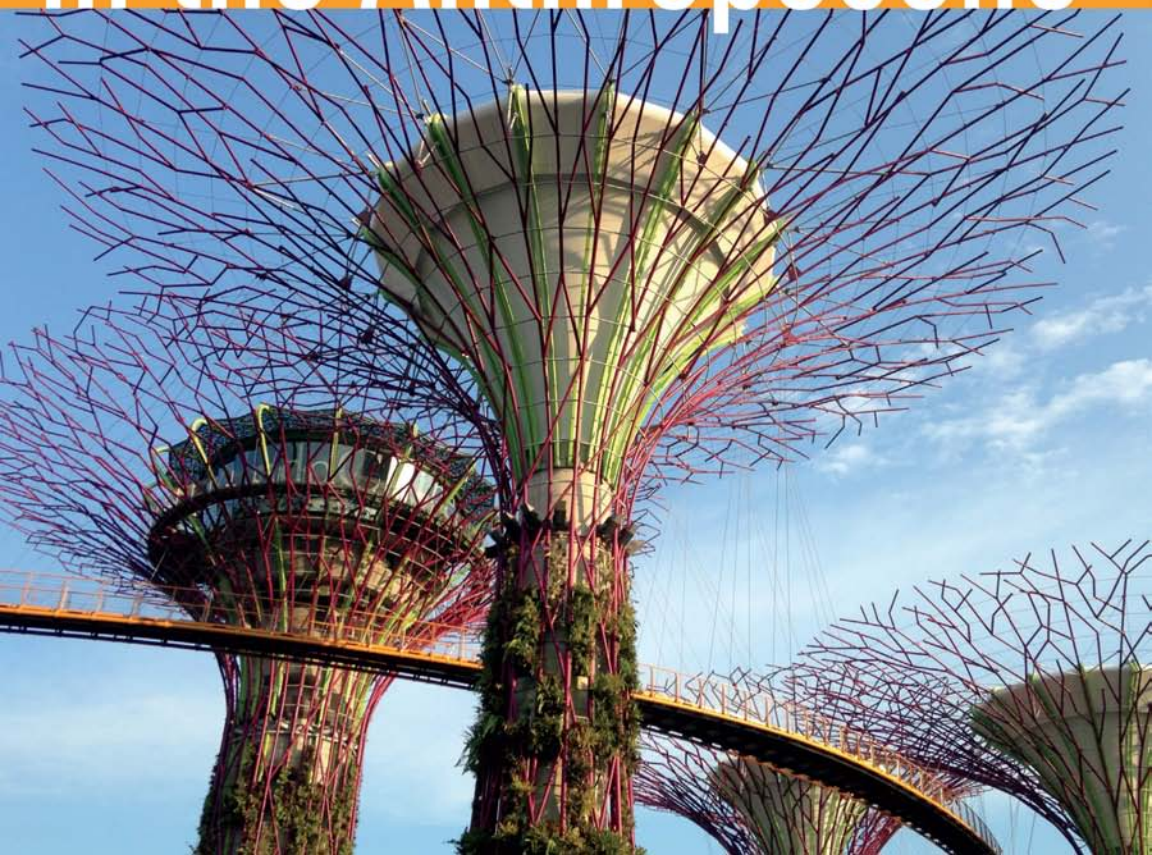


Infrastructure, Environment, and Life in the Anthropocene

Kregg Hetherington

EDITOR



Infrastructure,
Environment,
and Life
in the
Anthropocene



Experimental Futures: Technological Lives,
Scientific Arts, Anthropological Voices

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Infrastructure, Environment, and Life in the Anthropocene

Edited by KREGG HETHERINGTON

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INTRODUCTION. Keywords of the Anthropocene

KREGG HETHERINGTON



“Kyoto Is Dead.” The simple statement is scrawled across one of the busiest underpasses in downtown Montreal, only a few blocks from where the authors of this volume met in 2015. The overpass in question facilitates the use of fossil fuels to get in and out of the city, but it also straddles one of Montreal’s main protest routes, addressing itself to the city’s civic consciousness and appearing in many a photograph of local Earth Day parades. To many of us who live here, the words already feel nostalgic, evoking a moment when the city’s once hopeful environmental movement matured into something darker. At

the end of the twentieth century, Montreal had been seen by many of its residents as a center for progressive urbanism and environmental thinking. The city had rebuilt its infrastructure for Expo '67, a celebration of speculative urban planning, that included a massive geodesic dome called "Biosphere." In 1987, it gave its name to the Montreal Protocol on Substances that Deplete the Ozone Layer, a triumph of international diplomacy that many thought would provide the blueprint for future greenhouse emissions agreement (Schneider 1998; Hulme 2009). But by 2007, the infrastructure built for Expo '67 was deteriorating rapidly, known, among other things, for the lethal collapse of several concrete overpasses. The Biosphere geodome had gone up in flames.¹ And the Kyoto Protocol was collapsing as well. The quickly scrawled words, and their persistence in Montreal's precarious concrete, now seem prescient of the uncertainty that would follow, and of the sense of undoing that many call the Anthropocene.

