en

Kesselhaus

Alfredo Jaar

The End of the World

15.9.24 – 1.6.25

Curator:
Kathrin Becker

Content

Each year, the KINDL – Centre for Contemporary Art invites a prominent artist to create a site-specific installation for the extraordinary Kesselhaus space. With its unrenovated walls, remnants of its industrial past, and dimensions of 20 × 20 × 20 metres, the Kesselhaus offers a unique setting for new artistic creations. For the 2024/2025 exhibition cycle, the KINDL is honoured to present artist, filmmaker, architect and activist Alfredo Jaar. Jaar has developed a new work for the Kesselhaus that addresses the current state of our planet. Drawing on five years of research, he offers his insights into the ecological and political crises of the present and the future in *The End of the World*.

For over four decades, Jaar has grappled with complex sociopolitical issues, exploring the limitations and ethics of representation. His research, interventions, and artworks are driven by economic and social disparities, the exploitation of resources in the global South by the global North, unequal power relations, and the suppression of facts through media control. One of his most notable projects, *The Rwanda Project* (1994–2010), considers the 1994 genocide in Rwanda from the perspective of those unaffected by the trauma while critiquing global indifference to this humanitarian catastrophe.

Since the mid-1980s, Jaar has been investigating the theme of resource greed and its consequences, which is central to his installation at the KINDL. His visit to the Brazilian gold mine Sierra Pelada in 1985 inspired several works that expose exploitative mining practices and the relentless pursuit of profit, including *Gold in the Morning* (1985), *Welcome to the (Third) World* (1986), *Rushes* (1986–87), and *1+1+1* (1987). Jaar also delves into topics such as ecological justice in works like *Geography = War* (1990), which documents the export of toxic waste from industrialised countries to Nigeria.

Through his work, Jaar challenges dominant perceptions of the world. As a trained architect and filmmaker, he has long employed light and darkness – often in vivid colours – as an artistic strategy, engaging with the nuances of perception and visibility. This approach is exemplified in his installation at the KINDL.

With *The End of the World*, the result of years of research supported by human geographer and political geologist Adam Bobbette, Jaar brings attention to the struggle for resources – a critical and increasingly significant factor in international conflicts. Within the expansive Kesselhaus, the installation demands focus on a 4 × 4 × 4 cm cube composed of layered raw materials: cobalt, rare earths, copper, tin, nickel, lithium, manganese, coltan, germanium, and platinum – ten strategic metals vital to digitalisation, electromobility, high-tech applications, and storage media. Despite the growing demand for these materials, their extraction is fraught with severe human rights violations and environmental destruction, as compellingly detailed in Adam Bobbette's essays included in this booklet.

Jaar juxtaposes the impressive size of the Kesselhaus with a diminutive object at its centre. This radical staging creates a space of contrasts and discrepancies that extend beyond the physical oppositions of space and object: the cube's almost absurd diminutiveness vs. the immense scale of the ecological, social, and political upheavals it represents; the elegant presentation of the object, reminiscent of a jewellery display vs. the "dirty business" of its extraction; the emptiness and silence of the darkened Kesselhaus vs. the explosive nature of the subject matter. These raw materials are not only essential for civilian technologies but also for the military sector, underpinning the functionality of modern weapons systems and high-tech armies. The importance of "rare earths" for Western supply security is starkly at odds with NATO states' near-complete dependence on imports from China. Addressing strategic metals thus also provides a new perspective on current military conflicts and anticipates scenarios of future resource wars. Jaar's examination of strategic metals culminates in the apocalyptic title of the exhibition.

A lecture by Alfredo Jaar is planned for spring 2025.

An accompanying print publication is currently in preparation.

Introduction

Climate change is a resource war. Conflicts are flaring to build renewable technologies. The drive to extract precious minerals is contributing to genocide. Mining companies are profiting from ecological destruction and the devastation of Black, brown, and Indigenous communities. The energy transition is colonialism. Miners are enslaved, transformed into expendable populations, their bodies made fungible with minerals and corporate profits. Net zero is geological violence—breaking, crushing, burning the ground. Global supply chains radiate ecological dead zones, toxic slurries, poisoned horizons, and ancestral catastrophes. We are living through another industrial revolution, a traumatic re-enactment of the past where geopolitical plate tectonics are shifting. We are on the precipice of a new, terrifying world.

