not accompanied by a reduction of social injustices in the societies that depend essentially on these resources.”

The reference to the international context cannot “justify” the supposed powerlessness of our countries' authorities in stopping the exploitation of their populations' poverty. We first point to the responsibility of the local political elite whose real lack of vision and courage in accompanying the populations directly concerned by dispossession thus prevents them from appropriately guiding the changes underway. Without glorifying a closed "economic patriotism", the political

2 Cf. Millennium Assessment Report, “Living Beyond Our Means: Natural Assets and Human Well-Being” (http://www.millenniumassessment.org). This is a United Nations report based on the work of 1360 specialists from 95 countries, published in Tokyo on 30 March 2005. This report indicates that human activity abuses the ability of ecosystems to regenerate, to the point of compromising the economic, social, and health objectives fixed by the international community for 2015.

réellement de vision et de courage pour accompagner les populations directement concernées par la dépossession et encadrer ainsi les mutations en cours. Sans faire l’apologie d’un « patrioisme économique » fermé, l’élite politique opte, apparemment, pour le plus facile, c’est-à-dire l’ouverture tous azimuts des marchés à tous les opérateurs sous le prétexte d’un manque de qualification ou de technicité locale.  

Malheureusement, des compromis inexplicables sont notées, plaçant, en effet, les autorités politiques dans une logique de subordination-corruption face aux lobbies affaires étrangers. L’argument de la logique de membres du gouvernement pour justifier ainsi la « maximisation » d’opérateurs affaires et de lobbies au détriment des populations de tiers monde contemporain »4, Samir Amin précise (1991, p. 110):

4 Lors des séries de l’Assemblée nationale du Sénégal durant le premier septennat du président Macky Sall, on a plusieurs fois entendu cet argument de la bouche de membres du gouvernement pour justifier ainsi la « maximisation » d’opérateurs affaires et de lobbies au détriment des populations.

5 Formule de Samir Amin, Cité dans L’Empire du chaos, Paris, L’Hamattan, 1991, p. 120

« Dans les conditions actuelles ces activités sont parfaitement intégrées dans le système capitaliste global et y remplissent des fonctions précises, celles d’assurer la reproduction de la force de travail au coût minimum ou celle de fournir par la sous-traitance des intrants à bas prix. Elles constituent donc un appât nécessaire pour assurer la rentabilité de l’exploitation capitaliste ». 

Toutefois cette justification correspond également à un choix postindépendance car cesdites autorités ont, d’une certaine façon, participé au pillage des ressources pour avoir servi des intérêts égoïstes de petits groupes affaires depuis la rupture radicale avec le socialisme communautaire porté par Mamadou Dia. Ainsi peut-on faire remonter le phénomène jusqu’à l’époque coloniale. Le professeur Iba Der Thiam dénonce la spéculation foncière entreprise jadis par la mafia qui le qualifie de « complot multilatéral ».  

Finalement, la justification d’un enrichissement pour garantir la profitabilité de capitalist exploitation.6

Nonetheless, this justification also corresponds to a post-independence choice, for the said authorities have, in a certain sense, participated in the plundering of resources by serving the selfish interests of small business groups since the radical rupture with the communistar socialism advocated by Mamadou Dia. The phenomenon can thus be dated back to the colonial era. Professor Iba Der Thiam denounces the past land speculation carried out by what he qualifies as a “multilateral scheme”. Finally, the justification of an obligatory partaking in the international context is nothing more than a simplistic argument that poorly masks substandard economic options.

11/ Between The Universal And The Local: Questioning Economic Options

There is a real dialectic between the politicians’ will to back the efforts of entrepreneurs from the rural world, the

6 La révolution de 1914 au Sénégal, Dakar, L’Hamattan-Sénégal, 2014, p.252
II / Entre L’Universel Et Le Local : Les Options Économiques En Question

Il y a une vraie dialectique entre le vœu des politiques de soutenir les efforts des entrepreneurs du monde rural, le maintien des équilibres environnementaux, les attentes de bailleurs de fonds et les options de stratégies économiques. Les promesses s’éloignent souvent du vécu réel des populations comme en atteste l’exposé des motifs de l’avant-dernière réforme du Code minier sénégalais :