This volume is about how that same malaise plays out in contemporary social science. Whatever we choose to call it, the social sciences and humanities are clearly experiencing an environmental moment. Global climate change is taking a larger and larger place in social theory, profoundly challenging the distinction between social and natural categories on which the social sciences were always based, and destabilizing the ground from which academics contribute to meaningful discussions of solutions. The subjects and objects of our enterprise are no longer clearly distinguishable, and the figures and grounds of our critical traditions have been undermined. In 1987, some believed we needed to protect an environmental object for the sake of human life, using ingenious new infrastructures. But somewhere between Montreal and Kyoto, the environmental objects, infrastructural solutions, and the lives at stake had all become exponentially more complex and suspect, each becoming part of the massively distributed problem at hand.

Early approaches to the mitigation of environmental harm through heroic human designs now seem dated. The common human "we," so easily deployed in twentieth-century progressive social policy is no longer easy to pinpoint, its universalism and agency are suddenly up for question (Chakrabarty 2012), and the environmental objects that define our age, such as carbon emissions and algae blooms, are neither human nor nonhuman, neither fully outside of us, nor fully inside (Morton 2013). As Timothy Mitchell (2011) has so forcefully argued, even the democratic systems through which we purport to solve our dependence on fossil fuels are themselves the product of fossil-fuel de-

pendency. That which humans confront as the environment, that enveloping process of being that sustains us or destroys us with complete indifference, is as much the result of infrastructural history as natural history (Chakrabarty 2012; Stengers 2015). As Kim Fortun (2012) puts it, ours is an age characterized by degrading industrial infrastructure, environmental threat, and exhausted paradigms.

It is an open question whether “Anthropocene” is the right name for this moment. The term has already spawned its own industry of critiques.² Three problems with the name are most evident for the project in this book. First, the root “Anthropos” itself arguably makes it very difficult to think adequately beyond the human, who stands both heroically and tragically at the center of the action (Haraway 2015; Myers this volume). In a related vein, by naming Anthropos as a singular agent of environmental change, the Anthropocene tends to elide the deep colonial and capitalist inequalities among humans that are integral to the very problematic that it purports to name (Todd 2015). Third, freighted as it is with the anxieties about disaster, the Anthropocene narrates itself as crisis, both repeating well-worn Christian and environmental tropes about the Fall (Swyngedouw 2010; Wakefield and Braun, this volume) and inducing a kind of political paralysis (Masco, this volume). When the authors in this book met we were all aware of these pitfalls, and many of us were anxious to find a way to remove the term from our conversation. And yet as our discussion progressed, we continued to find it useful, and we were less concerned with trying to critique or characterize it than with the way it served as a placeholder for a certain mode of questioning the contemporary. “Anthropocene” itself is a keyword, which serves the purpose not of smoothing over contention, but of linking epochal discussions in the social sciences with those in the natural sciences and environmental movement. Part, indeed, of what we find generative about it is its continued rawness, and the way it playfully denotes something seen and not-seen (de la Cadena 2015b). It is, as a starting point, the “scene” of our discussion (Pandian 2015; Lorimer 2017), but it is not a passive backdrop, because it keeps reaching into the discussion itself to undermine our language.³

This book is therefore neither a catalogue of horrors, nor an attempt to define fraught concepts. The authors come from a range of analytic traditions in political economy, science and technology studies, and critical theory, and they engage with concepts quite differently from one another. Instead, the volume brings together focused ethnographic studies of the analytic mood of the

Anthropocene, and the flurry of new and repurposed concepts that it produces. Of these, we focus particularly on the way “environment,” “infrastructure,” and “life” are suddenly finding new purchase in social analysis. These three terms are, I propose, keywords of the Anthropocene, words that, in the tradition of Raymond Williams (1976), are important precisely because their meanings are contested and changing, even while they continue to play a central role in defining the stakes of argument. In what remains of this introduction, I offer a brief genealogy of each of the keywords, and show why we envision the concepts of environment, infrastructure, and life rearticulating in such disparate locations.

Environment (the Continuing Growing Pains of Political Ecology)

The primary conceptual problem that the Anthropocene causes for social science is that it further unsettles the relationship between nature and culture, humans and nonhumans. That unsettling was well under way before global climate change became a household concern, and it serves as the undertone for decades of debate in political ecology. In the 1980s, political ecology was still a side branch of political economy, attempting to explore the way environments figured in dramas of social and political ecology (Orlove 1980). This followed with a decade in which the dominant position was to show the myriad ways in which nature and wilderness were discursive constructions (Descola and Pálsson 1996; Cronon 1995). Many of those questions are still relevant, and in this volume they often manifest in the crossings of objects from environment to infrastructure and back again. For instance, Ballesteros confronts the question of how environmental phenomena come to be objectified as natural resources (what she calls “infrastructuralizing”), and Muehlmann shows how even people, once classified as “natural,” become the embodied infrastructure of new kinds of trade. In Gordillo’s piece the possibility of an Argentine rurality is subsumed by a new global infrastructure he calls simply “The Metropolis.”