The search for critical minerals is driving this violence. Sometimes they are called 'critical raw materials.' Whatever the name, they are essential to renewable technologies. And renewable technologies are fundamentally digital. Every solar panel, wind turbine, and electric vehicle is connected to computers. Every computer is a collection of chips, cables, satellites, and screens made of stuff from a mine.

Critical minerals are 'critical' not by nature but by politics. During the First World War, western states began to compile lists of minerals with supply shortages. The minerals mattered because they were essential to building killing machines and territory thieving machines. But the minerals that built the machines could only be mined outside the borders of the states that wanted them, that's why they were 'critical.' Western states invaded and stole the minerals, most located in continental crusts in the global south, transforming their states into vassals of the west. In the post war boom period, critical minerals lists reflected the industrial priorities of the rich west. It was a time of exorbitant growth and unprecedented injections of carbon into the atmosphere that caused the breakdown of the climate. Today, critical mineral lists are dominated by reversing the catastrophic effects of that same growth. These minerals

are mostly mined in regions devasted by European colonialism and now those places are courted by Chinese state wealth. Crepuscular or late-stage capitalists think the solution to the historic catastrophe of climate change is more colonialism.

Meanwhile, Europe is haunted by the mine. Neoliberalism banished mining to the global south in the 1970s. The energy transition is bringing it back, and it is scary. The profits from critical minerals are overwhelmingly concentrated in a few companies. States are increasingly incapable of redistributing wealth and far right and neo-fascist movements are filling the gap by harnessing working class resentment.

Net zero is impossible without the ten minerals in this exhibition. They appear on nearly every western country's critical mineral list. The extraction of each is the end of the world.

Cobalt

Central African Republic, China, Democratic Republic of the Congo, Denmark, Indonesia, Norway, Philippines, Russia, Ukraine, United States, Zambia, Zimbabwe

Cobalt is poisonous, it kills miners. It was called the Black Devil in the 16th century. Today, it kills the children who mine it in Congo. China and the United States are in a mineral arms race for it. 60 percent of all cobalt goes into rechargeable batteries. A standard electric vehicle uses about ten kilograms. China controls half of the world's supply and is opening mines in Zambia and Congo. Those states are now part of the mineral silk road and driving the west to violently open new colonial frontiers elsewhere. There is no alternative to cobalt. The Central African Copper belt, nearly 450 kilometres long and filled with cobalt, will be exhausted and turned to waste by the energy transition.

Rechargeable batteries make death worlds. Most African cobalt mines finance civil wars where miners are neither allowed to properly live or die; they handle cobalt with their hands, slowly poisoning themselves to pay for food. Russian mercenaries, the Wagner Group, protected mines in the Central African Republic in exchange for mining rights, the profits bought weapons for killing Ukrainians. The Russian state has now taken over their role. Benedikt Sobotka, co-chair of the Global Battery Alliance, wrote "there is almost a 100% chance that your smartphone or electric vehicle contains cobalt that comes from child labourers."

While climate change melts the Greenland ice sheet (Denmark), tech billionaires and Norwegian companies are prospecting for emerging cobalt reserves. Cobalt mining in Indonesia is driving migration, vast environmental destruction, and violence between workers and bosses. In 2023, a smelter exploded and killed nineteen people. Mining waste was dumped in the ocean at Morowali on the Indonesian island Sulawesi and there have been outbreaks of respiratory illnesses.

The recent election of Ferdinand Marcos Jr., in the Philippines – son of a dictator – lifted cobalt mining moratori-

ums that will intensify conflict between the United States and China. Huayou Cobalt, headquartered in Zhejiang, China, took over operations of the Arcadia cobalt mine in Zimbabwe in 2023 to expand the Belt and Road Initiative. Nornickel, in Moscow, is owned in part by Vladimir Potanin, a Russian oligarch close to Vladimir Putin, and is seeking to expand its cobalt mining to the southern provinces of Siberia, increasing its influence on the global green energy market to compete with China and the United States. The renewable energy revolution is generating resource nationalisms tipping into fascisms as disenfranchised workers face the sharp edge of the energy transition. The global far right is channelling worker anger into racist hatred. At the same time, western states are securing their critical mineral supply by militarizing mining concessions with private contractors and creating exclusion zones the size of megacities.

