

Research Plan

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Minas,

as in

mines

A HAUNTOLOGICAL
APPROACH TO A
LANDSCAPE OF
DISASTER

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Minas, as in mines

On November 5, 2015, the Fundão tailings dam located in the municipality of Mariana in Minas Gerais ruptured, letting out around 40 million cubic meters of toxic mud impregnated with a variety of heavy metals. The wave of material crashed into a second dam, Santarém, and broke off its top-most part. From there, the material contained in both dams spilled into two small streams, also called Fundão and Santarém, flooding the area around them and destroying their channels irreversibly. After that, the mud slid over Bento Rodrigues, located six kilometers away from Santarém, destroying most of the village and killing 19 residents. After passing through Bento, the mud entered the Gualaxo do Norte river, covered it for over 55 kilometers, then joined in on the Carmo river, causing the mineral-filled water to flood over sections of cities such as Barra Longa, Rio Doce and Santa Cruz do Escalvado.

Besides the damage to constructions, the flooding of the rivers led to a destruction of the riparian vegetation and death of thousands of terrestrial and aquatic animals who asphyxiated in the mud. After traveling for 22 kilometers across the Carmo river, the wave entered the Rio Doce. As the Doce is larger, only a few isolated contiguous areas flooded. Municipalities such as Governador Valadares, Baixo Guandu and Colatina, who were dependent on the Doce for water provision, had to shut down their plants immediately and cut off the supply for their citizens for months. Most of the aquatic life in the river died. On November 21 the mud finally reached the Atlantic ocean, at the city of Linhares in Espírito Santo.¹

Ironically, the toxicity unleashed on the landscape was the result of a quest for purity. Kathryn Yusoff points out how geology as a way of seeing (and changing) the world builds up a grammar of matter in which it is dividuated in order to form cognizable units. By denying a “geochemically communicative matter-state that is already situated in the earth,”² geology predicates contemporary life and all its technologies on the exploitation not of land or matter per se, in its physical-chemical “promiscuity,”³ but a pure, charted material obtained through a complete separation between matter and its context. In order to “clean” the material of its unwanted properties, mining activities result in massive amounts of waste. In the case in question, the goal was to obtain high quality iron ore. In order to do that, the original material had to undergo a purification process. What the tailings dam contained was not even mined material, but simply an unsolvable and un-moveable mass of byproducts—heavy metals, minerals, particulates and water.

The dam belonged to Samarco Mineração SA, a joint venture from two multinational companies: Vale SA, from Brazil, and BHP Billiton, a British-Australian enterprise. In 2016, the Federal Prosecutor’s Office presented a criminal complaint against the three companies. The complaint was archived and some of the crimes are currently bordering on statutory limitations. Instead, Samarco signed a TTAC (Transaction and Conduct Adjustment Agreement) through which Fundação Renova was founded. Renova is a non-profit who manages reparations to those affected by the disaster in the entire Rio Doce basin. As such, it has handled anything from experimental



1. Church in Gesteira Velha, a small settlement, after the flood.

aquaponics initiatives at the mouth of the river to the design and construction of Nova Bento Rodrigues three kilometers to the south of the ruined one.

If name of the state does not make it explicit enough, Minas owes its economic development since the beginning of the colony to mining. The region is rich in several minerals including aluminum, iron, gold and precious stones. In this long history of extraction, floods are nothing new. Between 1986 and 2015, seven other tailings dams ruptured in the state.⁴ In 2019, another massive rupture in Brumadinho led to the death of 270 people, mostly Vale employees. Capanema found indications of floods due to gold mining in the decades of 1730 and 1740 in Mariana, where the 2015 accident took place.⁵ Zonta and Trocate established in detail an ecology of reasons for the Samarco disaster, mentioning how dam ruptures occur more often during periods where minerals are undervalued in the international market or listing the names and values for politicians in Minas who had contributions from mining companies to their campaigns.^{6,7} All of these events are historically and geographically tied and then further connected to complex flows of matter and capital at a global scale.

In the midst of these movements of incommensurable proportions, damage is permanent and lives are irreparably altered. In the search for purity, toxicity ends up infiltrating time and space. The 2015 event is entangled with others and they all reflect off each other multi-directionally, becoming specters upon specters. They are all different and yet the same. The justice of reparations is being carried out, albeit poorly. Fundamentally, somehow, nothing seems to change. The past is dead, the present is sick and the future has been laid out. Within this conundrum, could hauntology present a different rendition of justice, undoing past and future? And is this exercise one in which architecture could participate?



2. Divide between aerial images of the Rio Doce before and after the mud, available at Google Earth.



3. Bento Rodrigues in its current state. The water is a result of containment works done after the disaster.

Haunting: things of the thing

Jacques Derrida coined the term hauntology in his lecture-turned-book *Specters of Marx: The State of the Debt, the Work of Mourning and the New International*. The text, written in 1992, responded to a broader political debate greatly conditioned by the fall of the Berlin Wall in 1989, in which the place of Marx and Marxism in contemporary society was being revised and even entirely questioned.

By positioning Marx himself as a specter, Derrida laid out the possibility for a beyond-ontology. The specter “does not belong to ontology, to the discourse on the Being of beings, or to the essence of life or death. It requires, then, what we call, to save time and space rather than just to make up a word, *hauntology*.”¹ What haunts, then, is what sits between the there and the not-there: “[o]ne does not know if it is living or if it is dead. Here is—or rather there is, over there, an unnameable or almost unnameable thing: something, between something and someone, anyone or anything, some thing, “this thing,” but this thing and not any other, this thing that looks at us, that concerns us.”²

There is room for the haunting to be taken as the virtual (especially since the not presently there also refers to the not yet there), or simply as a “repressed or unresolved social violence,”³ an unexpected manifestation of an economic or social system whose gargantuan contours cannot be made out and so it is mistaken for absent. Karen Barad even chooses to name the ontological indeter-

minacy observed at a quantum level as a hauntology, praising Kyoko Hayashi’s novel *From Trinity to Trinity* as a truly hauntological work of mourning.⁴ Derrida predicates this work of mourning on an acknowledgement of the thing made dead, an ontologizing of remains.⁵ Hayashi, through a deep understanding of how time is undone by disaster, joins this undoing of time itself, becoming a bodily present witness to all events diffracting across the one fateful day when the bomb was dropped: “[it] is still going off when she walks through the ruins of Nagasaki to Ground Zero in the days following 9 August, when her gums bleed when she is old, when her son faces with each new day the temporality of the future coming from the past, the prospect of getting leukemia as a second-generation *hibakusha*.”⁶

The ghost must be acknowledged because it meddles with the things of the living, “[w]e are in relation to it and it has designs on us such that we must reckon with it.”⁷ The central specter of Derrida’s text is the prime example: there is a forced death of the spirit of Marx, a “conjunction” in the form of a “deafening consensus” that the dead thing is indeed dead. Yet, it continues to work and to cause to work, with little concern to this death that does not kill. In the case of Minas, as the consequences of disaster infiltrate space and time, any interaction with that landscape must be predicated on the acknowledgement of what haunts it.

Architecture as response-ability

Derrida clarifies that speaking of ghosts is done fundamentally “in the name of justice.”¹ As a justice that operates hauntologically, it extends beyond right or law, as they fail to exercise “the respect for those others who are no longer or for those others who are not yet there, presently living, whether they are already dead or not yet born.”² This justice that extends outside of the present concerns things beyond what is “calculable and distributive, ... law, ... the calculation of restitution, the economy of vengeance or punishment, ... accountability or imputability of subjects or objects, ... sanctioning, restituting, ... doing right.”³ Instead, it would be based on an “an-economic ex-position to others,”⁴ that is, it would rely on acknowledging others and the way in which one is entangled with them.

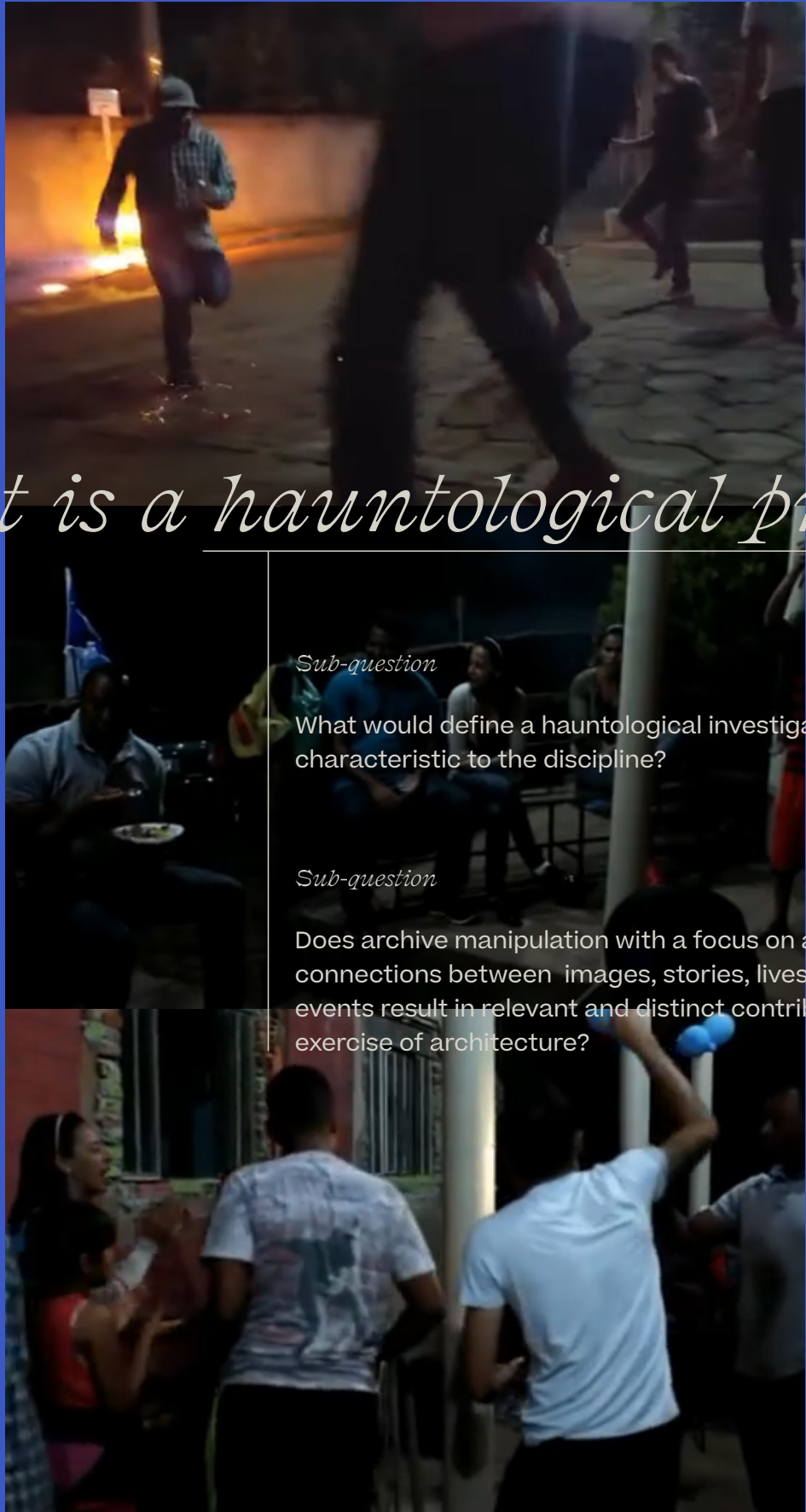
This justice beyond the living present and present living has as its precondition a responsibility that also concerns the there, the not yet and the no longer there. The now-living relate to ghosts by choosing to bring them closer or push them away. Implicated in this choice is what Derrida calls a “principle of selectivity,”⁵ as even the ones that decide to welcome the ghosts do so by before, even unwittingly, placing them in hierarchies, excluding some in favor of others. “By forgetfulness (guilty or innocent, it little matters here), by foreclosure or murder, this watch itself will engender new ghosts. It will do so by choosing already among the ghosts, its own from among its own, thus by killing the dead.”⁶ In the spirit of hauntology, as the dead are anything but gone, this double killing leads to nothing but even more ghosts. There is no way of escaping responsibility. To Derrida, it is an inheritance⁷—haunting will claim you even if you do not claim it.⁸