Even while critical political ecology has shown how discursive domains around the natural continually jump around, we are still in search of an adequate language for the ways that nature acts on its own. How fitting then that anthropogenic climate change should suddenly erupt from this epistemological impasse, a nature both social and terrifyingly antisocial. To be clear, what

makes the Anthropocene so conceptually unsettling is not that humans have never been faced with environmental disaster, but rather that those disasters have always appeared to have an intellectual outside, in the privileged halls of academia, from which they could be assessed using conventional categories of society and nature. Environmental problems and the people who suffered from them could always be localized, indeed often were in very predictable ways that silently reiterated colonial violence or deepened new vectors of class and racial inequalities.⁴ The conceit of the Anthropocene, by contrast, even while its effects are unevenly distributed, is its claim to reach everywhere, its promise to unsettle the condition of every life, and our scholarly attempts to grapple with it are at once part of its threat (Chakrabarty 2012; Morton 2013).

So far, discussion of the Anthropocene in the humanities has leaned heavily on actor-network theory and feminist science studies, which offer a toolkit for understanding the relationship between human knowledge and nonhuman actors. Actor-network theory, in its early iterations, gave us a blunt way of dehumanizing agency (Callon and Latour 1981; Law 2004) and of bringing into the purview of scholarly concern the different forms of construction at work (Latour 2005). Feminist science studies, by contrast, drew on a longer tradition of questioning the very category of agency (Braidotti 2013) and now offered new language for talking about ecologies of practice (Stengers 2010), relational intra-action (Haraway 2008; Barad 2007), and affect and care (Puig de la Bellacasa 2012; Hustak and Myers 2012; Tsing 2015). This broadened world allowed us to continue thinking through classic questions about politics and power, inequality and justice, but now with a broader set of relations at stake that are not or not only human.

But as the category of the human becomes less distinct, so too do the grounds on which the human claims to live, relate, and fight for justice. The concept of the Anthropocene, whatever else it does, expresses this beautifully: if humans have become a geological force, how does one differentiate ground from action? The Anthropocene amplifies a conceptual dilemma within environmental studies in general: as Morton (2007: 1) puts it, “when you mention the environment, you bring it into the foreground. In other words, it stops being the environment.” Not coincidentally, this problem of interpretation, of distinguishing objects from their surroundings, is also central to the recent literature on infrastructure.

Across the humanities and social sciences, infrastructure is suddenly a buzzword of the highest and most obnoxious order. Over the past ten years, dozens of new volumes have emerged claiming a stake in the redefinition of this old term, offering up new objects of analytic attention, a conversation in which many of the authors in this volume have been active participants.⁵ In this book we continue that conversation, not with a new program or definition, but rather to ask why infrastructure, in all of its dimensions, has become such a matter of concern in the first place.

Perhaps the most obvious reason for this is that already alluded to: environment and infrastructure share a great deal of conceptual territory, and the Anthropocene disturbs the distinction between them. Both terms straddle the terrain once held by concepts such as “context,” and each grapple to define the spatial extension of human action into that which surrounds, subtends, precedes, or silently conditions (Carse 2012; Hetherington and Campbell 2014). The classic way of distinguishing between them places human intention in time: the environment precedes infrastructure the way a landscape survey precedes an engineer’s design for a bridge, which itself precedes a bridge (Hetherington 2014). To put it crassly, in this formulation, environment is the infrastructure of infrastructure. But such a distinction no longer works when it is our infrastructures of global transportation and consumption that produce the anthropocenic environment on which infrastructures are built. Following that logic, we would have to say that carbon is the infrastructure of the infrastructure of carbon.

As material infrastructures fold in on themselves, it becomes all the more clear that infrastructure itself was always also an interpretive tactic. As Geoff Bowker (1994) famously argued, infrastructure is an analytic moment that happens precisely when one makes a distinction between figure and ground, where infrastructure appears to be the background to something else. The point, later taken up by Susan Leigh Star and others is that infrastructure only recedes into the background for those who are not busy building or repairing or analyzing it (Star 1999; Star and Ruhleder 1996). Infrastructural analysis, by extension, is the performance of a figure-ground reversal, what Bowker (1994) called “infrastructural inversion,” which brings the background to the foreground. In retrospect, we can think of all sorts of critical analyses as kinds of infrastructural inversion, in which, for instance, class relations, conditions of possibility, or semiotic structures are revealed as the infrastruc-

ture subtending cultural or social phenomena on the surface (Hetherington 2014). Classical anthropology, with its project of revealing the “context” of social phenomena, makes the same move, a figure-ground reversal in which an analyst claims to reveal the grounds for social behavior, and in so doing turns those grounds into a proper object of study, such as “society” or “culture.”⁶ Infrastructural inversion is always, therefore “critical,” in the sense that it attempts to lay bare the wires, pipes, and foundations of a phenomenon. But it is a critique that, once named infrastructural, is never transparent, always dependent on the position of the observer, and performed without guarantees. So it’s perhaps not surprising that infrastructural analytics emerges precisely at the moment when critique itself seems to be in crisis (Latour 2004b).