* Dans ce contexte, et tenant compte des limites du Code minier de 2003, il est apparu nécessaire de procéder à un meilleur rééquilibrage de la gouvernance des ressources minières du Sénégal, dans le but de maintenir l’attractivité du secteur minier national et de garantir un certain équilibre, de manière à promouvoir un partenariat mutuellement avantageux entre l’État, l’investisseur et les communautés hôtères.*


Néanmoins, il faut rappeler que la deuxième phase d’espoir avec les ICS

7 Cf. Loi n° 2016-32 DU 08 NOVEMBRE 2016/ www.sec.gouv.sn

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maintaining of environmental equilibriums, the expectations of funders, and the options for economic strategies. The promises are often far removed from the populations’ actual lives, as testifies the presentation of the motives behind the penultimate reform of the Senegalese Mining Code:

“In this context, and taking into account the limitations of the 2003 Mining Code, it has proven necessary to establish a better balance in the management of Senegal’s mineral resources, in the aim of maintaining the attractivity of the national mining sector and of guaranteeing at an equilibrium so as to promote a mutually advantageous partnership between the state, the investor, and the host communities.”

This avowal in the Mining Code contrasts with the treatment of the ICS. The Senegalese state’s responsibility has been engaged since the initial phase – “the hope phase” – of the ICS’s creation with the expansion of the Taïba mines (in 1981), under Abdou Diouf’s presidency. It must be recalled that

the exploitation of Senegal’s mining wealth began under the presidency of Léopold Sédar Senghor. Analysing Senegal’s successive political regimes chronologically, Jean Bosco Tine nonetheless points out that Senghor and Diouf’s regimes faced fewer problems with the rural world’s land titles and their exploitation; that is, less spoliations and sell-offs.*

Nonetheless, it must also be recalled that the second ICS “hope phase” paradoxically corresponded to the famous 1993 “emergency plan” introduced by President Diouf; which focused on increasing revenues and reducing expenditure to improve the overall budgetary situation.* Yet, in the discourse of political decision-makers’, everything suggests that decentralization policies are an inevitable factor of development. However, it is the liberal system that has in this sense prevailed since Senghor.

correspond paradoxalement au fameux « plan d'urgence » de 1993, porté par le président Diouf et mettant l'accent sur l'accroissement des recettes et la diminution des dépenses pour améliorer la situation budgétaire d'ensemble. Pourtant, dans le discours des décideurs politiques, tout porte à croire que les politiques de décentralisation sont un facteur inéluctable de développement. Or, c'est le système libéral qui a en ce sens prévalu depuis Senghor.

« Dans les premières années d'indépendance, le Sénégal avait pris cette option par la voie de son premier président de conseil Mamadou Dia qui avait défini des voies vers un socialisme participatif. Le socialisme du président Dia qui s'est éteint très tôt occasionnait une rupture dans la volonté de créer les instruments d'un socialisme à base communautaire à travers les coopératives (texte législatif et réglementaire de 1960). Cependant, malgré l'abandon des prémices du socialisme de Dia devant les nouvelles orientations vers le libéralisme de Senghor, le Sénégal a très tôt défini de nouvelles options socialistes en légitimant sur le foncier la loi du 17 juin 1964 portant domaine national. »

III/ Les Logiques De Résistances Endogènes
La troisième « phase d'espoir » avec les ICS correspond à celle de sa recapitalisation en 2008 avec l'intervention de plusieurs acteurs indiens. Phase correspondant — particulièrement entre 2008 et 2013 — à une baisse de la productivité et à une dégradation de l'outil de production et des conditions d'existence jamais égales et malgré l'espoir et l'« euphorie ».

9 Sy Chérif Sall, « La politique économique du Président Macky Sall : continuité ou rupture ? », in Démystifier le discours néolibéral, Dakar, ARCADE/Fondation Rosa Luxembourg, 2014, p. 28


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"In the first years of independence, Senegal adopted this option under the impulse of its first Prime Minister, Mamadou Dia, who defined the path towards a participative socialism. The socialism of President Dia, which was very rapidly abandoned, caused a rupture in the desire to create the tools of a community-based socialism via cooperatives (1960 legislative and regulation text). However, despite the abandonment of the premises of Dia's socialism before a turn towards Senghor's liberalism, Senegal defined new socialist options very early on by legislating on property in the 17 June 1964 law concerning the national domain."