Rare Earths

Afghanistan, China, Myanmar, Moon, United States

Rare earths are not rare, some are more abundant than copper or lead. But they are not often in concentrated deposits. The earth extracted for rare earth metals in 2018 was equivalent to nearly 23 Great Pyramids at Giza. Rare earths are difficult to get but central to nearly all digital technologies in a post-carbon world. They make magic: phone and television screens are luminous and swipe and zoom and create the illusion of reality. Semiconductors, capacitors, sensors, are all embossed, mixed, or lined with rare earths. Wind turbines turn, electric vehicles move, because of them. Rare earths make us think that machines are animate.

In 1992, Deng Xiaoping said, "The Middle East has oil; China has rare earths." The centre for China's production of rare earths became Bayan Obo, Inner Mongolia. Soon after, Chinese mining companies produced over sixty percent of the worlds rare earth minerals. The results were devastating: tailings ponds caused cancers, chronic arsenic poisoning, skeletal fluorosis in children, and long tooth disease. The pond became the "world's largest, rare earth lake", a dam burst would devastate the region.

Claims have been made that Afghanistan may contain as much as half of the world's supply of rare earths. One member of the conservative Fraser Institute used Afghanistan's rare earth mineral abundance as a reason to prolong the United States occupation of the region. In 2021, CNBC and CNN ran reports suggesting that Chinese authorities were colluding with the Taliban to access the minerals and cement their dominance of the global trade. In the northern Myanmar state of Kachin, local militias are colluding with Chinese traders to open the region to rare earth mining. Thousands of tailing ponds and collection pools have been recorded there with satellite photography. Profits from the mining are funding the war against the Burmese struggle for democracy. Artisanal miners are at risk of polluting the entire Irrawaddy River system that connects Myanmar to the Indian Ocean. The environment is becoming a weapon of civil war.

Even the moon is being turned into a mine. Six national space programs, 50 private companies, and one university engineering program are currently developing strategies to extract from the moon. No one owns the moon, but it has been prospected. The western lunar highlands is projected to contain massive reserves of rare earths, some have called it a "lunar treasure chest." Silicon Valley engineering companies and financiers are looking eagerly at outer space mining technologies. Back on earth, AI technologies are prospecting Greenland (Denmark) for rare earths as the glaciers retreat. Frontiers are not found, they are made, they are geoviolence.

Copper

Brazil, Chile, China, Indonesia, Papua New Guinea, Peru

Refined copper is one of the most ubiquitous materials on earth. Every computer command, every transaction of every bank, all crypto currencies, exist, at least for a time, as movements in copper. The world's copper cables are a planetary scaled scaffolding for electrical flows. Sourcing more copper for the energy transition is creating civil wars, ecological dead zones, accelerating climate breakdown, and exacerbating economic inequality. In 2022, nearly one billion pounds of copper was laced through cars. The known reserves of copper may be exhausted within a century and capitalists are on the hunt to find more.

In 1981, one of the world's largest mining companies, Freeport Mineral Company, opened a copper mine on the island of New Guinea (Indonesia) to extract 32 million tonnes of copper, gold, silver. The company had an annual income of three hundred million dollars, almost none of which went to local Papuans. Instead, their society was destroyed. The mine rendered wetlands unsuitable for aquatic life. An armed independence movement formed and resulted in death and imprisonment of activists and the violent colonization of the island by the Indonesian state.

Mining giant Rio Tinto worked on the island of Bougainville, east of New Guinea, at the Panguna copper mine. The company built a segregated town that separated white mine managers from Indigenous Buka people. The disposal of more than one billion tonnes of mining waste into the Kawerong-Jaba River delta caused birth defects, species extinction, and the destruction of livelihoods. The situation resulted a civil war that killed more than twenty thousand people over a decade. Only one percent of the profits from the copper was estimated to have been shared with the people of Bougainville. The mine was shut down in 1989 but Rio Tinto is currently exploring the possibility of re-opening it to meet rising global demand for copper for the energy transition, raising the prospect of a new civil war.

Chinese state-owned mining companies and South American governments are forming new geopolitical alliances.