The crisis in critique that spurs the infrastructural moment is one of the resonances of the end of the Cold War, or the rise of neoliberalism. But infrastructural concerns resonate with Cold War histories in other ways as well. The mid-twentieth century marked a great expansion in human physical intervention on the global landscape, a continuation of what Brian Larkin (2008) calls the “colonial sublime,” in which the radical transformation of landscapes was a poetic enactment of imperial power. Indeed, the very distribution of cement and rebar came to characterize the uneven development of north and south, signposts of the very theory of progressive betterment that could now be taken to underwrite world history (Koselleck 2004; Harvey and Knox 2012; Mrázek 2002). To be sure, the story of development, and the way concrete comes to both mark and facilitate it, is by no means over. But development’s infrastructures began to gather new layers of meaning as the landscapes of the Cold War decayed in the late 1980s, and with them the ideas of progress that underpinned that historical period (von Schnitzler 2016; Anand, this volume). By the twenty-first century, Montreal’s succinct epitaph to the Kyoto protocol was also an epitaph to the concrete of the Cold War and to the very grounds of criticism itself. The history of progress seemed to be coming to an end.

The end of progress makes certain political projects harder to imagine, but it also provides space for the emergence of other histories and projects that development, humanism, and progress marginalized. If Montreal’s decaying concrete in the late twentieth century made visible the rise and fall of progressive internationalism, it also made visible the ongoing racial violence of settler colonialism. In 1990, another bridge made it impossible for Montreal’s settlers to forget that the land they lived on was stolen Mohawk

territory. At the time the island was taken by the French, Mohawks were forced to a small enclave on the south shore of the St. Lawrence River, at Kahnawà:ke. Kahnawà:ke had then been further reduced throughout the twentieth century by Montreal's infrastructural expansion—principally the construction of the St-Lawrence Seaway Canal, which expropriated the community's waterfront, and the Mercier Bridge, which bisected the reserve to connect commuters to downtown Montreal (Alfred 1995). In 1990, that same bridge became the site for one of many political inversions. In answer to a dispute in another Mohawk community, where white developers had tried to build a golf course over a forest cemetery, Kahnawa'kehro:non occupied the bridge. They drew such a disproportionate military response from the Canadian government that the ensuing showdown couldn't but stand as a spectacle for ongoing settler violence (Simpson 2014). In other words, two disputes over environment and infrastructure—turning a river into a canal and a forest into a golf course—also forced a reimagination of Montreal as colonial space. As such they could be thought of as prefiguring the anticolonial struggles over pipelines threatening the territories of the Standing Rock Sioux and Wet'suwet'en, among many others. These are the front lines of the Anthropocene, in which indigenous people not only block carbon-intensive infrastructures, but also challenge social theory, remaking histories of progress, colonialism, and carbon (Todd 2015; TallBear 2015).

The Anthropocene as infrastructural moment is one in which infrastructural inversion is itself inverted, and in which the political stakes of material structures and historical analyses fold into each other. In this volume, Masco argues we need to reclaim elements of progress and public investment in large-scale social thinking from the Cold War imaginaries that are currently in crisis. Jensen, by contrast, argues that we should pay more attention to the micropolitics of infrastructural experimentation, by which small interventions built by states, private companies, and international agencies have the capacity to multiply future possibilities. Zeiderman wonders whether the intertidal zones in Buenaventura, once reclaimed from the sea, now reclaimed by the sea, in fact offer us an opportunity for rethinking the submerged histories of humanism. If Kyoto is dead, each of these chapters argues that we need to think more carefully about what was salvageable in Kyoto-style thinking in a way that is both materially attuned and more deliberately inclusive of submerged histories.

Ultimately, infrastructural decay also sets up the final conceptual term for this volume, which interrogates the degree to which “life” needs to be thought beyond its human qualifications and its colonial universalism. In their chapters, both Carse and Myers suggest weeds as our point of departure in this question, weeds that grow among the cracks of concrete buildings, along the mown banks of a canal, and throughout the groomed spectacles of future life. As these two essays suggest, weeds can be read in radically opposing ways. For residents of the Panama Canal Zone, in Carse’s chapter, weeds are emblematic of the decline of progress. For artist Lois Weinberger, in Myers’s chapter, the indomitability of weeds stands in for some sort of hope, of resilience, and the perpetuity of life amid human control and destruction. Weeds complicate the temporalities of growth and decay, they live in the interstices between environment and infrastructure, and they are both unwanted (by definition), and the sign of life’s future.

The Anthropocene is weedy, not only because out-of-place plants grow up in the cracks of old mortar and cling to the bottom of tankers, but because it profoundly complicates the categories of life on which social science has for so long depended. The dissolution of a common academic understanding of life participates in the same plot that sees critique and infrastructure in decline. World War II may have created the conditions of possibility for the technological and material booms of the Cold War. It also facilitated a theoretical transition in the social sciences from eugenics and evolutionism to a slate of theories that treated cultural humans as radically distinct from biological humans. The distinction had of course a very long genealogy that can be traced back to Aristotle, and World War II in no way meant the end of biological reasoning in the social sciences. But the wide embrace of the cultural construction of gender and race among liberal academics produced an important shift, in which the autonomy of the social was not only a methodological prerogative; it was the basis of progressive politics.