Donna Haraway turns responsibility into response-ability—the ability to respond—and by doing so makes the hinge between acknowledgement and action that was already present for Derrida even more visible. Response-ability can be cultivated, made more complex and more multiple through the recognition of what connects us (and our actions) to human and non-human others. A simple way to understand response-ability is through the anti-example that Haraway provides in Adolf Eichmann, one of the architects of the Holocaust. Haraway sees the “commonplace thought-

lessness”⁹ that Hannah Arendt witnessed in him during his trial in Israel as a lack of response-ability. Perhaps extremely, he was “a human being unable to make present to himself what was absent, what was not himself, what the world in its sheer not-one-selfness is and what claims-to-be inhere in not-oneself. Here was someone who could not be a wayfarer, could not entangle, could not track the lines of living and dying.”¹⁰

Karen Barad directly connects response-ability and hauntology by further developing the idea of entanglements. They point out how ontological indeterminacy at a quantum level exposes the limitations of a “classical ontology based on ... determinately bounded and propertied objects”^{11,12} as it shows that “[t]here are no separately determinate individual entities that interact with one another; rather, the co-constitution of determinately bounded and propertied entities results from specific intra-actions.”¹³ The entanglements also mentioned by Haraway would then not simply be connections between definitely separate things but “specific material relations of the ongoing differentiating of the world.”¹⁴ This immediately dissolves any hard conceptual boundaries between the self and the other, even the other no longer or not yet there. The debt to the other results from the fact that they are “threaded through”¹⁵ the self, indelibly, and each intra-action promoted by oneself is then a way of mutual constitution with the other.

Response-ability can be cultivated through acts of acknowledgement and Derrida and Barad show that the world and its ghosts are always already reconfigured in these acts. This translates to the practice of architecture in the sense that the way in which one approaches the ghost is no different than the way one decides to deal with it, not just because one leads into the other. Simply put, we make the world as we intra-act with it. This means I need to continuously assess and re-assess the entanglements on which the design would rest and the new ones it could create, at every moment of the process, all the way into the materialization of the project.



What is a hauntological practice of architecture as response-ability?

Sub-question

What would define a hauntological investigation that is characteristic to the discipline?

Sub-question

Does archive manipulation with a focus on animating connections between images, stories, lives, places and events result in relevant and distinct contributions to the exercise of architecture?

Sub-question

How does architecture enmesh itself within existing entanglements in the Rio Doce area?

Sub-question

Can architecture aid in achieving an an-economic justice for “the ones not there” that supplements other forms of justice?

1. Former residents celebrate the Easter week in the remnants of Bento Rodrigues.

In the introductory chapter to her hauntological exercises, Gordon declares a prevalent interest in “the relationship between what *assembles and joins* and what is gaping, detouring.”¹¹ Further in the book, she mentions Luisa Valenzuela’s ability to animate a relationship between three “Open Doors” in Argentina. The first is the title of Valenzuela’s own book of short stories, the second is a traditional insane asylum in the country, and the third is a torture method employed during the dictatorship, all with the same name.² The key element is *animation*, as “in and of themselves, these correlations ... can be collected, but they will lie like the debris of a system barely thinkable and yet abounding in excessive significations.”³ Gordon’s methodological reference is Walter Benjamin’s materialistic historiography, which is inspired by montage techniques in modern cinema. According to her, the method requires “not only attention to the thing thought, but also attention to the thinker’s mode of engagement.”⁴ Her appraisal of Valenzuela’s writing, then, is an appraisal of her way of engaging with and animating underlying connections.

Gordon herself is highly skilled in animating connections. In chapter four of *Ghostly Matters*, for example, she connects the events in Toni Morrison’s *Beloved* to the real life inspiration of Margaret Garner, a mother who killed her child in 1856 to avoid them being enslaved. She interweaves happenings from both stories, producing not a comparison but a new text with new meanings. At one point she tells the story of Levi Coffin, a white abolitionist lawyer present at Garner’s trial who refused to remove his hat in court, and how that was seen by the abolitionist *intelligentsia* as an act of heroic defiance.⁵ She connects it to Sethe’s (*Beloved*’s main character) gut reaction to the sight of a hat which she thought belonged to her former captor, which inspired no heroism on her part, only fear.⁶ In Gordon’s exercises of connection, the thread is as relevant as the dots, and the haunting that animates this small system of two stories is an amalgam of ideas of property, race, gender, class and trauma.

Gordon’s definition of the thinker’s task as one of animation represents little in the sense of a reproducible methodology, as she never clarifies what a transferable method for establishing such connections would be. As the “thinker’s mode of engagement” is central, the only thing she proposes is starting this peculiar enterprise through the haunting of one’s own, as “[t]o be haunted and to write from that location, to take on the condition of what you study, is not a methodology or a consciousness you can simply adopt or adapt as a set of rules or an identity.”⁷ This critical stance is reiterated when Gordon refers to Luce Irigaray’s description of method as artifice and reduction,⁸ characteristics she consolidates into the figure of the detour. Creatively, she then turns the method as detour into the detour as method, stating that it gladly “takes us away from abstract questions ... into ... us, our involvement, or at least our unruliness and sometimes our rudeness.”⁹

Starting through the haunting of one’s own does not mean to simply be haunted, but to become haunted. Although this still does not constitute a method, the possibility of cultivating an openness towards the ways in which ghosts are formed is available to anyone. In order to better understand how this cultivation could take place, I have looked for inspiration in the concept of intuition as defined by Henri Bergson.

Intuition is “the temporary suspension of habitual action” and “a pulling back from the actualization ... of memories into representational images. Intuition thus involves an effort to remain within the cone of pure memory – within a plane of the pure past – and to adjust, affectively or spiritually, to this level without molding it to fit a particular present, interest, perception or act.”¹⁰ Intuition presents a possibility to access a different plane of the past, different than the one usually accessed. The idea of a constant actualization of memo-

ry is properly hauntological, as the body’s “sensori-motor schema may actualize a particular plane of memory, but other planes will continue to haunt it. The memory of other pasts which have never been present for me, of other lives that I have not lived, persist as a virtual “nebulosity” accompanying my own life.”¹¹ Moving between planes in order to access ones not automatically resorted to is an exercise of relation to the other since “[i]ntuition is the attunement to a plane different than that opened up by my body and corresponding to my rhythm of duration.”¹² The important thing about intuition is that it can be exercised, or cultivated, as it is a “way of listening.”¹³

A hauntological investigation relies, then, on the becoming-haunted, which can possibly happen through a cultivation of attunement to the other and an openness to other lines of becoming. This is an effort made, ultimately, in order to better trace connections or entanglements and to animate them. The following step is to define how this translates to the practice of architecture.



1. Levi Coffin with a group of escaped slaves, wearing a hat.

The hauntological investigation in architecture

Derrida and Barad have shown that architectural response-ability is already exercised in the way one approaches the ghost, and that is where the hauntological practice of architecture begins. Usually, the architect gathers knowledge on a place during what is commonly called site analysis, in which discrete information is inscribed and later shown in a logical order, usually following thematic axes and standard methodological approaches. The working hypothesis, here, is that archive manipulation with a focus on animating connections between images, stories, lives, places and events would be a more response-able way of approaching the ghosts that unfolded in time and space towards and since the disaster in 2015.

In attempting to define what form this interaction with the ghosts would have, I first looked at the works of Forensic Architecture. The goal in their projects is fundamentally different from mine, as a forensic inquiry considers that there is an incontestable truth about a certain event that can be discovered by accumulating evidence, that is, proof, which is not the case here: “[t]he whole story is always a working fiction that satisfies the need to deliver what cannot possibly be available.”¹ I became interested, however, in the way they thread connections between the most varied types of media and archive material, articulating anything from cellphone videos to memory-based testimony as long as it helps in developing their investigations.

Satellite and aerial imagery are some of the tools used most often by the group for assessing changes to the environment at what Eyal Weizman calls the scale of architecture.² The human scale would be present in first-person point-of-view videos or personal stories, where aspects such as material details, sensations, characters and objects are visible.