III/ The Logics Of Endogenous Resistance
The third ICS “hope phase” corresponds to that of its recapitalization in 2008, with the intervention of several Indian stakeholders.

This phase corresponded — especially between 2008 and 2013 — to an unprecedented fall in productivity and a degradation of the means of production and conditions of existence, and this despite the hope and euphoria of the workers. The ultimate tragedy remains the environmental pollution that President Macky Sall’s plan for emergence has only accelerated. The magazine L'OBS of 16 March 2015, reported: "A dozen villages in the Tivaouane department are polluted by the damaging effects of the toxic emanations given off by the Industries Chimiques du Sénégal (ICS) chimneys. Today, the installation of a coal power plant in the zone is angering the local population."

Faced with the increasingly rapid degradation of the environment that has accompanied the poor management of the ICS, the population has attempted to address


11 Cf. Iba Fall, Le prix de la survie, Dakar, L'Harmattan-Sénégal, 2018, p. 101
13 www.gfm.sn/tagics
its multiple consequences. Two forms of resistance have emerged, and deserve particular attention: on the one hand, the creation by the local populations of monitoring associations, behind which they have taken refuge to protect their land and crops, and, on the other, local citizen organizations typified by the local youth’s involvement and the widespread use of social networks to communicate.12 Respectively, these testify to the failure of a social policy surrounding the ICS, the progressive ghettoization of several social classes, and the resulting de-socialization and disillusionment of an increasingly radicalized youth.

Dismayed by this degrading socio-economically tableau, new forms of property “communitarianism” can be observed to be emerging as if by a survival instinct. The examples of ADL and NND remain highly indicative in this respect.13 The ADL is a monitoring organization seeking to protect the lands situated between Diogo and Notto. As for NND, it covers the area from Dakar (Technopole) to St Louis and remains marked by the strong adhesion of the Niyes’ Fulani populations, the majority of whom are landowners. Revived by the atmosphere of “economic vampirization,” the new community-based spirit rests not only on ethnic considerations, but also on fears concerning economic dispossession and its cultural fallout. Apart from a few NGOs and cultural organizations, which, by accompanying and strengthening existing capacities, are trying to contain the socio-economic metamorphoses of these populations and communities whose desperation engenders new forms of citizenship and identity, the state and Senegalese civil society – much more focused on political events – do not appear to see all the sociology that is being built or unravelled around these volunteer citizen-based initiatives. Prospecting a little, we risk seeing in a few decades waves of revolts resulting from the status quo with regards to the following preoccupations: a hypothetical socio-economic reconversion; the expansion of mining zones to the detriment of

13 www.ifm.sn.IMGes
14 Le nom NND est tiré d’un acronyme peul qui, en français, se traduit littéralement par “s’unir pour développer”
forte adhésion des populations peuls des Niayes, majoritairement propriétaires des terres. Ravivé par l’atmosphère de “vampirisation économique”, le nouvel esprit communautariste n’est pas seulement fondé sur des considérations ethniques mais aussi sur les peurs vis-à-vis de la dépossession économique et de la déflation culturelle. Sauf quelques ONG et structures à caractère culturel qui, par l’accompagnement et le renforcement de capacités, tentent de juguler les métamorphoses socioéconomiques de ces populations ou communautés dont le désespèrement sècrétdenouvelles formes de citoyenneté et d’identité, l’État et la société civile sénégalaise – beaucoup plus aspirées par les faits politiques – ne semblent pas voir toute la sociologie qui se construit et se déconstruit autour de ces initiatives citoyennes et volontaristes. En faisant un peu de prospection, dans quelques décennies, on risque de noter des vagues de révoltes qui seront l’aboutissement du statut quo sur les préoccupations suivantes : l’hypothétique reconversion socioéconomique, l’élargissement des zones d’exploitation minière au détriment des surfaces habitables et l’envergure sociale d’éventuelles catastrophes chimiques.

Conclusion

Finalement, la réflexion sur le tableau contradictoire de la zone des Niayes renseigne sur les problèmes de carences des dirigeants politiques de nos pays de réussir à créer une parfaite harmonie entre les politiques publiques en matière de développement, les métamorphoses sociales et économiques conséquentes et l’intervention des bailleurs de fonds et opérateurs privés. Les ICS constituent ainsi un paradoxe réel dans les Niayes où contrastent richesse et misère, beauté naturelle et pollution massive mais aussi espoir et désespoir.