Perhaps the most interesting effect of this shift is the way that it conditioned the emergence of Foucauldian biopolitics, which looked at the way that politics attempted to direct or capture “life itself” (Foucault 1990; Rose 2001). Taking over from eugenics, biopolitics is the arena in which late liberalism imagined how to build the infrastructures of the good life (e.g., Li 2009; Ferguson 2006). For better or for worse, the biopolitical model, in both its

progressive and its critical strains, has become increasingly weedy as the conventional separation of biology and culture break down once more. Now that plants communicate and rivers have rights, the specificity of human life and politics is once more in doubt.⁷

New strands of vitalism and “sociable life” are also about opening up our analyses to the complex interweaving of different relations that used to be categorized as social, biological, or physical (Hird 2009; Bennett 2010). In anthropology, where biology and culture have been most forcefully held apart, anthropologists are suddenly debating not whether but *how* life structures a specific relationship between biology, matter, and culture (Kohn 2013; Ingold 2011). In science and technology studies, the invigoration of Deleuzian vitalism, complex systems theory, and Whiteheadian pragmatism has gone along with the resurrection of the figure of Gaia as a way of characterizing planetary life force (e.g., Latour 2013; Stengers 2015).

Social movements concerned with food infrastructures, built environments, and biodiversity are increasingly invoking “life” as the baseline for a politics of resistance (Escobar 2008; Zeiderman 2013; Hetherington 2013). But here too the question of what life actually means is not at all settled. Indeed, while conservation-oriented approaches to the environment reckon with their underlying relationship to colonialism (e.g., Neumann 1998; West 2006), others struggle with their relationship to nativism, nationalism, and a place-based politics that doesn’t connect easily to the planetary scale of the Anthropocene. How can the “defense of life” be understood as simultaneously local and global, conservative and newly inclusive? And how can anyone claim to defend human life at a moment when we recognize the definitions of that life as part of the very things that are imperiling us in the first place?

Humans end, of course, not just in annihilation, but in ceasing to be other-than-weeds. The Anthropocene, as Anna Tsing (2015) puts it, highlights the “unruly edges” of human endeavor, the margins between the social and the natural, and the blasted aftermath of ecological violence in which weeds and scavengers thrive. We may want to seriously question the sudden proliferation of discourses of precarity and resilience that have recently made their appearance in the literature (see Masco’s chapter), but we can recognize them as symptoms of our own weediness; in ecological terms we are more like dandelions than like chimpanzees. Human life, so long qualified apart from other living beings, is suddenly reconnected—analogically, ecologically and affectively—with other forms of life (e.g., Helmreich 2009; Haraway

2008; Hustak and Myers 2012). Humans end as an infrastructural inversion, where our life projects are no longer human-life projects. The Kyotos to come will be more-than-human projects, this time explicitly.

Organization of the Book

This book does not propose answers to these questions, but it does hope to show a variety of paths in and out of them. Because the chapters that follow each grapple with the volume's central themes ethnographically, I have already done them some injustice by boiling them down to key terms. To make up for this, the book is organized in such a way as to bring out cross-currents and nuances in the way each of the authors encounters these concepts. The chapters are therefore divided into three parts, organized around one of the problems that emerged, not from the concepts themselves, but from the relation between concepts.

In the first part, "Reckoning with Ground," each of the chapters describes a moment in which some set of relations switches from environment to infrastructure. Together, the chapters recapitulate the point that infrastructure is both a material and an analytic move, often both a literal and metaphorical "ground." For Ballesterio, an aquifer emerges as infrastructure from the ground of indeterminate material relations as its function for human sustenance becomes clear. For Muehlmann, clandestine trade routes play on infrastructure's ambiguous relationship to knowledge, and people become infrastructural to the extent that they both facilitate and obscure the movement of goods. To end the part, Gordillo's chapter argues that the infrastructure of South American agriculture has ceased to be a local rural endeavor and became a global, urban one. In each case, the anthropocenic moment reconfigures ecological relationships as infrastructural ones and vice versa.

If in the first part we meet squelchy aquifers, indigenous fishers, and rural territories *turning into* infrastructure, in the second part, "Lively Infrastructures," we explore the kinds of beings that thrive on infrastructure's ultimate inseparability from the environment. The key metaphor here is the weed, which in Carse's chapter shows up as a plant out of place in the once "clean" grounds around the Panama Canal. In Myers's exploration of Lois Weinberger's weedy art installations, we are offered a way to think outside the staged gardens of the Anthropocene. In a reverse echo of Ballesterio's functional aquifer,

Anand shows how the dysfunction of Mumbai's urban plumbing allows water to regain its indistinct, nonhuman form.