Forensic Architecture’s multimedia approach to how events are registered stems from an awareness of the limitations and qualities of each technology. In the case of satellite photography, its resolution and orbit time make it so that it usually registers moments “before” and “after” a given event: “[t]he “before” ... establishes the baseline ... against which the “after” ... is studied for differences and deviations. Satellite image archives are thus depositories of potential “befores” to devastating “afters” yet to come. The juxtaposition ... produce[s] the fundamental element of what Sergei Eisenstein called “dialectic (sic) montage” - a juxtaposition in which the meaning lies not in the images, but in the tension or discord between them.”³ A before-after coupling provides a clear example, but montage techniques all rely on the broad principle that when separate, not only the images but what they represent act as standalone *things* with a set of potential significations, and when hinged together, so placed in a specific succession in time or on a specific spatial configuration, they can produce entirely new meaning.

My goal is to trace the entanglements between different images, stories, lives, places and events, throughout space and time, all of them passing through the disaster of 2015. This is a process composed of compiling sources, building a multimedia archive, making maps, diagrams and writing texts in order to somehow inscribe the connections that must be animated. Avery Gordon and Luisa Valenzuela do so exclusively by writing; my hypothesis is that my research instead needs to be presented

through a medium that retains the multiplicity of the archive and that makes it possible to articulate representations of the things entangled both through placement in space and succession in time. That is why I have chosen to work with a video format, the characteristics of which I will detail in the text *Moving essays*.

Since the hauntological investigation is unconventional in the sense of deviating from methodological conventions, additional effort must be made in order to establish what I am looking for and where I will look for it. Gordon calls the “case of a ghost” the one where it makes a difference to “start with the marginal, with what we normally exclude or banish, or, more commonly, with what we never even notice. It is often a case of inarticulate experiences ... of more than one story at a time.”⁴ What I am looking for is what haunts the landscape of disaster at Minas, and it is more than one thing. I need to notice



2. 18th century drawing of Mariana, the head of the district where Bento Rodrigues is located, depicting a flood caused by mining activities.

what goes unnoticed, and that is when intuition as cultivated attunement to the other must be present.

Anything can speak of the ghost, be it a cellphone video taken minutes after the dam rupture (1), an eighteenth century drawing of a flooded village due to gold mining (2) or an article about heavy metal concentration in the bodies of fish. That is why, at this moment, I am setting no restrictions on what type of media joins the archive and how. What I have determined as my starting point is a list of sources and archives that I see as ways to join the ongoing story of the disaster. As it moves further along, the research will lead to an increasing granularity of information, as a journalism piece might lead to a community advocate who might have had direct contact with a victim, for example. In the following pages, I have listed the sources I believe will be good points of entry, with a brief justification for their relevance.

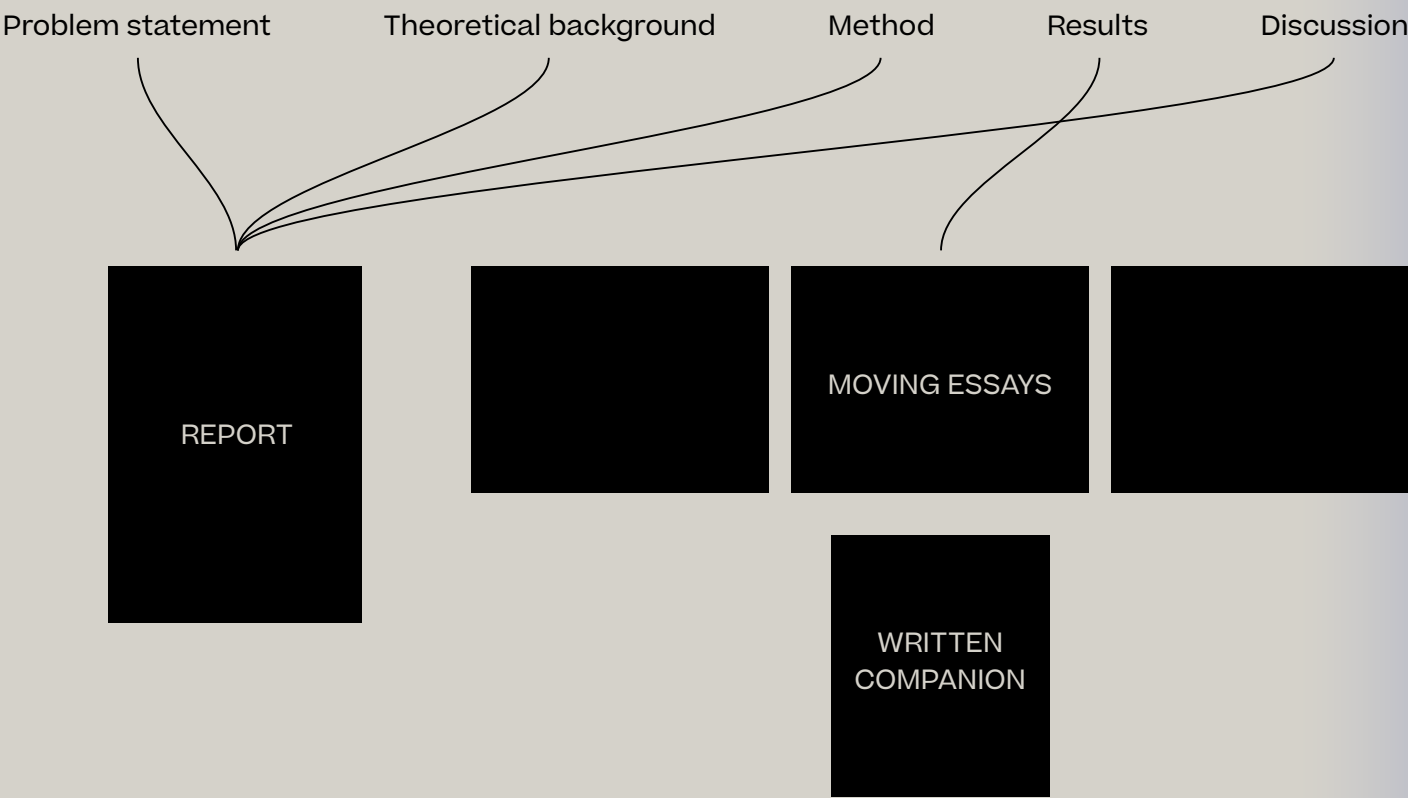


1. Stills from a video uploaded to YouTube recorded somewhere between the dam and Bento Rodrigues right after the moment of rupture.

Material	Archives/sources	Description and relevance
Historical drawings, documents and photographs	Acervo Público Mineiro	Public Archive of the state of Minas Gerais, hosting several documents, drawings and photographs from public and private archives stretching back to the colonial period.
Photographs posted to social media	Instagram	Photography-based social network. Useful for information concerning the public perception of the disaster, amateur images taken from the impacted sites, images made directly by the affected populations.
Videos posted to social media	YouTube	Video-based social network. Useful for information concerning the public perception of the disaster, amateur videos taken from the impacted sites, amateur videos taken during and in the direct aftermath of the dam rupture, journalistic reports, archival footage about the history of the state and the country.
News clippings Press releases Journalistic photography	Folha de São Paulo	Largest newspaper in the country. Useful for documentation of historical events, reports on the dam rupture both directly after it and in the years following, special reports on the communities affected.
	Jornal Estado de Minas	Largest newspaper in the state of Minas Gerais. Useful for reports on the dam rupture both directly after it and in the years following, reports on the communities affected and on the state of the reparations.
	Revista Piauí	Magazine specialized in longer format reporting. Useful for special reports and recollections of the event, more in-depth reporting on specific aspects or situations.
	Observatório da Mineração	Small scale news portal specialized in social and environmental justice issues related to mining in Brazil. Useful for reports on the state of reparations, points of view and demands by the victims.
	Fundação Renova	NGO created as a result of the TTAC (Transaction and Conduct Adjustment Term) imposed upon the mining company and its shareholders. Useful for up to date and detailed information concerning reparations involving all of the communities and locations affected.

<i>Material</i>	<i>Archives/sources</i>	<i>Description and relevance</i>
Official government documentation	Jornal A Sirene	Monthly newspaper written by and for the victims of the dam rupture. Useful for up to date information on the reparations, statements and testimonials from the affected communities.
	Ministério Público de Minas Gerais	State-wide branch of the public prosecutor’s office. Useful for official reports, legal procedures, information regarding reparations and fines.
Maps Aerial photography/satellite imagery	Ministério Público Federal	National public prosecutor’s office. Useful for official reports, legal procedures, information regarding reparations and fines. The company and its shareholders were the object of several lawsuits at different levels, including those enacted by the government and also class-action lawsuits by the victims.
	Google Maps	Public on-line database for satellite imagery and aerial photography (the technology depends on scale of the visualization). Useful for tracing changes to the environment throughout time, complementing information not available in official maps.
	IEDE Minas Gerais	Infrastructure for Spatial Data in Minas Gerais. Provides several geo-referenced maps to the public including topography, water, types of soil, human occupation, vegetation and others.
	DPS UFV	Soils department of the Federal University of Viçosa. Provides geo-referenced material concerning soil types in Minas Gerais.
Articles, theses and dissertations	IDE-SISEMA MG	Spatial Data Infrastructure of the State System for the Environment and Water Resources in Minas Gerais. Provides robust geo-referenced data concerning soil types and quality, environmental risk, water management, pollution, human occupation, biodiversity and many others.
	Repositório UFMG	Repository of the Federal University of Minas Gerais. Contains work about the history of the region, studies on the victims of the disaster and the environmental damage after the dam rupture.

Moving essays



1. Diagram clarifying the relationship between the research structure requested by the school and my research results.

As detailed before, my research process will consist of archive-building and the tracing of entanglements, registered in texts, maps and diagrams. I will then translate these findings into a video format, with the possibility of presenting the results in a video installation. In January, then, I will have the following material: a research report providing an extended reflection on hauntology and the hauntological practice in architecture, a set of video essays, and a written companion to the video essays with transcripts, notes and source attributions (1). By working with three screens (or a tripartite video projected through a beamer, to be defined) I am able to associate images, text, video or audio through a succession in time and through a coexistence in space. I am interested in manipulating duration, movement and stillness, effectively returning to some principles of montage in order to produce meaning. I also believe there is value in not presenting the findings in a general diagram where all of the associations are immediately visible, but in a way where the haunting is also intuited, demanding an active involvement from the viewer with the material.