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inhabitable areas; and the social importance of possible chemical catastrophes.

Conclusion

Finally, this reflection on the Niayes zone’s contradictory tableau sheds light on the problem that is the failure of the political leaders of our countries to create a perfect harmony between public development policies, considerable social and economic metamorphoses, and the intervention of financial backers and private operators. The ICS thus constitutes a real paradox in the Niayes, where wealth and deprivation, natural beauty and massive pollution, but also hope and disillusion contrast.
Le texte suivant est tiré de la Living Convention, un document édité par l’organisme Natural Justice qui a pour objectif d’informer les populations autochtones et communautés locales de leurs droits au regard de la législation internationale et de développer la prise de conscience sur les responsabilités légales des gouvernements nationaux à l’égard de leurs citoyens, en particulier en ce qui concerne les relations entre les Hommes et la nature.

Intendance, gouvernance, gestion et usage des territoires, terres et ressources naturelles

1. Les peuples autochtones ont droit aux terres, territoires et ressources qu’ils ont traditionnellement possédés, occupés, ou encore utilisés ou acquis. 2. Les peuples autochtones ont le droit de posséder, d’utiliser, de mettre en valeur et de contrôler les terres, territoires et ressources qu’ils possèdent parce qu’ils leur appartiennent ou qu’ils les occupent ou les utilisent traditionnellement, ainsi que ceux qu’ils ont acquis autrement. 3. Les États doivent reconnaître et protéger légalement ces terres, territoires et ressources. Cette reconnaissance doit se faire en respectant dûment les coutumes, traditions et systèmes de propriété des peuples autochtones concernés.1

1 UNDRIP Article 26.

The following text is drawn from the Living Convention, a document produced by the organization Natural Justice that aims to inform indigenous peoples and local communities of their rights with regards to international law and to raise greater awareness of the legally binding responsibilities national governments have towards their citizens, in particular pertaining to the relationship between humans and nature.

Stewardship, Governance, Management, and Use of Territories, Lands and Natural Resources

1. Indigenous peoples have the right to the lands, territories and resources which they have traditionally owned, occupied or otherwise used or acquired. 2. Indigenous peoples have the right to own, use, develop and control the lands, territories and resources that they possess by reason of traditional ownership or other traditional occupation or use, as well as those which they have otherwise acquired. 3. States shall give legal recognition and protection to these lands, territories and resources. Such recognition shall be conducted with due respect to the customs, traditions and land tenure systems of the indigenous peoples concerned.1

1 UNDRIP Article 26.
Les États doivent instaurer et mettre en place, en lien avec les peuples autochtones concernés, un processus juste, indépendant, impartial, ouvert et transparent afin d'accorder la reconnaissance qui est due aux lois, traditions, coutumes et systèmes de propriété des peuples autochtones et de statuer judiciairement sur leurs droits en ce qui concerne les terres, territoires et ressources, y compris ceux qu'ils possèdent, occupent ou utilisent traditionnellement. Les peuples autochtones doivent avoir le droit de prendre part à ce processus.  

1. Les peuples autochtones ont le droit de définir et d'établir des priorités et des stratégies pour la mise en valeur et l'utilisation de leurs terres ou territoires et autres ressources. 

Il ne peut y avoir d'activités militaires sur les terres ou territoires des peuples autochtones, à moins que ces activités ne soient justifiées par des raisons d'intérêt public ou qu'elles n'aient été librement décidées en accord avec les peuples autochtones concernés, ou demandées par ces derniers.  

2  269 UNDRIP Article 27. 
3  UNDRIP Article 30 (1). 
4  UNDRIP Article 32.

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States shall establish and implement, in conjunction with indigenous peoples concerned, a fair, independent, impartial, open and transparent process, giving due recognition to indigenous peoples' laws, traditions, customs and land tenure systems, to recognize and adjudicate the rights of indigenous peoples pertaining to their lands, territories and resources, including those which were traditionally owned or otherwise occupied or used. Indigenous peoples shall have the right to participate in this process.  