The decay of modern piping brings us to the third part of the book, "Histories of Progress," in which four chapters explore the shifting temporality and politics of the Anthropocene. Two of the chapters are constructed around reclaiming human projects that seem to be imperiled. Zeiderman starts part III by arguing that rising tides offer an opportunity for reclaiming (submerged) humanism as a project of radical equality. Wakefield and Braun's chapter, about a project to create living tidal breaks in New York Harbor, shows how the contemplation of environmental catastrophe leads inexorably toward other lessons, that life as a progressive human project needs to reckon with other life projects. For Jensen, the failure of grand, public environmentalisms is a chance to think about more modest forms of infrastructural experimentation. For Masco, though, these small conceptual opportunities are not enough; we need to reclaim the idea of crisis as something that can spur our collective, infrastructural imagination.

In the end, this volume should be read as a modest proposal to use empirical studies of infrastructure and environment to think about the difficulties of contemporary life that are partially captured by the frame of the Anthropocene. As such it is also an invitation to extend the conversation in new research directions, toward new objects and dilemmas. Each of the chapters offers a way of thinking about critique, and of mobilizing infrastructure and environment toward new ways of conceptualizing human and other forms of life. Whether because of the "crisis in crisis" (as Masco puts it), or because new material and institutional arrangements open different future possibilities (as Jensen argues), the empirical study of moments in which infrastructure and environment become conceptual problems gives social scientists an entry to engage with the entanglements of present and future lives.

Notes

- 1 The acrylic covering on the geodome burned in 1976, and the hollow structure has stood since then on the artificial island built for the expo with the rubble excavated for the city's new Metro system.
- 2 I won't enumerate the literature here, but see Donna Haraway et al. (2016); Cymene Howe and Anand Pandian (2015); Jason Moore (2017); and Jedediah Purdy (2015), for starters.

- 3 See also the great collection of short essays entitled “Lexicon for an Anthropocene Yet Unseen” edited by Cymene Howe and Anand Pandian (2015).
- 4 I’m thinking here particularly of the long literature in “environmental racism” that traces the ways environmental harms are unevenly distributed (e.g., Bullard 1993; Checker 2005; Auyero and Swistun 2009; Martinez-Alier 1997; Nixon 2011; Harrison 2011).
- 5 These include Hetherington and Campbell (2014); Harvey, Jensen and Morita (2016); Anand et al. (2018); and Howe and Pandian (2015). See also Brian Larkin (2013).
- 6 This is particularly true of the Malinowskian school of ethnography (see Dilley 1999; Strathern 1995).
- 7 For two brief examples from popular media, see Nic Fleming, “Plants Talk to Each Other Using an Internet of Fungus,” *BBC News*, November 11, 2014, <http://www.bbc.com/earth/story/20141111-plants-have-a-hidden-internet>; “New Zealand River First in the World to Be Given Legal Human Status,” March 15, 2017, *BBC News*, <http://www.bbc.com/news/world-asia-39282918?SThisFB%3FSThisFB>.

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Part I.

Reckoning with Ground

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ONE. The Underground as Infrastructure?

*Water, Figure/Ground Reversals,
and Dissolution in Sardinal*

ANDREA BALLESTERO

As we stood in a circle, Joan sat on a bucket, notebook and pen in hand, ready to jot down the numbers that Fernando would eventually give her. We all looked expectantly into the small hole that William had carved out of thick, humid, and dark soil. William had poured fifteen liters of water into the hole. We stood ready to time the speed with which the water seeped down and disappeared into the vast subsurface world (figure 1.1). The formation we had sculpted out of empty space, liquid, and time lay peacefully, unaware of our presence, despite owing its existence to our laboriousness. Well, mostly to William's, since he dug the hole and carried the water container from the car into its temporary earthly receptacle. While we conversed, regularly looking down into the hole, the water level started going down very, very slowly.



Figure 1.1. Inscribing water's dissolution into the underground. Photo by the author.

We were witnessing how gravity patiently pressed water against layers of rock, clay, and soil that were considering whether to welcome water's intruding presence or push back to keep it at bay.

As we timed the duration of water's struggle to permeate the subsurface, the temporality of politics and the speed of the conflict that led us there that morning seemed to belong to a totally different register. That is, until all of a sudden, a pickup truck with about fifteen community members arrived to check on us. Somebody had alerted them that unknown people were doing unusual things in the area. The political atmosphere in Sardinal, the area we were at, made any atypical event suspicious, as the conflict over the potential use of underground water for "luxury" housing had reached a fever pitch.¹

When people jumped off the pickup truck and approached us to check on our "unusual" activities, there was a sudden shift in mood. "Ah, son de sas" (Oh, they are from sas), a woman in her forties said. I was relieved by the swift change. The aggressive, defiant, and mostly female bodies that confronted us loosened, turning into curious and inquisitive subjects asking for specifics about our presence. "When are these tests going to yield results? Are we

going to finally know if there is enough water? They can't take it if there is not enough for us! We will not let them rob us of our water!"