Each essay will be thematically guided. Through my first findings, I have been able to identify six themes, which are detailed in the next page. One should note that the overlap between topics states to the fact that a format that allows for coexistence and juxtaposition is what would best suit this research. Changes are still possible in case I find I should divide a particular essay into smaller ones with more specific themes.

Some of the predicted issues with this format concern the volume of material in each media, as a large part of the information is exclusively written; limitations due to copyright, if all of the rights are to be contemplated; and limitations to the use of the space in the school. I am part of a group of around ten students working on an unofficial exhibition at the Explore Lab studio around the weeks of the P2. Ideally, this video installation would be a part of the exhibition. Depending on what the final format is, there can be additional concerns about video resolution and legibility of the material.

Minas

Unfolds from the fact that flooding due to mining is a repeated event in the region. Traces the origins of mineral extraction and discusses how Minas has become embroiled in a self-perpetuating fate, as the region’s economy is apparently irreversibly dependent on mining. Intersects colonization, socioeconomic inequalities, the slave trade and environmental racism.

Scales

Deals with the multiplicity of scales in which the tragedy is manifested. Threads connections between the territorial scale of the Rio Doce, which parallels the extractive scale, that is, the one of soil maps, property lines and engineering works, and the scale of individuals and communities impacted, focusing on bodily expressions of trauma, personal belongings and material damage.

Krenak

Retells the story of the Krenak, settled by the Rio Doce, who have dealt with consecutive ends of their life-worlds. Moves across the arrival of the colonizers, the Krenak genocide during the military dictatorship, its relationship to their resistance to the developmentalist-extractive project, and the destruction of their connection to the river after 2015.

Toxicity

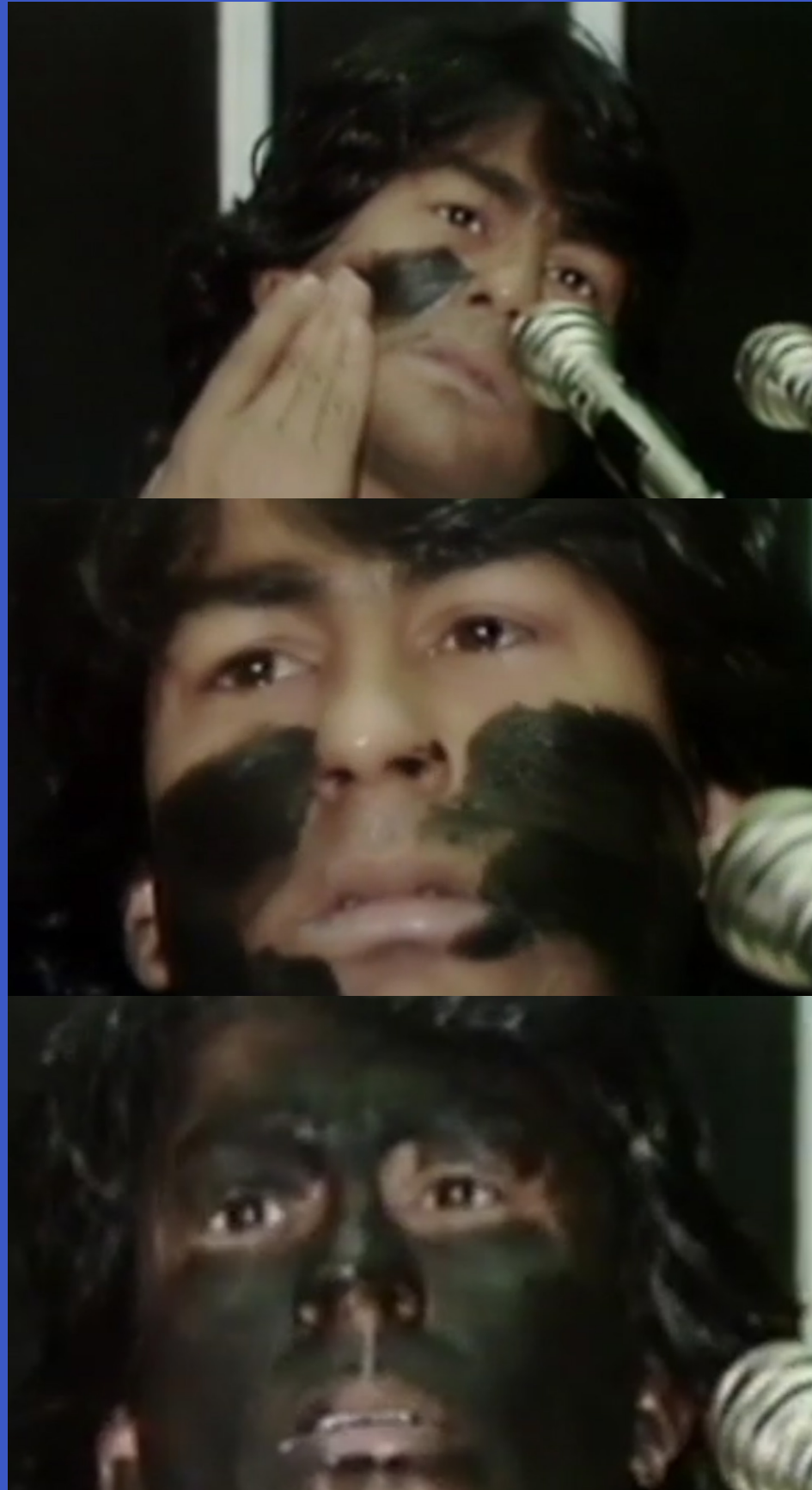
Focuses on the state of the Rio Doce and how it has changed irreversibly, but also in other forms of contamination caused by the disaster. Also touches upon the previous anthropogenic changes to the river and general forms of toxicity present in mining areas in order to break away from the idea of “cleaning” the area as a localized solution.

Interruptions

Deals with the ways in which the disaster led to disentanglements between people and their surroundings and communities, with a focus on losses (of home, occupation, family and friends) and also on interruptions of the future. This interruption happens at two levels, as the self-perpetuating fate of the mining region leads to a constriction of possible futures and the violent nature of the disaster causes individual losses of projected futures. For that, is also heavily connected to the essay on mining.

Ongoingness

Discusses the ways in which the event is constantly re-actualized. Has strong connections with the essay on toxicity, as the event is ongoing in the bodies of victims and the contamination of the river. I would also like to discuss the way in which the disaster is usually approached. There is a fixation on the image of the mud and visions of destruction, victims are made to relive their experiences through repeated reports, documentaries and interviews; yet the way in which the event is entangled with others in time and space goes unstated.



1. Ailton Krenak in a speech-performance during the 1988 Assembly that would define Brazil's new constitution, defending the rights of the native populations.



2. Sign around Bento Rodrigues marking a former site of the Estrada Real, the official path through which gold was moved towards the ports to be taken to Portugal.

Following a suggestion by Vanessa Grossman, I started mapping key locations in direct proximity with the Rio Doce. After the dam rupture in November 2015, the mud contained in the tailings dam moved down the terrain until it reached the Gualaxo do Norte river, through which it traveled until the Carmo river, across which it also moved, finally spilling into Rio Doce, travelling downstream for around 600 kilometers until it reached the mouth of the river at the sea.¹

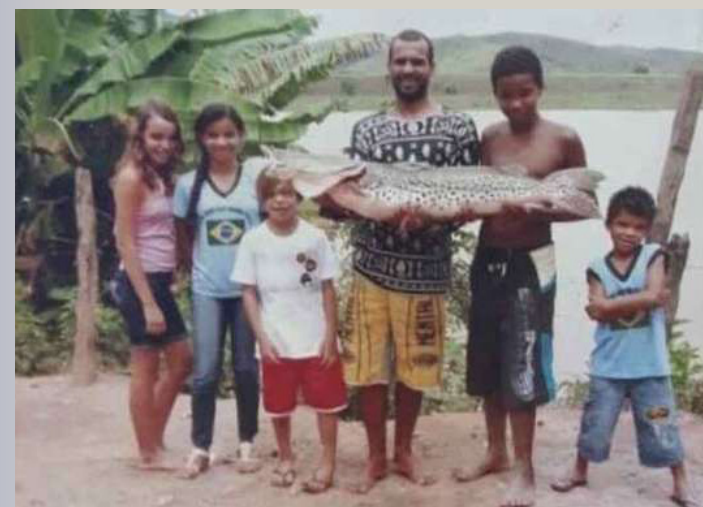
The immediate result of making the map that appears in the following pages was a discomfort with the scale of the approach implicated in framing all of the areas impacted by the spill in a single image, with a standard representation of scale.² For the effect of comparison, the full extent of the damage is roughly the same as the distance between Amsterdam and Berlin. With that in mind, the mapping activity did lead to discoveries on how the tragedy unfolded at different points along the river.