Most Chilean and Peruvian copper is sold to China, much of it used in green technologies. A town of 25.000 people beside Chile's largest copper mine was relocated in 2014 because pollution made the place uninhabitable. Chinese company Shougang Group, who owns Peru's largest copper mine, was sanctioned by the Peruvian government for dumping chemical waste into the ocean. Chile accounts for nearly one third of global copper supply but environmental devastation, climate change, and disputes with communities create price surges that fuel illegal copper mining in the Brazilian Amazon. The deforestation creates a viscious feedback loop by speeding up climate breakdown while the minerals go into renewable energies.

Tin

Bolivia, China, Democratic Republic of the Congo, Indonesia, Kazakhstan, Malaysia, Myanmar, Peru, United Kingdom, United States, Russia

Tin made the modern world. Tin cans enabled preservation and shaped global capitalism. Tin makes solder, and solder makes electricity flow, without it there will be no renewable energy grid. Tin is the great connector. But the extraction of tin for the energy transition is chewing up landscapes and river systems with devastating multi-generational consequences on human and more-than-human communities. Coral reefs have been destroyed, human populations displaced, ancestral lands have been shredded, and ethnic conflict exacerbated. While tin connects, it also makes people landless, floating, vulnerable.

The industrialisation of tin mining in Malaysia resulted in slow violence that haunts the present. Rivers were turned to sludge and farms were flooded. Massive river dredgers built by British engineering firms caused wars between rival tin mafias and created dead zones in the centre of the country. Villages were buried under mine tailings or turned to swamps. In 1939, more earth was moved for mining tin in Malaysia than for the three tunnels that connect France with Britain. The legacy of the mining is present in the Malaysian ethno-state and its ongoing disenfranchisement of Chinese and South Asian communities.

Tin reserves have been found in Kazakhstan, Yakutia Russia, and the eastern Democratic Republic of the Congo. Nearly 40 percent of tin is mined artisanally, which often means the mines are poorly regulated and dangerous for miners and local ecologies. On the Indonesian island of Bangka, which has been intensively mined since the Dutch colonial period, one observer wrote that “one can foresee a time when there is nothing left but a dead skeleton.” Much of the mining on Bangka is managed through shady cartels with links to the country’s oligarchs and military.

Tin is so valuable because the world’s major reserves are in only four places: Britain, Southeast Asia, South America, and China. The United States and Britain include tin

on their critical minerals lists to justify renewed colonial extraction. Creating and securing supply chains is an inherently violent project, they reduce places to sites of value extraction for distant private interests. The export of Malaysian and Indonesian tin is a case in point, communities and landscapes were devastated to build British wealth. And methods of tin extraction have barely changed in a century. The irony is that some of the world's largest mining companies emerged from the colonisation of Malaysia, they are now carrying out their work in the name of solving the climate crisis, a crisis fuelled by the industrial revolution which was in turn driven by European colonialism. The result is an Anthropocene defined by earth moving, breaking, and crushing. Critical minerals are the embodiment of both the history of western conquest and the profound refusal to reckon with that past.

Nickel

Brazil, Canada, China, France, Indonesia, Japan, Philippines, Russia, Ukraine, United States

Nickel is essential for energy storage, it helps keep the charge in an electric car. A single battery contains about 40 kilograms of it. It is also crucial for making steel. All renewable energy infrastructures use nickel. Most of it comes from strip mining, which tears apart forests and turns mountains into rubble. In 2022, the war in Ukraine and the global rush to produce electric vehicles increased the price of nickel by nearly 35 percent. Cheap Indonesian nickel created riots in New Caledonia (France) and a violent intervention by the French state.

One of the world's largest nickel mines, located in Indonesia, is managed by PT Vale, which is partly owned by the Indonesian and Brazilian governments. The concession at Sorowako, on the island of Sulawesi, is nearly the size of Greater London but profits are entirely exported elsewhere. The mining town is in disrepair, migrant labourers live in shacks on the nearby lake or in hastily built dormitories that don't have refuse collection. Garbage is burned in the playground while Indonesian oligarchs buy their children private airplanes.

At one site in Indonesia, nearly 50 million tonnes of nickel has been illegally mined since 2019. Local police were paid off, documents forged, forests cleared, and toxic waste dumped. The nickel was then sold to Chinese companies to be used in batteries. Since 2019, at least ten workers at PT Gunbuster Nickel Industry, also in Indonesia, have died in accidents. One miner drowned in his front-end loader when a landslide pushed it into the ocean. In 2023, trade unionists protested the company, demanding safety. The result was a riot that led to a worker's dormitory being set on fire. Two workers died. PT Gunbuster Nickel Industry is a Chinese owned company with financial links to the President of Indonesia and the Indonesian military. Supply chains are the products of violence, they make space through force.