As we discussed the conflict, reflected on the global and local politics of water, and dissected the *longue durée* of structural economic inequalities in Guanacaste, the province where Sardinal is located, the water in the hole continued pressing downward. While Fernando, William, and I talked to our sentinels, Joan held the notebook, pen, watch, and measuring tape all on her own, while she recorded the speed with which water receded into the sub-surface and initiated its migration into the aquifer. After about half an hour of conversation, the water had seeped through the bottom and sides of the hole, and the women, children, and few men who had instructed us on Sardinal water politics left in the same pickup truck they had arrived in. Both figures, the combative community and the water, had dissolved into their backgrounds.

Our doings that morning followed a well-established protocol for preliminary infiltration tests, a set of procedures designed to measure the speed with which water dissolves into the ground. These tests are critical for determining how quickly aquifers recharge and how much water can be sustainably extracted from them, questions that were at the center of the whirlwind that enveloped the people of Sardinal, the aspirations of transnational investors, and the aquifer we were trying to understand that morning.

After packing our equipment and loading our cars, we continued to our next stop in the data collection route my coinvestigators had planned. We followed the same protocol in three different locations across the upper Sardinal Basin. Digging a hole, dumping water in it, waiting and taking notes on time and distance. No more neighbors came to supervise our activities, though. At the end of that day in 2009, we had started a new study to characterize—to “conceptually model,” hydrogeologists and courts would say—the Sardinal aquifer.

Our fieldwork that morning was not a singular event. Different governmental agencies had begun visiting Sardinal more often than usual about half a year before, when the tension between local residents and the water utility, AyA, began to escalate. By the time we were running our infiltration tests, the political environment was crisped. Just a few weeks earlier, the head of the water utility and the environment minister were prevented from delivering their speeches at a public meeting convened to discuss what was already known as “the Sardinal crisis.” Quietly, although angrily, the public officials had to listen to the complaints of the community as the discussion got more

and more heated until police officers awkwardly escorted the institutional representatives to their cars and then managed to drive off, but not before a couple of rocks landed on their windshields.

Maneuvering across a politics of time—delaying or moving forward legal procedures to their convenience—and a politics of space (Kirsch 2014)—verifying or disproving environmental or human harm—people involved in the Sardin case were caught in a dynamic of trust and mistrust. Tension escalated to its highest point when town residents saw the pipes that would move water fifteen kilometers from storage tanks to the Ocotal–El Coco coastal region. With their deep metallic darkness, the pipes embodied the depth of conflicting economic interests, different senses of morality, and the push of capital for the expansion of profit that entwined corporations, bureaucracies, and residents into an explosive hydrolithic arrangement.

Luckily, our infiltration tests were enfolded by a different kind of political appreciation. The governmental agency that Joan, William, and Fernando work for, SAS, is responsible for the study and planning of underground water in Costa Rica and is held in high esteem by many local citizens.² Generally, people perceive the information SAS produces to be fair, though many activists criticize the agency's inability to police the drilling of water wells more systematically. The technical resolutions and studies performed by SAS have been pivotal in approving or rejecting water use permits and construction licenses for projects planning to rely upon underground water in Costa Rica. The science SAS produces is structurally shaped by the politics of public interest. The institution's everyday work is grounded in an understanding that the facts it produces are always much more than mere unequivocal truths, an awareness that many public officials share (Ballesterio 2012a; Ballesterio 2012b). The tests we performed that day in 2009 were no different. Commissioned by an interinstitutional committee that included AyA, the Environment Ministry, and other local and state organizations, our measurements would help determine whether the plan to supply underground water to the booming tourism development in the area was viable.

A year earlier, opponents to the project identified several gaps in existing knowledge about the aquifer. A major one, singled out by the court that ultimately mediated the conflict, was a “most alarming missing piece.” According to the courts, project proponents lacked knowledge about the size, temporality, movement, and qualities of the aquifer. They lacked an adequate “conceptualization” of the aquifer. Despite the construction work, infrastructural planning, and international marketing already unfolding, the aquifer was still

conceptually unknown, its technoscientific material qualities undetermined. Coming up with its technical conceptualization required not only activating infrastructural and environmental imaginaries but also mobilizing a series of legal and technoscientific tools—work permits, water use licenses, mathematical models, and calculation of an extraction rate. The court hoped that combining legal imaginaries with technical instruments would transform underground water, an entity with blurred boundaries, into a clear figure.

But aquifers can be particularly uncooperative when humans try to clearly delineate them. Few environmental entities seem so unattached from the density of life that saturates the biosphere. Due to their location under the surface of the earth, aquifers occupy a peculiar symbolic place. Their invisibility to the naked eye makes stark how embedded aquifers are in the specific political and scientific histories through which they become recognizable. At once fundamental to life and hidden from it, we often make aquifers thinkable as infrastructures; as reservoirs of water for human use.

Infrastructures have been theorized as arrangements with the capacity to produce and circulate value (Marx 1976), as entities with the power to bring about social meaning (Jakobson 1980; Kockelman 2013), and as matter with the capability to move matter (Larkin 2004). Privileging functional capacities, these infrastructural concepts have also permeated environmental imaginaries. When taken as infrastructures, environmental entities are conceived via their function: maximizing, minimizing, interrupting, or transforming life. In these function-centered imaginaries aquifers take the form of receptacles that store water; they are described as tank-like entities sitting in pause until humans use them according to our needs and desires.