In terms of a broad classification of the locations, there are three ways in which different groups were impacted. The first refers to the extension between Bento Rodrigues and Santa Cruz do Escalvado,³ where the physical environment was interfered with more significantly. Residents had to deal with total or partial relocation, belongings were lost, and reconstruction efforts had to be offered either at a different site, as is the case of Bento Rodrigues (1), or within the village, as is the case of Barra Longa (2). Those impacted deal with issues including a disarticulation of community ties, the loss of belongings related to family or individual memory, socioeconomic difficulties and mental and physical illness.^{4,5} The second type refers to the extension between Sem-Peixe and the mouth of the river, where problems concern mostly professional activities and income obtainment. Although various tourism-dependent professions such or artisanal mineral panning were affected, an expressive group that has since been unable to exercise their main source of income are the small-scale, artisanal fishing communities (3). The practice has been restricted in the entirety of Rio Doce since 2017 for several reasons, including conflicting or inconclusive assessments on fish contamination and efforts for the repopulation by native species.^{6,7} The third one refers to the specific situation of TI (Terra Indígena) Krenak (4). The Krenak, who were almost decimated during the military dictatorship (1964-1985), are settled by the Rio Doce, to whom—as they would say—they relate not only in terms of what it provides for their subsistence, but also in a deeply spiritual way, as their interaction with the river is a constitutive part of their identity.⁸

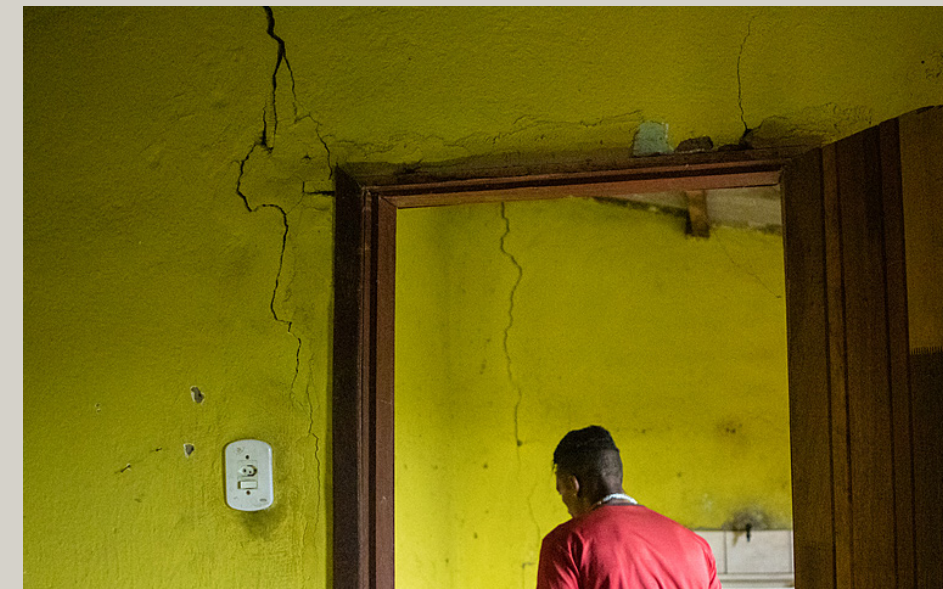
The Rio Doce and its affluents emerge in this configuration as the thread that connects vastly distinct stories, both in its immense life-making power and in its role as carrier of the toxicity far beyond the extent of the original damage. At the same time, the tragedy, with a scale that mirrors the one of the river, has a granularity that extends to individual stories, people with complicated and complete lives, but also the dead fish and the mangrove trees where the river joins the sea, now forever entangled in their past and future. The fundamental challenge of this hauntological exercise is to bridge these scales, embracing the extension of the disaster in space and time without turning them into abstract diagrams and becoming enmeshed within the smallest constitutive parts of this web of lives without losing sight of what connects them.



1. Antonio, a community leader from Bento Rodrigues, discusses the accident.



3. Alessandro, a former Periquito fisherman, in a photo before the dam rupture.



2. Ricardo, a resident of Barra Longa, walks through cracked walls that became compromised after construction works by Renova in town.



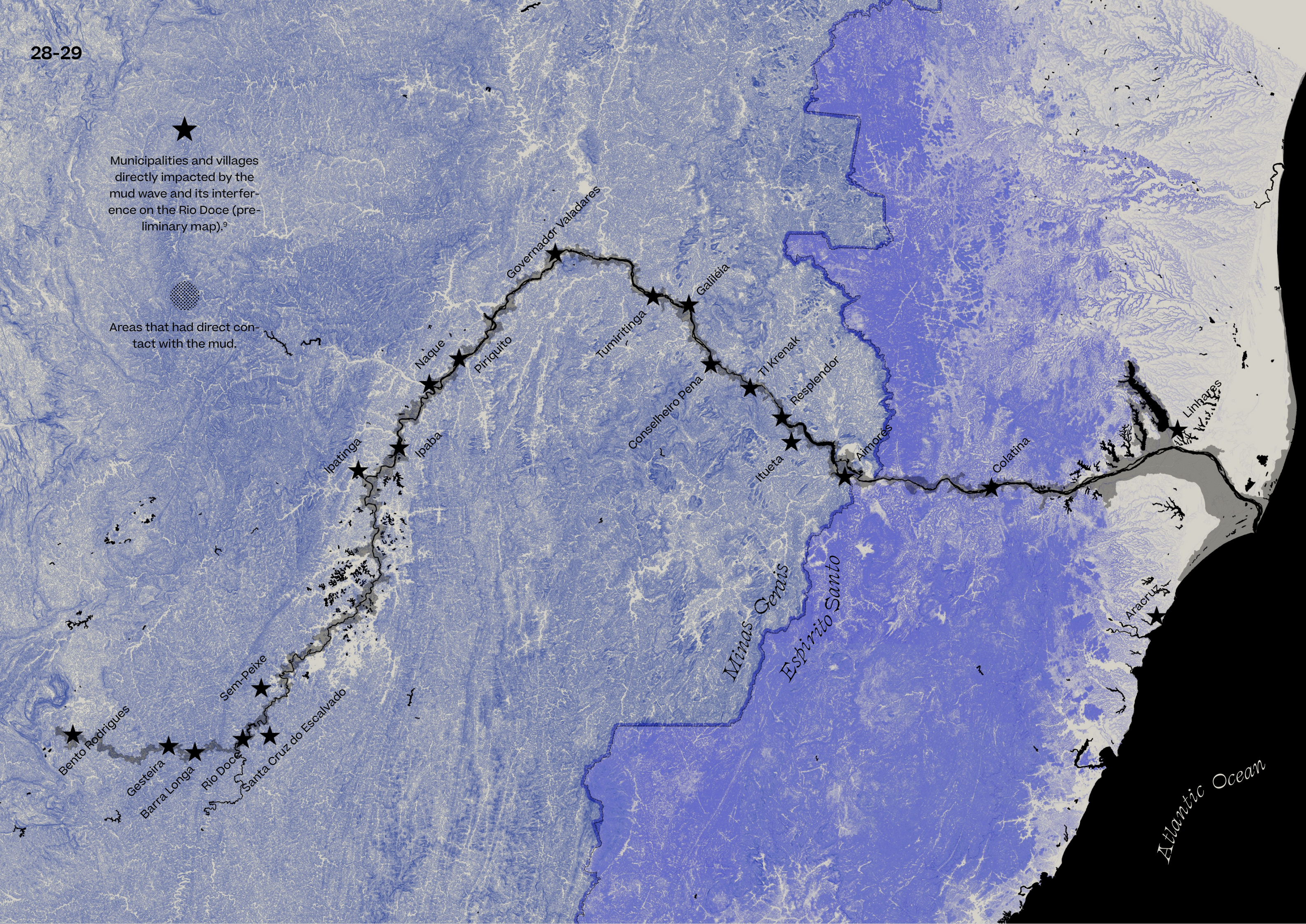
4. Barbosa, a member of TI Krenak by the Rio Doce in 2016, when the contamination could still be seen and smelled.



Municipalities and villages directly impacted by the mud wave and its interference on the Rio Doce (preliminary map).⁹



Areas that had direct contact with the mud.



A strange thing that moves

At this point, I believe I will design an object or a series of objects that float along the Rio Doce, as the goal of the architecture is to animate the connections between the complex and multiple lives across the landscape of disaster, never dealing with them as un-articulated points. These built objects could have a changing materiality and even changing contents, as they join in with the flows of life and toxicity of the river and their programs spur interaction with the communities.

The design would have a particular cycle, as it would itself be an event. At the end of the longitudinal crossing of the river, the architecture would simply be transported to its starting point and begin again. Aldo Rossi's Teatro del Mondo is an obvious reference for this, as the structure built for the 1980 Biennale sailed from Venice to Dubrovnik, making stops at different cities, until it was disassembled at the end of its journey (1). Studio Ossidiana's Amsterdam Allegories are a reinterpretation of the floating pavilion as a set of movable islands that can both gather at their site of origin or spread out and latch onto multiple docking points in the city (2). Robert Smithson's proposal for a floating island also enacts a cycle but at a smaller scale, with a barge holding a garden continuously towed around the island of Manhattan (3).

Gordon lists as one of the characteristics of the ghost the way it "imports a charged strangeness into the place or sphere it is haunting."¹ Without attempting to simulate the ghost itself or its absence, a strangeness not only in the sense of Freudian uncanniness (which is mostly Gordon's interest) but simply in the sense of unconventionality could be employed in the design. It could help expand the possibilities for response-ability as forms or uses might not be automatically apprehensible. An example is Raumlabor's Floating University, which has an iterative configuration and looks strange enough to elicit the curiosity and, further along, participation of the residents of Berlin in its events (4).

Yet, the design must also deal with past events, somehow acting as a form of acknowledgment. This is done very often in memorials, where the use of architecture as an unsettling element towards a certain configuration of space or feeling is not uncommon. A known example is



1. The Teatro del Mondo in Venice.



2. The islands in Studio Ossidiana's Amsterdam Allegories.

Peter Eisenman's Memorial to the Murdered Jews of Europe, which in its abstraction provides no one correct interpretation of its forms and presupposes no particular structure of feeling that must be felt or achieved (5). It is contrasted by Daniel Libeskind's Jewish Museum, in which the changes to the visitor's sensations are cautiously planned in order to simulate the feelings present among the Jewish community during the Shoah, such as disorientation, feeling lost, feeling small, being in darkness (6). Eisenman's design turns

the interaction between the visitor and the memory of a tragedy into a creative exercise, as each one must actively join in on making the space and its meaning.

Conjuration is the name Derrida gives to the act of bringing the ghost to the fore. He calls it a mode of performative interpretation, in the sense that it transforms that which is being interpreted.² As the ghost is transferred into the world of the living, it loses its hauntological character: "[o]ntology is a conjuration."³ After a ghost is conjured, it is usually exorcised, that is, made twice dead, this time knowingly. Rarely, the ghost can be convoked positively, in order to be given a hospitable space.⁴ My design is certainly a case of positive conjuration, yet I must take care not to focus on simply attempting to construct a material representation of the ghost, or worse, of its hauntological character as a material in-betweenness. This seems to be the case in most ghostly architecture (7,8) and leads to a question so far still unanswered: what does a properly hauntological architecture look like? I believe some pitfalls can be avoided if I, such as Eisenman, position this design creatively and not simply reflectively in relation to tragedy.