Military activities shall not take place in the lands or territories of indigenous peoples, unless justified by a relevant public interest or otherwise freely agreed with or requested by the indigenous peoples concerned.  

1. Indigenous peoples have the right to determine and develop priorities and strategies for the development or use of their lands or territories and other resources. States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources. States shall provide effective mechanisms for just and fair redress for any such activities, and appropriate measures shall be taken to mitigate adverse environmental, economic, social, cultural or spiritual impact.  

1. The rights of ownership and possession of the peoples concerned over the lands which they traditionally occupy shall be recognized. In addition, measures shall be taken in appropriate cases to safeguard the right of the peoples concerned to use lands not exclusively occupied by them, but to which they have traditionally had access for their subsistence and traditional activities. Particular attention shall be paid to the situation of nomadic peoples and shifting cultivators in this respect. 

2. Governments shall take
1. Les droits de propriété et de possession sur les terres qu’ils occupent traditionnellement doivent être reconnus aux peuples concernés. En outre, des mesures doivent être prises dans les cas appropriés pour garantir le droit de ces peuples d’utiliser les terres non exclusivement occupées par eux, mais auxquelles ils ont traditionnellement eu accès pour leurs activités habituelles et leur subsistance. Une attention particulière doit être accordée à cet égard à la situation des peuples nomades et des agriculteurs itinérants. 2. Les gouvernements doivent prendre les mesures nécessaires pour identifier les terres qu’occupent traditionnellement les peuples concernés et pour garantir la protection effective de leurs droits de propriété et de possession. 3. Les procédures appropriées doivent être mises en place à l’intérieur du cadre légal national pour répondre aux revendications territoriales des peuples concernés. Les droits des peuples aux ressources naturelles relatives à leurs terres doivent être particulièrement sauvagardés. Ces droits comprennent celui de participer à l’utilisation, à la gestion et à la conservation de ces ressources.

1. Les modes de transmission des droits sur la terre entre leurs membres établis par les peuples concernés doivent être respectés. 2. Les peuples concernés doivent être consultés lorsque l’on envisage leur capacité d’aliéner leurs terres ou de transmettre leurs droits en dehors de leur propre communauté. 3. Les personnes ne faisant pas partie de ces peuples ne doivent pas utiliser à leur avantage les coutumes ou la non-compréhension des lois des membres qui les composent pour s’assurer la possession ou l’usage des terres qui leur appartiennent.

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6 Convention N° 169 de l’OIT Article 15 (1).
7 Convention N° 169 de l’OIT Article 17.

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steps as necessary to identify the lands which the peoples concerned traditionally occupy, and to guarantee effective protection of their rights of ownership and possession. 3. Adequate procedures shall be established within the national legal system to resolve land claims by the peoples concerned. The rights of the peoples concerned to the natural resources pertaining to their lands shall be specially safeguarded. These rights include the right of these peoples to participate in the use, management and conservation of these resources.

1. Procedures established by the peoples concerned for the transmission of land rights among members of these peoples shall be respected. 2. The peoples concerned shall be consulted whenever consideration is being given to their capacity to alienate their lands or otherwise transmit their rights outside their own community. 3. Persons not belonging to these peoples shall be prevented from taking advantage of their customs or of lack of understanding of the laws on the part of their members to secure the ownership, possession or use of land belonging to them. Adequate penalties shall be established by law for unauthorized intrusion upon, or use of, the lands of the peoples concerned, and governments shall take measures to prevent such offenses.

Traditional guardianship/custodianship recognizes the holistic interconnectedness of humanity with ecosystems and obligations and responsibilities of indigenous and local communities, to preserve and maintain their traditional role as traditional guardians and custodians of these ecosystems through the maintenance of their cultures, spiritual beliefs and customary practices. Because of this, cultural diversity, including linguistic

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5 ILO Convention No. 169 Article 14.
6 ILO Convention No. 169 Article 15(1). In this Article “[t]he use of the term ‘land’ shall include the concept of territories, which covers the total environment of the areas which the peoples concerned occupy or otherwise use.” ILO Convention No. 169 Article 13(2).
7 ILO Convention No. 169 Article 17.
8 ILO Convention No. 169 Article 18.
Des pénalités adéquates doivent être fixées par la loi concernant toute intrusion non autorisée sur les terres des peuples concernés – ou leur usage – et les gouvernements doivent prendre les mesures nécessaires pour empêcher de telles infractions.