	Cobalt	Rare Earths	Copper	Tin	Nickel	Lithium	Manganese	Coltan	Germanium	Platinum
Afghanistan		✓								
Argentina						✓				
Australia						✓			✓	
Belgium							✓			
Bolivia				✓						
Brazil			✓		✓			✓		
Canada					✓		✓		✓	✓
Central African Republic	✓									
Chile			✓			✓				
China	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Congo (DRC)	✓			✓				✓	✓	
Denmark	✓									
Finland									✓	
France					✓					
India						✓			✓	
Indonesia	✓		✓	✓	✓					
Japan					✓					
Kazakhstan				✓					✓	
Malaysia				✓						
Mexico						✓			✓	

	Cobalt	Rare Earths	Copper	Tin	Nickel	Lithium	Manganese	Coltan	Germanium	Platinum
Myanmar		✓		✓						
Norway	✓									
Pakistan						✓				
Papua New Guinea			✓							
Peru			✓	✓						
Philippines	✓				✓					
Portugal						✓				
Russia	✓			✓	✓		✓		✓	✓
South Africa										✓
Taiwan								✓		
Tibet						✓				
Ukraine					✓	✓	✓			
United Kingdom				✓		✓		✓		
United States				✓	✓	✓		✓	✓	
Venezuela								✓		
Zambia	✓									
Zimbabwe	✓									✓
Pacific Ocean							✓			
The Moon		✓								

Primary forests are due to be destroyed in the Philippines to expand nickel mines. More than 2000 hectares of rainforest will be razed on Mount Bulanjao, destroying the livelihoods of Indigenous Palawan people. Deforestation sends wildlife into increasingly urbanised spaces and exacerbates conflict with humans. The nickel will pass through refining stages in Japan and end up in Tesla cars in American show rooms. The Japanese mining giant, Sumitomo Metal Mining Co. owns a 25 percent stake in the Rio Tuba mine in the Philippines where from 2016 to 2020 73 environmental activists and Indigenous people were murdered in extra-judicial killings for opposing the mines.

Chinese renewable energy companies are turning Southeast Asia into a colonial periphery. The oligarchies that control Indonesia and the Philippines have accepted the narrative that the energy transition is their chance for economic growth and that some people and places will be sacrificed.

Lithium

Argentina, Australia, Chile, China, India, Mexico, Pakistan, Portugal, Tibet, Ukraine, United Kingdom, United States

The atomic bombs dropped on Hiroshima and Nagasaki were made with lithium. Now lithium is driving the energy transition, mainly in rechargeable batteries for EVs and communications technologies. The search for lithium is leading to new colonial occupations, agricultural land degradation and violent protests. Chinese companies control nearly 80 percent of the refining capacity for lithium-ion batteries, giving the state a near monopoly on the development of renewable technologies. Tensions between the United States and Chinese governments is driven, in large measure, by China's global domination of renewable energy technologies. Russia is invading Ukraine to gain access to one of Europe's largest lithium deposits.

Tianqi Lithium, headquartered in Chengdu, China, is the second largest shareholder in Sociedad Quimica y Minera, a Chilean company and one the world's largest lithium producers which is extracting ground water at unsustainable rates in the arid Atacama Desert region. Lithium extraction there is pushing Indigenous Kolla people off their land. Mines have been blocked and violence has flared. Lithium deposits in Mexico are in regions controlled by drug cartels and risk being used to fund the global trade in narcotics and weapons.

Chinese company Ganfeng Lithium is developing mines in Argentina and the United States. The company proposed to open a mine in Nevada at Thacker Pass, an ancestral site for Indigenous people. A tent city was built to block the mine but failed. Tianqi Lithium owns a large part of Australia's Greenbushes, one of the largest lithium mines on earth, making the Australian economy increasingly dependent on Chinese capital.

At the Ganzizhou Rongda Lithium mine in Tibet, protesters threw dead fish on the street because their rivers were poisoned. Mining the Tibetan plateau has been a way for the Chinese state to colonise the contested area. In 2022, a study found that climate change was speeding up the

production of lithium in the mountains because lakes were increasing in temperature, further catalysing prospecting into disputed territories and extending extractive capitalism to earth's highest mountains and most remote places.