3. Robert Smithson's sketch for the Floating Island.



4. The Floating University in use.



5. Peter Eisenman's *Memorial to the Murdered Jews of Europe*.



7. Edoardo Tresoldi's *reconstruction of the Basilica of Siponto*.



6. *Permanent installation in Daniel Libeskind's Jewish Museum*.



8. Robert Venturi and Denise Scott-Brown's *Franklin Court*.

Minas, as in mines

1. All information extracted from Ministério Público Federal. *Denúncia*, by José Adércio Leite Sampaio, Gustavo Henrique Oliveira, Jorge Munhós de Souza, Eduardo Henrique de Almeida Aguiar, Eduardo Santos de Oliveira. Minas Gerais, Espírito Santo: Ministério Público Federal, 2016.

2. Kathryn Yusoff, “Mine as Paradigm,” *e-flux Journal: Survivance* (2021), <https://www.e-flux.com/architecture/survivance/381867/mine-as-paradigm/>

3. Yusoff, “Mine as a Paradigm.”

4. Marcio Zonta, Charles Trocate, *Antes fosse mais leve a carga: reflexões sobre o desastre da Samarco/Vale/BHP Billiton* (Marabá: iGuana, 2016), 30.

5. Carolina Capanema, “Mining and Environmental Destruction in Minas Gerais: A Historical Comparison,” *Arcadia* 6 (Spring 2021), Rachel Carson Center for Environment and Society, doi:10.5282/rcc/9217.

6. Zonta, Trocate, *Antes fosse mais leve a carga*, 20.

7. Zonta, Trocate, *Antes fosse mais leve a carga*, 220.

Figures

1. Cai Santo, *Half buried*, photograph, November 7, 2015, <https://flic.kr/p/Bp2Qjm>

2. Google Earth. *Aerial photograph of the Rio Doce* [air photo]. No scale provided. Retrieved in October 6, 2021.

3. Brasil de Fato, *Registro atual de Bento Rodrigues, em Mariana (MG). É uma das três comunidades centenárias atingidas pela lama de rejeitos após rompimento da barragem de Fundão, em 2015. De lá pra cá já se passaram quatro anos, e 430 famílias seguem sem um lar* (Tânia Rêgo/Agência Brasil), photograph, October 22, 2019, <https://flic.kr/p/2hGaWqr>

Haunting: things of the thing

1. Jacques Derrida, *Specters of Marx: The State of Debt, the Work of Mourning and the New International*, trans. Peggy Kamuf (New York: Routledge Classics, 1994), 63.

2. Ibid, 5.

3. Avery Gordon, *Ghostly Matters: Haunting and the Sociological Imagination* (Minneapolis: University of Minnesota Press, 2008), 166.

4. Karen Barad, “Troubling Time/s and ecologies of noThingness: re-Turning, re-membering, and facing The incalculable,” *new formations: a journal of culture/theory/politics* 92 (2018): 70, muse.jhu.edu/article/689858.

5. Derrida, *Specters of Marx: The State of Debt, the Work of Mourning and the New International*, 9.

6. Barad, “Troubling Time/s and ecologies of noThingness: re-Turning, re-membering, and facing The incalculable,” 70.

7. Gordon, *Ghostly Matters: Haunting and the Sociological Imagination*, 64.

Architecture as response-ability

1. Derrida, *Specters of Marx: The State of Debt, the Work of Mourning and the New International*, xviii.

2. Ibid, emphasis by me.

3. Ibid, 26.

4. Ibid.

5. Ibid, 109.

6. Ibid.

7. Ibid, 114.

8. Gordon, *Ghostly Matters: Haunting and the Sociological Imagination*, 166.

9. Donna Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham and London: Duke University Press, 2016), 36.

10. Ibid.

11. They refer to the two-slit experiment devised by Bohr and executed in the 1990s in which atoms behave both as particle and wave, with the difference being whether and when measurements are done as they pass through a surface with two slits.

12. Karen Barad, “Quantum Entanglements and Hauntological Relations of Inheritance: Dis/continuities, SpaceTime Enfoldings, and Justice-to-Come,” *Derrida Today* 3, issue 2 (2010): 253, DOI: 10.3366/E1754850010000813

13. Ibid.

14. Ibid, 265.

15. Ibid.

Hauntological investigations

1. Gordon, *Ghostly Matters: Haunting and the Sociological Imagination*, 27, emphasis by me.

2. Ibid, 66.

3. Ibid, 67.

4. Ibid, 65.

5. Ibid, 160.

6. Ibid, 161.

7. Ibid, 22.

8. Ibid, 40.

9. Ibid.

10. Alia Al-Saji, “The memory of another past: Bergson, Deleuze and a new theory of time,” *Continental Philosophy Review* 37, issue 2 (June 2004): 225, DOI 10.1007/s11007-005-5560-5

11. Ibid, 226.

12. Ibid.

13. Ibid, 227.

Figures

1. Sylvia Rummel, *Levi Coffin, back row center, with Jonathan Cable and slaves escaping to freedom. Photograph taken in Cincinnati, Ohio*, photograph, no date provided, <http://civilwaref.blogspot.com/2013/10/levi-coffin-born-october-28-1798.html>

What is a hauntological practice of architecture as response-ability?

1. Jornal A Sirene, *Loucos Pelo Bento - Semana Santa 2017*. Video. YouTube. April, 2017. <https://youtu.be/CYqiYqzS41s>

The hauntological investigation in architecture

1. Gordon, *Ghostly Matters: Haunting and the Sociological Imagination*, 174.

2. Eyal Weizman, *Forensic architecture: violence at the threshold of detectability* (New York: Zone Books, 2017), 98.

3. Ibid.

4. Gordon, *Ghostly Matters: Haunting and the Sociological Imagination*, 24.

Figures

1. Arthur RILOS. *Rompimento barragem Samarco Bento Rodrigues MOMENTO EXATO*, video stills, no date provided, <https://youtu.be/WMHqSp7lse8>

2. Author unknown. *Map of Mariana*. Scale not given. 18th century. Itamaraty Map Library, Rio de Janeiro. MI (in. 874).

Moving Essays
Figures

1. Rodrigo Siqueira, *Índio Cidadão?*, video stills, April 19, 2014, <https://www.camara.leg.br/tv/432678-indio-cidadao/>
2. Marcelo Nava, *Bento Rodrigues*, 2016, photograph, May 5, 2016, <https://flic.kr/p/GtrtAQ>

First mappings

1. Ministério Público Federal. *Denúncia*, by José Adércio Leite Sampaio, Gustavo Henrique Oliveira, Jorge Munhós de Souza, Eduardo Henrique de Almeida Aguiar, Eduardo Santos de Oliveira. Minas Gerais e Espírito Santo: Ministério Público Federal, 2016.
2. Here it should be noted that depending on the source or method the number of villages can increase greatly and extend into the entire river basin. For this reason the map presented is a preliminary study.
3. INPE. *Os pescadores da bacia do Rio Doce: subsídios para a mitigação dos impactos socioambientais do desastre da Samarco em Mariana, Minas Gerais*. João Paulo Viana. Nota Técnica Nº 11, Brasília: INPE, 2016.
4. Pedro Stropasolas, “Vítimas da Samarco: os esquecidos de Barra Longa e a reparação que nunca existiu,” *Brasil de Fato*, November 5, 2020, <https://www.brasildefato.com.br/2020/11/05/vitimas-da-samarco-os-esquecidos-de-barra-longa-e-a-reparacao-que-nunca-existiu>.
5. Gessica Silva, Diego Boava and Fernanda Macedo, “Refugiados de Bento Rodrigues: estudo fenomenológico sobre o desastre de Mariana, MG” (paper presented at IV Congresso Brasileiro de Estudos Organizacionais, Porto Alegre, 19 to 21 October 2016).
6. IEF. *Portaria nº 40*, by João Paulo Mello Rodrigues Sarmento. Belo Horizonte, Minas Gerais: IEF, 2017.
7. Fabrício Â. Gabriel, Rachel Ann Hauser-Davis, Lorena Soares, Ana Carolina A. Mazzuco, Rafael Christian Chavez Rocha, Tatiana D. Saint Pierre, Enrico Saggiaro, Fabio Verissimo Correia, Tiago O. Ferreira and Angelo F. Bernardino, “Contamination and oxidative stress biomarkers in estuarine fish following a mine tailing disaster,” *PeerJ* 8 (2020): e10266. DOI 10.7717/peerj.10266
8. *Krenak, sobreviventes do Vale*, directed by Andrea Pilar Marranquiel (2019; Rio de Janeiro, RJ: Canal Futura, 2019), <https://canaiglobo.globo.com/assistir/futura/krenak-sobreviventes-do-vale/v/7484834/>
9. The list of locations was obtained from INPE, *Os pescadores da bacia do Rio Doce: subsídios para a mitigação dos impactos socioambientais do desastre da Samarco em Mariana, Minas Gerais*, which considers the directly affected villages as the ones whose center was at a maximum range of 5 kilometers from the river channel. Other sources for the map are *Hidrografia* [map]. 1:250.000. Brasília: IBGE, 2017. Using: QGIS [GIS software]; *Mapeamento ES - 2012-2015 - Altimetria* [map]. No scale provided. Vitória: IEMA, 2015. Using: QGIS [GIS software]; *Curvas de Nível* [map]. No scale provided. Brasília: INPE, no date provided. Using: QGIS [GIS software]; *Área afetada* [map]. No scale provided. Belo Horizonte: SISEMA, no date provided. Using: QGIS [GIS software].