But on top of these functional capabilities, infrastructures are also powerful material forms where social consciousness about desired futures and the order of political life are lived, opened up, or closed off (Coleman 2014). So when we take an aquifer as an infrastructure, we also create a space where the principles along which people organize political, material, and epistemic orders can be accessed and clarified not only analytically but also practically, in this case both by the Sardinian neighbor and the anthropologist alike. In this sense, when people privilege function as they trace the ways in which an aquifer is turned into infrastructure, we can access some of the ontological assumptions inscribed in such figuration. But it is important to not lose sight of the fact that when those assumptions become apparent, the limits and excesses that come with them are also revealed. In the case at hand, the ways in which people attempt to make underground water a clear, functioning

infrastructure make apparent the difficulties in doing so, the ambiguities of dissolution that keep water embedded in its grounds, and the tendency of an aquifer to dissolve, troubling, though not necessarily preventing, our aspiration of turning it into a clearly defined infrastructural object.

This chapter is concerned with the possibility of knowing aquifers without reducing them to an infrastructural function. It highlights the moments when it is difficult to bound the aquifer as such. But I will not argue for a radically different ontological order in which aquifers are alternative earth beings (see, for example, de la Cadena 2015a). Instead, my interest is to trace the moments when the Sardinal aquifer resists being “infrastructuralized,” a process that troubles efforts to single out legally and technically the function that an entity plays in sustaining life, more often than not, human life.³ This process of infrastructuralization depends, to a large extent, on the possibility of separating figure from ground, an infrastructure from its background. Just like the water we poured into the hole we carved for our infiltration tests, underground water has a material tendency to dissolve; to confuse figure and ground. Once it moves out of sight, water becomes an aquifer that in Sardinal is activated through lack of employment, agricultural practices, state science, and transnational capital.

Attending to that material and political proclivity to dissolve requires that we think about the dissolution of water into underground worlds and about the dissolution of angry residents into historical space. In Sardinal, dissolution was most evident when data couplings broke and returned numeric accounts of what an aquifer is to the materiality of subsurface structures; when assumptions about entrepreneurial well-being were questioned and replaced among contradicting ideas of collective life grounded in local histories; when geologic scales were revealed to be arbitrary, turned inside out, and shown as nested forms that could not be separated from each other. Rather than taking these moments as minor events with little significance, I want to stay close to them. I want to dwell in them because they challenge the seamless separation between the aquifer as a figure and the subsurface as its ground. Together those moments pose questions about the very limits of figure/ground separations as means for infrastructural analysis. They remind us of the arbitrary, yet inevitable, cuts we make as we single out an infrastructure as a figure and invite us to attend more carefully to the alternate possibilities inscribed in those cuts.

To trace this project I follow the public life of the technolegal struggle to define the Sardinal aquifer. My purpose is not to offer an ethnography of scien-

tific practice that documents all the existing, but left aside, scientific knowledge about Guanacaste and the watershed where Sardinal is located. Instead, I am interested in the moment when select technoscientific reports, with particular visions of aquifers, are introduced into the legal struggle to turn the aquifer into a viable infrastructural figure. In what follows I remain attentive to those technoscientific reports and how the knowledge (the figures) they propose dissolve. Exploring the trouble those moments engender in the heart of the bureaucratic and technoscientific apparatus short-circuits any smooth reliance on infrastructure to make sense of the “environment.”

The chapter begins by thinking through the presumptions of figure-ground reversals and their relevance for infrastructural analysis. I then provide some historical background to the Sardinal underground water crisis and its connections to the expanding luxury real estate boom that has swept over certain areas in the province of Guanacaste. With that political and bureaucratic history in place, I then return to the technical challenges of figuring the aquifer out from its background and to the ontohistorical stickiness that results from its tendency to dissolve. I do so by looking at two technical studies attempting to conceptually define the aquifer and by following some of the reactions they generated. I conclude with some thoughts on the relation between functional imaginaries, figure/ground reversals and the possibilities these open for alternative underground figurations.

A Figure and Its Ground

In his groundbreaking study of knowledge production infrastructures in the oil industry, Geoffrey Bowker (1994) proposed a shift in our analysis of how major scientific and technical innovations develop. Instead of chronicling the story of a technological innovation by focusing on how an “inventor,” “scientist,” or collective went about developing their technology, he argued that we needed to redirect our attention toward the standards, norms, and other techniques that made it possible to work on the generation of a new technology in the first place. He showed how bureaucratic and organizational tools—such as timelines, memos, and standards—create the necessary administrative, technical, and bureaucratic infrastructures for the figure that we finally come to recognize as an invention to emerge. Turning our attention to that infrastructure, Bowker argued, performs an analytic approach he called “infrastructural inversion.” With Susan Leigh Star, Bowker (1999: 34)