The Geological Survey of India recently found six million tonnes of lithium in Kashmir, thirty miles from the Line of Control that separates India from Pakistan, a geography rife with tension since the partition of India in 1947. The Indian government recently revoked Kashmir of its constitutionally protected autonomy and put the region in an indefinite military lockdown and communications black-out. The region is a mixture of Hindu and Muslim communities and mining may supercharge latent tensions between them, especially if land is expropriated and populations are displaced to open mines.

Plans to mine lithium in Europe are leading to protests. It is the return of the repressed: mining was banished to the global south by neo-liberalism in the 1970s, the pain and violence is back.

Manganese

Belgium, Canada, China, Pacific Ocean, Russia, Ukraine

Manganese is in us. Our bones and cells need it. Manganese made the modern world. It makes steel. Trains, bridges, buildings are laced with manganese. In the 1950s, manganese was added to batteries and powered the rise of consumer capitalism and its world destroying waste stream. Today, mining companies want manganese for rechargeable batteries and steel for the energy transition. They are looking to mine the ocean floor for the first time ever. We are racing into ecocide with unfathomable consequences.

The Clarion Clipperton Zone in the Pacific Ocean is an area nearly four and a half million square kilometres and with one of the highest known concentrations of manganese on earth. Estimates claim that there are nearly 21 billion tonnes of nodules containing, in addition to manganese, cobalt, copper, and nickel. An area larger than India has been given over to exploration by private companies. It is a continuation of the European colonial period when state backed corporations scoured the earth for lands to exploit. Companies are creating technologies to comb the sea floor and suck up nodules. One of the problems is that no one knows the effects the mining will have on the sea floor. The deep oceans are one of the least understood regions on earth. Mining companies think the ocean floor is a dead space and that minerals are the lowest forms of existence. Nodules though, it is increasingly understood, are not simply inert rock debris, they are lively habitats for organisms that are unknown to us, that live in an ecology that we have not even studied. We do not know how they relate to systems on the ocean floor or how those systems connect upwards into the water column, out into the ocean, and to the earth system as a whole.

As major economies shift to carbon neutrality, Russian capital is under threat and stealing Ukraine's vast mineral wealth is one of its solutions. Armed conflicts have unfolded in the Donbas region of Ukraine since 2014, today it is one of the fronts of the Russian invasion. The Nikopol Manganese Basin is in the Donbas and contains more than two billion tonnes of manganese. Since February 2022, 44 peo-

ple have been killed and over 200 injured in Nikopol. Nearly 3000 buildings have been destroyed.

Humans and non-humans are being sacrificed at these new extractive frontiers. A single manganese nodule takes more than a million years to form and is connected to ancient planetary processes. The Nikopol Manganese Basin in Ukraine is nearly 30 million years old. The transition to renewable energy is destroying these temporalities and creating the illusion that energy is untethered to the earth.

Coltan

Brazil, China, Democratic Republic of the Congo, Taiwan, United Kingdom, United States, Venezuela

Coltan is invincible in your life and your use of it creates nightmares. Coltan is behind your computer and phone screens, making the flow of images flicker past, phones vibrate, electricity flow in wind turbines and EVs. Coltan is the ore from which tantalum and niobium are derived. Tantalum is essential in semiconductors. Most coltan is mined by artisanal miners, including child labour in the Democratic Republic of the Congo. Demand for coltan is also driving corporations to destroy the Amazon. Chinese threats to invade Taiwan, and potentially cause a war with the West, are attempts to control Taiwan's semiconductor supply chain.

Congolese artisanal miners feel the weight of global coltan prices in their bodies. Some miners are in debt, others have been driven out of farming by decades of civil war. Global price hikes create chaos on the ground: money, people, tools, all move and new mines open-up, porters, vendors, sex workers, tax collectors, militias follow. NGOs encouraged the United States government to ban the import of conflict minerals in 2010 but President Joseph Kabila then shut down the artisanal mining trade for six months, driving miners into militias. Attempts to tag minerals as conflict free are only aspirational and many miners think they are being price gouged by foreign white capitalists. Sourcing coltan from outside the DRC will be devastating, miners will either starve or become soldiers. There is no way to guarantee that the coltan in your phone is conflict free.