Le système de tutelle traditionnelle reconnaît l'interconnexion globale de l'humanité avec les écosystèmes et les obligations et responsabilités qui incombent aux communautés autochtones et locales vis-à-vis de la préservation et du maintien de leur rôle habituel de garants et protecteurs traditionnels de ces écosystèmes. Les peuples autochtones et communautés locales doivent donc, le cas échéant, être impliqués de manière active dans la gestion des terres et des eaux d'eau qu'ils ont traditionnellement occupées et utilisées, notamment les sites sacrés et les aires protégées. Les peuples autochtones et communautés locales peuvent également considérer certaines espèces de plantes ou d'animaux comme sacrées et, en tant que gardiens de la biodiversité, être responsables de leur bien-être et de leur durabilité, et ceci doit être respecté et pris en compte dans toutes les activités/interactions.

Les États doivent faciliter un accès et une utilisation durable et non-discriminatoires des ressources conformément à la législation nationale et internationale et protéger les biens nécessaires à la subsistance des personnes. Les États doivent respecter et protéger les droits des individus par rapport aux ressources telles que la terre, l'eau, les forêts, les zones de pêche et le bétail sans discrimination. Lorsque cela est nécessaire et pertinent, les États doivent mettre en œuvre des réformes agraires et politiques en conformité avec leurs obligations en matière

8 Convention N° 169 de l'OIT. Article 18.

9 Tkemwe: Code de conduite éthique section 2 (20).

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diversity, ought to be recognized as keys to the conservation and sustainable use of biological diversity. Therefore, indigenous and local communities should, where relevant, be actively involved in the management of lands and waters traditionally occupied or used by them, including sacred sites and protected areas. Indigenous and local communities may also view certain species of plants and animals as sacred and, as custodians of biological diversity, have responsibilities for their well-being and sustainability, and this should be respected and taken into account in all activities/interactions.

States should facilitate sustainable, non-discriminatory and secure access and utilization of resources consistent with their national law and with international law and protect the assets that are important for people's livelihoods. States should respect and protect the rights of individuals with respect to resources such as land, water, forests, fisheries and livestock without any discrimination. Where necessary and appropriate, States should carry out land reforms and other policy reforms consistent with their human rights obligations and in accordance with the rule of law in order to secure efficient and equitable access to land and to strengthen pro- poor growth. Special attention may be given to groups such as pastoralists and indigenous people and their relation to natural resources.

Given that all human rights are universal, indivisible, interdependent and interrelated, the governance of tenure of land, fisheries and forests should not only take into account rights that are directly linked to access and use of land, fisheries and forests, but also all civil, political, economic, social and cultural rights. In doing so, States should respect and protect the civil and political rights of defenders of human rights, including the human rights of peasants, indigenous peoples, fishers, pastoralists and rural workers, and should observe their human rights obligations when dealing with individuals and associations acting in defence of land, fisheries and forests.
de droits de l'Homme et dans le respect de la loi, afin d'assurer un accès équitable aux terres et pour soutenir une croissance favorisant les plus démunis. Une attention particulière peut être accordée aux groupes d'éleveurs et peuples autochtones et aux liens qu'ils entretiennent avec les ressources naturelles.  

Étant donné l'universalité de tous les droits de l'Homme, leur caractère indivisible, leur interdépendance et leur corrélation, la gestion de la propriété des terres, zones de pêche et forêts ne doit pas seulement prendre en compte les droits qui sont directement liés à l'accès et à l'usage des terres, zones de pêches et forêts, mais aussi tous les droits civils, politiques, économiques, sociaux et culturels. Ce faisant, les États doivent respecter et protéger les droits civils et politiques des défenseurs des droits de l'Homme, notamment les droits des paysans, peuples autochtones, pêcheurs, éleveurs et travailleurs ruraux et doivent veiller à leurs obligations en matière de droits de l'Homme lorsqu'ils traitent avec les individus et associations œuvrant dans la défense des terres, zones de pêche et forêts.  