Figures

1. Silvia Costa, Central 98, *Especial Bento Rodrigues - #Central98*, video still, November 5, 2018, <https://youtu.be/xxt2F0qrIVU>
2. Pedro Stropasolas, *Rachaduras estão em todas as casas visitadas pelo Brasil de Fato no bairro de Volta da Capela*, photograph, Brasil de Fato, November 5, 2020, <https://www.brasildefato.com.br/2020/11/05/vitimas-da-samarco-os-esquecidos-de-barra-longa-e-a-reparacao-que-nunca-existiu>
3. Mateus Parreiras, *Alessandro Fernandes da Silva antes, com os filhos*, photograph, Estado de Minas, July 31, 2020, https://www.em.com.br/app/noticia/gerais/2020/07/31/interna_gerais,1171931/tragedia-mariana-pescadores-rio-doce-aguardam-julgamento-inglaterra.shtml
4. Márcio Fernandes, *Rio de Lama. Barbosa, morador da reserva do Rio Doce: ‘Nem a gente entra mais na água,’* photograph, O Estado de S. Paulo, November 4, 2016, <https://brasil.estadao.com.br/noticias/geral,lama-faz-indios-krenaks-depender-de-agua-mineral,10000086316>

A strange thing that moves

1. Gordon, *Ghostly Matters: Haunting and the Sociological Imagination*, 64.
2. Derrida, *Specters of Marx: The State of Debt, the Work of Mourning and the New International*, 63.
3. Ibid, 202.
4. Ibid, 135.

Figures

1. Antonio Martinelli, *Bodybuilding, Aldo Rossi, Il Teatro del Mondo, Venice 1979*, photograph, ArchDaily, no date provided, <https://www.archdaily.com/942357/an-online-exhibition-connects-the-dots-between-performance-and-architecture/5ef32adeb35765dd99000136-an-online-exhibition-connects-the-dots-between-performance-and-architecture-image>
2. No author provided, *Amsterdam Allegories: Twenty-one islands for Amsterdam’s future*, photograph, Future Architecture Platform, no date provided, <https://futurearchitectureplatform.org/projects/b84c6a27-892a-47c5-b55d-26badbd54851/>
3. Daniel Seiffert, *Floating University Berlin / raumlabor berlin*, photograph, ArchDaily, no date provided, <https://www.archdaily.com/901501/floating-university-berlin-raumlabor-berlin>
4. Robert Smithson, *Floating Island—Barge to Travel around Manhattan Island*, drawing, Flash Art, 1971, <https://flash---art.com/article/robert-smithson-primordial-beginnings/>
5. Piotr Dziubak, *Making waves with a timeless memorial*, photograph, Buro Happold, no date provided, <https://www.burohappold.com/projects/memorial-to-the-murdered-jews-of-europe/>
6. Denis Esakov, *AD Classics: Jewish Museum, Berlin / Studio Libeskind*, photograph, ArchDaily, no date provided, <https://www.archdaily.com/91273/ad-classics-jewish-museum-berlin-daniel-libeskind>
7. Imaginapulia, *Archeological Park of Siponto*, photograph, Imaginapulia, no date provided, <https://imaginapulia.com/points-of-interest/siponto-archaeological-park/>
8. Mark Cohn, *Spotlight: Robert Venturi and Denise Scott Brown*, photograph, ArchDaily, no date provided, <https://www.archdaily.com/769194/spotlight-robert-venturi-and-denise-scott-brown>

38-39 *Tentative schedule*

[illegible]

- Adams, Tim. “Félix Guattari: Architectural Enunciation.” *Interstices: Journal of Architecture and Related Arts* 6 (September 2005): 119-125.
- Agência Nacional de Vigilância Sanitária. *Nota Técnica No 8/2019/SEI/GEARE/GGALI/DIRE2/ANVISA*. Carolina Araujo Vieira. Process no. 25351.918291/2019-53. Brasília: ANVISA, 2019.
- Al-Saji, Alia. “The memory of another past: Bergson, Deleuze and a new theory of time.” *Continental Philosophy Review* 37 (June 2004): 203–239.
- Assessoria de Comunicação Social do Ministério Público Federal em Minas Gerais. “Caso Samarco: MPF pede que Juízo Federal de Ponte Nova (MG) retome andamento da ação penal.” *MPF-MG*, February 9, 2021. <http://www.mpf.mp.br/mg/sala-de-imprensa/noticias-mg/caso-samarco-mpf-pede-que-juizo-federal-de-ponte-nova-mg-retome-andamento-da-acao-penal>
- Augusto, Leonardo. “Justiça inglesa reabre ação contra BHP por desastre de Mariana (MG).” *Folha de São Paulo*, July 27, 2021. <https://www1.folha.uol.com.br/cotidiano/2021/07/justica-inglesa-reabre-acao-contra-bhp-por-desastre-de-mariana-mg.shtml>
- Barad, Karen. “Quantum Entanglements and Hauntological Relations of Inheritance: Dis/continuities, SpaceTime Enfoldings, and Justice-to-Come.” *Derrida Today* 3, no. 2 (2010): 240–268. DOI: 10.3366/E1754850010000813.
- Barad, Karen. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham and London: Duke University Press, 2007.
- Barad, Karen. “Troubling time/s and ecologies of nothingness: re-turning, re-membering, and facing the incalculable.” *new formations: a journal of culture/theory/politics* 92 (2018): 56-86. muse.jhu.edu/article/689858.
- Bernardino, Angelo F., Fabiano S. Pais, Louisi S. Oliveira, Fabricio A. Gabriel, Tiago O. Ferreira, Hermano M. Queiroz and Ana Carolina A. Mazzuco. “Chronic trace metals effects of mine tailings on estuarine assemblages revealed by environmental DNA.” *PeerJ* 7, e8042 (2019): 1-18. DOI 10.7717/peerj.8042
- Capanema, Carolina. “Mining and Environmental Destruction in Minas Gerais: A Historical Comparison.” *Arcadia* 6 (Spring 2021). Rachel Carson Center for Environment and Society. doi:10.5282/rcc/9217.
- Carvalho, Érika. “Pescadores do ES cobram reparações 4 anos após desastre ambiental no Rio Doce.” *G1*, November 5, 2019. <https://g1.globo.com/es/espírito-santo/noticia/2019/11/05/pescadores-do-es-cobram-reparacoes-4-anos-apos-desastre-ambiental-no-rio-doce.ghtml>
- Conselho Nacional dos Direitos Humanos. *Relatório sobre o rompimento da barragem de rejeitos da mineradora Samarco e seus efeitos sobre o Vale do Rio Doce*. CNDH. Brasília: CNDH, 2017.
- Corrêa, Rogério. “Reformatório Krenak (2016).” YouTube video, 18:06. November 8, 2016. <https://youtu.be/Qpx8nKVXOAo>
- DeLanda, Manuel. *A Thousand Years of Nonlinear History*. New York: Swerve Editions, 2009.
- Deleuze, Gilles. “Desert Islands.” In *Desert Islands and Other Texts 1953-1974*, edited by David Lapoujade, 9-14. New York: Semiotext(e), 2004.
- Derrida, Jacques. *Specters of Marx: The State of Debt, the Work of Mourning and the New International*. Translated by Peggy Kamuf. New York: Routledge Classics, 1994.
- Dorrian, Mark. “On Google Earth.” In *Seeing from Above: the Aerial View in Visual Culture*, edited by Mark Dorrian and Frédéric Pousin, 290-307. London: I.B. Tauris, 2013.
- Enríquez, Maria Amélia Rodrigues da Silva. “Maldição ou Dádiva? Os dilemas do desenvolvimento sustentável a partir de uma base mineira.” PhD dissertation, Universidade de Brasília, 2007.
- Espindola, Haruf Salmen. “A navegação do Rio Doce: 1800-1850.” *Navigator* 3, no. 5 (2007): 50-72.
- Ferreira da Silva, Denise. *A dívida impagável*. São Paulo: Oficina de Imaginação Política e Living Commons, 2019.
- Ferreira da Silva, Denise. “Reading the Dead: A Black Feminist Poethical Reading of Global Capital.” In *Otherwise Worlds: Against Settler Colonialism and Anti-Blackness*, edited by Tiffany Lethabo King, Jenell Navarro and Andrea Smith, 38-51. Durham and London: Duke University Press, 2020.
- Ferreira da Silva, Denise. “Speculations on a Transformative Theory of Justice.” *Hearings: The Online Journal of Contour Biennale* (April 2017). <http://hearings.contour8.be/2017/04/11/speculations-transformative-theory-justice/>
- Freitas, Raquel. “Com perda de atividade, atingidos pelo rompimento da barragem da Samarco se reinventam.” *G1*, November 8, 2018. <https://g1.globo.com/mg/minas-gerais/noticia/2018/11/08/com-perda-de-atividade-atingidos-pelo-rompimento-da-barragem-da-samarco-se-reinventam.ghtml>
- Fundação Getúlio Vargas. *Reparação Individual nos Territórios de Rio Doce, Santa Cruz do Escalvado e Chopotó: Uma Análise do Desenho, Procedimentos e da Cobertura do Cadastro, do Programa de Indenização Mediada e do Auxílio Financeiro Emergencial da Fundação Renova*. Rio de Janeiro, São Paulo: FGV, 2020.
- Fundação Renova. “Comunidades da foz do Rio Doce vão receber projeto de aquaponia.” *Fundação Renova*, June 14, 2019. <https://www.fundacaorenova.org/noticia/comunidades-da-foz-do-rio-doce-vao-receber-projeto-de-aquaponia/>
- Fyfe, Jessie, Maximilian Sternberg. “Unsettled landscapes: traumatic memory in a Croatian hinterland.” *Space and Polity* 23, no. 3 (2019): 299-318, <https://doi.org/10.1080/13562576.2019.1695113>
- G1 ES. “Contaminação no Rio Doce e Regência está maior que no auge do desastre no ES.” *G1*, November 30, 2019. <https://g1.globo.com/es/espírito-santo/noticia/2019/10/30/contaminacao-no-rio-doce-e-regencia-esta-maior-que-no-auge-do-desastre-no-es.ghtml>
- Gabriel, Fabrício Â., Rachel Ann Hauser-Davis, Lorena Soares, Ana Carolina A. Mazzuco, Rafael Christian Chavez Rocha, Tatiana D. Saint Pierre, Enrico Saggiaro, Fabio Verissimo Correia, Tiago O. Ferreira and Angelo F. Bernardino. “Contamination and oxidative stress biomarkers in estuarine fish following a mine tailing disaster.” *PeerJ* 8, e10266 (2020): 1-25. DOI 10.7717/peerj.10266
- Guimarães, Heron, Lúcia Castro. “Um Adeus ao Rio Doce.” *O Tempo*, no date provided. https://www.otempo.com.br/polopoly_fs/1.1180473.1449081357!/index.html
- Gordon, Avery. *Ghostly Matters: Haunting and the Sociological Imagination*. Minneapolis: University of Minnesota Press, 2008.
- Haraway, Donna. *Staying with the Trouble: Making Kin in the Chthulucene*. Durham and London: Duke University Press, 2016.
- Hecht, Gabrielle. “Interscalar Vehicles for an African Anthropocene: On Waste, Temporality, and Violence.” *Cultural Anthropology* 33, no. 1 (2018): 109-141. DOI: 10.14506/ca33.1.05
- Instituto Estadual de Florestas. *Portaria Nº 40*. João Paulo Mello Rodrigues Sarmento. Diário do Executivo Minas Gerais. Belo Horizonte: IEF, 2017.
- Instituto de Pesquisa Econômica Aplicada. *Os pescadores da bacia do Rio Doce: subsídios para a mitigação dos impactos socioambientais do desastre da Samarco em Mariana, Minas Gerais*. João Paulo Viana. Brasília: IPEA, 2016.
- Junior, Edmundo Antonio Dias Netto. “Opinião: por que a Fundação Renova não funciona?” *Jornal A Sirene*, September 18, 2019. <https://jornalasirene.com.br/opiniao/2019/09/18/opiniao-por-que-a-fundacao-renova-nao-funciona>
- Loewenson, Thandi. “To get lost in mysterious mist.” *e-flux Journal: Survivance* (2021). <https://www.e-flux.com/architecture/survivance/387184/to-get-lost-in-mysterious-mist/>
- Mallett, Alexandra, Erica Lima Barros França, Ítalo Alves, Lisa Mills. “Environmental impacts of mining in Brazil and the environmental licensing process: Changes needed for changing