In 2019, the United States imposed sanctions on the export of semiconductors built in the USA to Chinese company Huawei. Huawei turned to domestic sources, including forced labour in Uyghur detention camps. British Telecom agreed to tear out all Huawei equipment from the 5G network by 2027 and replace it with equipment from Swedish company Ericsson. Ericsson has refused to give up using conflict minerals.

Venezuela's mining arc, where coltan is mined, is notoriously violent. Minerals fund militias. Ores are smuggled

through Brazil. Minas Gerais, one of Brazil's largest producers of niobium, has killed nearly 300 people since 2015 in mudslides of toxic waste. The need for capacitors in the energy transition is creating more artisanal mines in the DRC, drawing children into them, financing armed groups, killing Indigenous people in South America, and destroying the Amazon. Green energy mineral commodity chains generate friction and violence all along them, from the ground to your screen.

Germanium

Australia, Canada, China, Democratic Republic of the Congo, Finland, India, Kazakhstan, Mexico, Russia, Peru, United States

Germanium creates solar energy. Most financial transactions move through germanium-laced fibre optic cables. Computers have germanium in their semi-conductors. Orbiting satellites are powered by germanium. The United States military uses germanium in night vision goggles to kill people. Mostly, germanium is produced as a by-product of zinc. The race for germanium is a race to secure zinc and the entire supply chain that begins in the ground and ends in the refinery.

For the first time in history, the global production of solar energy reached more than one terawatt. The world's largest solar farms are on Chinese soil at Longyangxia, Huanghe, in an area nearly 700 square kilometres. The Pavagada Ultra Mega Solar Park in Andhra Pradesh occupies an area the size of Manhattan. The Bhadla Solar Park in the Rajasthan desert is nearly half the size of Paris and contains ten million solar panels. Most of these installations use germanium, often in semi-conductors.

The town of Cerro de Pasco in Peru has had its drinking water contaminated by germanium mining and at least two and a half thousand children were chronically poisoned. In 2014, Indigenous Australians in the Northern Territory protested Glencore, one of the world's largest mining companies, headquartered in Switzerland, because one of their waste pits spontaneously combusted and became permanently on fire at the McArthur River zinc mine. Fish died in the river and residents were scared for their safety. In 2016, Kazzinc, Kazakhstan's largest zinc refinery (owned in part by Glencore) dumped high concentrations of cyanide into the Ulba river and turned the water cement grey.

The world's largest zinc mine, Red Dog Mine in Alaska, is described as 'Americas most toxic site.' Plans to close the mine by 2026 were stalled because geologists found deposits of zinc laden with germanium. In Mexico, the Canadian mining company Goldcorp used explosives to expand

their mine, the blasts were so forceful that they destabilised nearby houses. Residents established blockades to the mines but then their groundwater was contaminated with cyanide and mercury.

All renewable energy technologies that use germanium are haunted by the violence of mining, by its dust and pollution and destruction. Every solar panel connects to the dead zones created by zinc refining; virtual reality headsets are rooted in the actual hellish innards of the Red Dog Mine. It is not a question of whether to transition away from fossil fuels but how that transition relates to mining, all mining, and its violence.

Platinum

Canada, China, Russia, South Africa, Zimbabwe

The energy transition is a 21st century resource war, and the causalities are mounting. As China gains global energy dominance it is drawing South America, Central Asia, Southeast Asia, and Africa into its sphere of influence. With Russian collaboration, China is looking to dominate the Arctic, forcing out European and Canadian power. Platinum extraction is at the vanguard of these realignments because it is essential for green hydrogen, electronics, and semiconductors. It is also one of the rarest metals on earth and almost all of it is currently found in three places: Zimbabwe, Russia, and South Africa. South Africa alone contributes seventy five percent of global production. Mining there is rife with poverty and violence. There is not enough platinum on earth to supply the energy transition and scarcity is stoking capitalist competition.

Miners at the Marikana platinum mine in South Africa went on strike in 2012 against low pay and deadly working conditions. Fearing an outbreak of strikes across the platinum belt, President Jacob Zuma ordered the military to attack the workers. 40 miners were killed and 78 injured, many were shot in the back of the head as they fled. The BBC reported that the killings increased the global price of platinum and raised the profits of the mining company.