11 FAO Tenure Guidelines n°4 (8).
Activisme / Activism

Alternatiba Dakar
Association Nébédaye
Association Sénégalaise des Amis de la Nature
Coalition Publiez Ce Que Vous Payez
Eclaireuses et Eclaireurs du Sénégal
Forum Civil sénégalais
Initiative pour la Transparence dans les Industries Exécutives Sénégal
Océanum de Dakar

Fondations / Foundations

Fondation Heinrich Boll

Écoles / Schools

L’Institut des Sciences de l’Environnement, Université Cheikh Anta Diop
L’Institut des Science de la Terre, Université Cheikh Anta Diop
L’Université du Sine Saloum El-Hâdji Ibrahima Niass

Recherche / Research

Enda Tiers Monde
Innovation, environnement, développement en Afrique
Institut de Recherche pour le Développement
Unité mixte internationale Environnement Santé Sociétés (UMI ESS, CNRS/
UCAD Dakar/UGB Saint Louis/USTTB Bamako/CNRST Ouagadougou)
Biographies

Dulcie Abrahams Altass est née et a grandi à Londres et a étudié l’histoire de l’Art et le Français à University College London où elle a récemment été lauréate du prix d’excellence académique Violet Hall. Elle est Commissaire des Programmes à RAW Material Company où elle a récemment été co-commissaire des expositions La révolution viendra sous une forme non-encore imaginable et Toutes les fautes qu’il y avait dans le monde, je les ai ramassées. Son travail au Sénégal comprend de la recherche sur des sujets aussi divers que l’histoire de l’art, le performance sénégalais et les interactions entre le hip-hop et l’art contemporain à Dakar. Elle a également été membre du collectif d’artistes Les Petites Pierres.

Christian Danielewitz (né en 1978) est un artiste visuel, chercheur et écrivain. Son travail s’articule autour des dommages socio-écologiques causés par les industries minières et des exactions liées à l’extraction des ressources. Ce travail est marqué par l’émergence de nouvelles antennes géologiques, la génération de pouvoir et la transformation de minéraux en éléments d’architecture informatique, c’est-à-dire nos technologies contemporaines d’images et de communication. En tant qu’artiste, Christian Danielewitz s’est aventuré dans des territoires centés de désastre environnemental pour exposer la face cachée de l’ingénierie humaine et les dérives mondiales de travail forcé. Il s’intéresse particulièrement aux sites de contamination in situ et interiôrs, ainsi que les formes invisibles d’exploitation tels que la pollution monotone et la radioactivité. Depuis 2017 il a aussi été membre du collectif artistique Lehman Brothers qui a été établi à Copenhague en 2012 au lendemain de la crise financière mondiale.

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Biographies

Dulcie Abrahams Altass was born and grew up in London. She read History of Art and French at University College London where she was the recipient of the Violet Hall prize for academic achievement. She is Curator of Programs at RAW Material Company where she was recently co-curator of the exhibitions The revolution will come in a form we cannot yet imagine and Toutes les fautes qu’il y avait dans le monde, je les ai ramassées. Her work in Senegal has included research on diverse topics ranging from the country’s performance art history to the nexus of hip hop and contemporary art in Dakar, and she has also been a member of artist’s collective Les Petites Pierres.

Christian Danielewitz (b. 1978) is a visual artist, researcher and writer whose work revolves around the socio-ecological wreckage caused by the industries of extraction. His work is informed by geological timescales, power generation, and the processing of minerals into elements of information architecture, that is, our contemporary image and communication technologies. As an artist, Danielewitz has ventured into contested territories of environmental devastation to expose the myriad of human engineering, and the global division of toxic labor. He is particularly interested in hidden and restricted sites of contamination, and invisible forms of exposure such as nuclear activity and radiation. Since 2017, he has also been a member of the Danish art collective Lehman Brothers, which was established in Copenhagen in 2012 in the wake of the global financial crisis.
Ipso Fall
Docteur en philosophie moderne et contemporaine et titulaire d'un C.A.E.S (Certificate d'aptitude à l'Enseignement Secondaire/FASTEF-UCAD), Ipso Fall est chargé de cours au département de philosophie (UCAD). Il enseigne également un module en « géopolitique/géostratégie », niveau Professionnel/MBA (Master of Business Administration) à l'Institut Afrique de Management (IAM) de Dakar. Il est également membré de l'ESS (Groupe de Recherches Interdisciplinaires en Sciences Sociales) / Siège : Mouvement Citoyen.