- times?” *The Extractive Industries and Society* 8, no. 3 (September 2021): 1-15.
- Marranquiel, Andrea Pilar. *Krenak, sobreviventes do Vale*. Directed by Andrea Pilar Marranquiel. 2019; Rio de Janeiro, RJ: Canal Futura, 2019. <https://canaisglobo.globo.com/assistir/futura/krenak-sobreviventes-do-vale/v/7484834/>
- Marston, Sallie A, John Paul Jones III and Keith Woodward. “Human geography without scale.” *Transactions of the Institute of British Geographers New Series* 30, no. 4 (December 2005): 416-432. <https://www.jstor.org/stable/3804505>
- Meillassoux, Quentin. “Subtraction and Contraction: Deleuze, Immanence, and Matter and Memory.” In *Collapse Volume III*, edited by Robin Mackay, 63-107. London: Urbanomic, 2007.
- Ministério Público Federal. *Denúncia*. José Adércio Leite Sampaio, Gustavo Henrique Oliveira, Jorge Munhós de Souza, Eduardo Henrique de Almeida Aguiar, Eduardo Santos de Oliveira. Minas Gerais e Espírito Santo: Ministério Público Federal, 2016.
- Morrison, Toni. *Beloved*. New York: Vintage International, 2004.
- Önal, Gökce. “Media Ecologies of the ‘Extractive View’: Image Operations of Material Exchange.” *Footprint 27: Conflict Mediations* 14, no. 2 (Autumn/Winter 2020): 31-48. <https://doi.org/10.7480/footprint.14.2.4694>
- Parreiras, Mateus. “Tragédia em Mariana: pescadores do Rio Doce aguardam julgamento na Inglaterra.” *Estado de Minas*, July 21, 2020. https://www.em.com.br/app/noticia/gerais/2020/07/31/interna_gerais,1171931/tragedia-mariana-pescadores-rio-doce-aguardam-julgamento-inglaterra.shtml
- Parreiras, Mateus. “Tragédia Mariana: município busca R\$ 1,2 bilhão de indenização pelo rompimento.” *Estado de Minas*, July 29, 2020. https://www.em.com.br/app/noticia/gerais/2020/07/29/interna_gerais,1171159/tragedia-mariana-municipio-busca-r-1-2-bilhao-de-indenizacao-pelo-ro.shtml
- Povinelli, Elizabeth A. “Horizons and Frontiers, Late Liberal Territoriality, and Toxic Habitats.” *e-flux Journal* 90 (2018). <https://www.e-flux.com/journal/90/191186/horizons-and-frontiers-late-liberal-territoriality-and-toxic-habitats/>
- Purbrick, Louise. “Nitrate ruins: the photography of mining in the Atacama Desert, Chile.” *Journal of Latin American Cultural Studies* 26, no. 2 (2017): 253-278. <http://dx.doi.org/10.1080/13569325.2017.1313205>
- Ribeiro, Bruno, Márcio Fernandes. “Lama faz índios Krenak depender de água mineral.” *O Estado de S. Paulo*, November 4, 2016. <https://g1.globo.com/mg/minas-gerais/noticia/2018/11/08/com-perda-de-atividade-atingidos-pelo-rompimento-da-barragem-da-samarco-se-reinventam.ghtml>
- Rodrigues, Carla, Rafael Haddock-Lobo and Marcelo José Derzi Moraes. “Specters of Colonialidade: A Forum on Jacques Derrida’s Specters of Marx after 25 Years, Part V.” *Contexto Internacional* 42, no. 1 (Jan/Apr 2020): 149-171. <http://dx.doi.org/10.1590/S0102-8529.2019420100007>
- Dos Santos, Monica. “5 anos do Desastre da Barragem do Rio Doce. Entrevista com Monica dos Santos, atingida de Bento Rodrigues, Mariana, pelo rompimento da barragem de rejeitos do Fundão.” Interview by Cáritas Minas Gerais. Cáritas, October 13, 2020.
- SAMARCO. *Bento Rodrigues: sua história, patrimônio e cotidiano*. Minas Gerais: SAMARCO, no date provided.
- Sauvagnargues, Anne. *Artmachines: Deleuze, Guattari, Simondon*. Edinburgh: Edinburgh University Press, 2016.
- Secretaria de Estado de Desenvolvimento Regional, Política Urbana e Gestão Metropolitana. *Relatório: Avaliação dos efeitos e desdobramentos do rompimento da Barragem de Fundão em Mariana-MG*. Grupo da Força-Tarefa. Belo Horizonte: Secretaria de Estado de Desenvolvimento Regional, Política Urbana e Gestão Metropolitana, 2016.
- Sharpe, Christina. *Monstrous Intimacies: Making Post-slavery Subjects*. Durham and London: Duke University Press, 2010.
- Siqueira, Rodrigo. *Índio Cidadão?* Directed by Rodrigo Siqueira. April 19, 2014; São Paulo, SP: 7G Documenta. <https://www.camara.leg.br/tv/432678-indio-cidadao/>
- Da Silva, Alexandre Pessoa (coordinator). *Estudo de avaliação de risco à saúde humana em localidades atingidas pelo rompimento da barragem do Fundão - MG*. São Paulo: AMBIOS Engenharia e Processos LTDA, 2019.
- Silva, André Fabrício, Priscila Faulhaber. “Bento Rodrigues e a memória que a lama não apagou: o despertar para o patrimônio na (re)construção da identidade no contexto pós-desastre.” *Boletim do Museu Paraense Emílio Goeldi. Ciências Humanas* 15, no. 1, e20200126 (2020): 1-15. doi 10.1590/2178-2547-BGOELDI-2019-0126.
- Silva, Gessica, Diego Boava and Fernanda Macedo. 2016. “Refugiados de Bento Rodrigues: estudo fenomenológico sobre o desastre de Mariana, MG.” Paper presented at IV Congresso Brasileiro de Estudos Organizacionais, Porto Alegre, 19 to 21 October 2016.
- Stropasolas, Pedro. “‘É um tribunal do crime’, diz vítima da Samarco após pedido de extinção da Renova.” *Brasil de Fato*, March 5, 2021. <https://www.brasildefato.com.br/2021/03/05/e-um-tribunal-do-crime-diz-vitima-da-samarco-apos-pedido-de-extincao-da-renova>
- Stropasolas, Pedro. “Samarco retoma atividades em Mariana sem dar conta do legado de destruição.” *Brasil de Fato*, November 5, 2020. <https://www.brasildefato.com.br/2020/11/05/samarco-retoma-atividades-em-mariana-sem-dar-counta-do-legado-de-destruicao>
- Stropasolas, Pedro. “Vítimas da Samarco: os esquecidos de Barra Longa e a reparação que nunca existiu.” *Brasil de Fato*, November 5, 2020. <https://www.brasildefato.com.br/2020/11/05/vitimas-da-samarco-os-esquecidos-de-barra-longa-e-a-reparacao-que-nunca-existiu>
- Vally, Sumayya. “Ingesting architectures: the violence of breathing in parts of Joburg.” *The Architectural Review*, June 8, 2021. <https://www.architectural-review.com/places/south-africa/ingesting-architectures-the-violence-of-breathing-in-parts-of-joburg>
- Vormittag, Evangelina da Motta Pacheco Alves de Araujo, Maria Aparecida de Oliveira, Cristina Guimarães Rodrigues, Josué Souza Gleriano. *Avaliação dos riscos em saúde da população afetada pelo desastre de Mariana*. São Paulo: Instituto Saúde & Sustentabilidade, Greenpeace, no date provided.
- Weigel, Sigrid. “The Flash of Knowledge and the Temporality of Images: Walter Benjamin’s Image-Based Epistemology and Its Preconditions in Visual Arts and Media History.” *Critical Inquiry* 41, no. 2 (Winter 2015): 344-366. <https://www.jstor.org/stable/10.1086/679079>
- Weizman, Eyal. *Forensic architecture: violence at the threshold of detectability*. New York: Zone Books, 2017.
- Yusoff, Kathryn. *A Billion Black Anthropocenes or None*. Minneapolis: University of Minnesota Press, 2018.
- Yusoff, Kathryn. “Mine as Paradigm.” *e-flux Journal: Survivance* (2021). <https://www.e-flux.com/architecture/survivance/381867/mine-as-paradigm/>
- Zonta, Marcio, Charles Trocate (organizers). *Antes fosse mais leve a carga: reflexões sobre o desastre da Samarco/Vale/BHP Billiton*. Marabá: iGuana, 2016.