The Bushveld Igneous Complex in South Africa is dotted with informal mining camps where violence and insecurity proliferate. A study in Rustenburg, a settler town at the base of the Magaliesberg platinum mines, found a prevalence of sexual violence nearly double the average for South Africa. The study attributed the violence to economic insecurity and wealth disparities. Victims suffered post-traumatic stress disorder, depression, substance use, HIV, and cycles of intergenerational risk. As the South African economy crumbles and platinum prices soar because of the Russian invasion of Ukraine, more people are descending into the mines. Slums flow from the edges of the mines, precariously housing a Black underclass deemed expendable by state backed mining companies. Platinum is creating a new mineral apartheid. Geological violence is inseparable from social violence.

In Xinjiang, northwest China, Sinopec is installing one of the world's largest green hydrogen projects at Kuqa, in a move of Han Chinese colonialism in a Uyghur region. Uyghurs are excluded from high level positions at Sinopec and reports have emerged that forced labour camps are part of the electronics supply chain.

As climate change melts the Arctic, Russia is looking to mine it. Nornickel is opening one of the largest platinum mines in the world and will ship the ores through the Artic Ocean. Russia has reopened more than 50 Soviet military bases in the Arctic to secure the supply chains and flows of green energy minerals.

Adam Bobbette is a human geographer and political geologist, and Lecturer at the University of Glasgow in the School of Geographical and Earth Sciences. His current book project *Earthworks* (Verso) is about the history and politics of critical minerals, mining, and geological violence.

Alfredo Jaar
The End of the World
2023 – 2024
Cobalt, Rare Earths (Neodymium), Copper, Tin, Nickel, Lithium, Manganese, Coltan (Niobium), Germanium (Argentium) and Platinum
4 × 4 × 4 cm
Oak base: 2.5 × 75 × 75 cm
Plexiglass vitrine: 75 × 75 × 75 cm
Wooden pedestal: 90 × 75 × 75 cm
Overall dimensions variable

Alfredo Jaar (* 1956 in Santiago de Chile) is an artist, architect, and filmmaker. His works have been exhibited worldwide, and he has realized more than seventy public interventions around the world. Over 70 monographs have been published on his work. He has received numerous awards, including the IV Mediterranean Albert Camus Prize (2024), the Hasselblad Award (2020), and the Hiroshima Art Prize (2018). He lives in New York.
alfredojaar.net

Selected solo exhibitions: Hiroshima City Museum of Contemporary Art (2023); SESC Pompéia, São Paulo (2021); Zeitz MOCAA, Cape Town (2020); Yorkshire Sculpture Park (2017); Museum of Contemporary Art Kiasma, Helsinki (2014); Rencontres de la photographie d'Arles (2013); Alte Nationalgalerie, Berlinische Galerie and Neue Gesellschaft für bildende Kunst, Berlin (2012); Museo d'Arte Contemporanea di Roma (MACRO) (2005); The Museum of Contemporary Art, Chicago (1995); Moderna Museet, Stockholm (1994); The New Museum of Contemporary Art, New York (1992); Whitechapel Gallery, London (1992).

Selected group exhibitions: Venice Biennial (2013, 2009, 2007, 1986); São Paulo Biennial (2021, 2010, 1989, 1987); Documenta, Kassel (2002, 1987).

My infinite gratitude to Evelyne, who patiently enlightens me about the beauty and precariousness of our planet, and to Nicolas and his generation, who are teaching us to outgrow our madness.

15.9.24 – 1.6.25

Alfredo Jaar. The End of the World

Kesselhaus

More information about the discursive programme:
kindl-berlin.com/jaar

Curator
Kathrin Becker

Texts
Kathrin Becker
Adam Bobbette

Diagram
Alfredo Jaar

Editor
Katja Kynast

Proofreading
Bärbel Kirchhoff

Public relations
Denhart von Harling /
segeband.pr

Translation Introduction Kathrin Becker
(p.1, de > en)
Alisa Kotmair

Graphic design
Büro Otto Sauhaus

Edition
3rd

Courtesy
Galerie Thomas Schulte,
Berlin

As part of
BERLIN ART WEEK 11—15 SEP 2024

KINDL

KINDL – Centre for Contemporary Art

Am Sudhaus 3
12053 Berlin

kindl-berlin.com

Opening hours

Wed
12:00 – 20:00

Thu – Sun
12:00 – 18:00