Dana Lijigren est candidate au doctorat en histoire de l'art au Graduate Center de la City University de New York. Ses spécialités et ses sujets d'intérêt incluent l'art de l'Afrique de l'Ouest, l'art contemporain mondial, la théorie postcoloniale, l'environnementalisme, et les études cinématographiques. Elle est diplômée en histoire de l'art de Brown University, de Columbia University, et de l'Université Paris 1 Panthéon-Sorbonne. Sa thèse porte sur la réalisation de deux projets de l'art contemporain, avec une attention particulière à la matérialité et à la circulation des objets dans des conditions postcoloniales.

Marie Hélène Pereira (1986), Directrice des Programmes à RAW Material Company, est diplômée en Gestion et droit international de l'Université Dakar Bougainville à Dakar. Après des années de travail dans le monde commercial, son intérêt professionnel s'est tourné vers les arts et la culture. À RAW Material Company, Pereira a travaillé à l'organisation d'expositions et de programmes discursifs y compris la participation de RAW Material Company à We Face Forward: Art from West Africa Today au Whitworth Art Gallery, Manchester; ICI Curatorial Hub à TEMP, New York; la 9e Biennale de Shanghai, Shanghai, et d'autres. Elle a également travaillé sur la participation de RAW Material Company au MARKER Art Dubai (2013), a co-commissarié le projet Scattered Seeds à Cal le Colomb (2015-2017) et a co-commissarié l'exposition Battling to normalize freedom à Claphouse Initiative à Mumbai, en Inde. Elle a été co-commissarié de la section de Dr Bonaventure Soh Bejing Njikung intitulée Canine Wisdom for the Barking Dog – The Dog Done Gone Deal, Exploring The Sonic Cosmologies of Halim El-Dabh, dans les catalogues de l'11ème édition de la Biennale de l'art contemporain de Dakar. Marie Hélène est fort intéressée par la réflexion et la discussion autour des questions identitaires et de la migration.

Ipso Fall
A Doctor in Modern and Contemporary Philosophy and the holder of a C.A.E.S (Certificate of Aptitude for Secondary Education/FASTEF-UCAD) Ipso Fall is course supervisor at the Department of Philosophy UCAD. He also teaches a professional MBA module on "Geopolitics/Geostatistics" at the African Management Institute of Dakar. He is a writer-essayist and since 2013 is a founding member and coordinator of the G.R.I.S.S (Interdisciplinary Research Group of Social Sciences) / headquarters: Citizenship Movement.

Dana Lijigren is a PhD Candidate in Art History at the Graduate Center of the City University of New York. Her specializations and topics of interest include West African art, global contemporary art, postcolonial theory, environmentalism, and film studies. She holds degrees in art history from Brown University, Columbia University, and Université Paris 1 Panthéon-Sorbonne. Her dissertation examines the repurposing of trash in contemporary Senegalese art and pays special attention to materiality and the circulation of objects under conditions of postcolonialism.

Marie Hélène Pereira (1986), Director of Programs at RAW Material Company, graduated from Université Dakar Bougainville in Management and International Business Law. After a few years of work in the business world, she shifted her professional interest to the arts and culture. At RAW Material Company, Pereira has organized a number of exhibitions and related discursive programs including the participation of RAW Material Company in "We Face Forward: Art from West Africa Today" Whitworth Art Gallery, Manchester; ICI Curatorial Hub at TEMP, New York; The 9th Shanghai Biennial, Shanghai, and others. She also worked on the participation of RAW Material Company in MARKER Art Dubai (2013), co-curated Scattered Seeds in Calle Colom (2016-2017) and curated the exhibition Battling to normalize freedom at Claphouse Initiative in Mumbai, India (2017). She co-curated Dr Bonaventure Soh Bejing Njikung’s section for the 13th edition of Dakar Biennale of Contemporary African Art (2018) entitled Canine Wisdom for the Barking Dog – The Dog Done Gone Deal, Exploring The Sonic Cosmologies of Halim El-Dabh. Marie Hélène has a strong interest in the reflection and discourse around identity and migration and she lives and works in Dakar.
Infos

RAW Material Company
Zone B villa 2A, Dakar

info@rawmaterialcompany.org
Tel: (+221) 33 864 02 48
www.rawmaterialcompany.org

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