Roadsides

Infrastructural Times

Edited by: **Agnieszka Joniak-Lüthi**

Roadsides is an open access journal designated to be a forum devoted to exploring the social life of infrastructure.

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Editorial

We are delighted to present the first collection of *Roadsides* – a collaborative online publishing platform designed to be a forum devoted to exploring the social life of infrastructure. We understand the title *Roadsides* as a metaphorical proxy for all sorts of engagements arising alongside roads, rail tracks, pipelines, border fences, airports, houses, dams, and other kinds of infrastructure as they are imagined, contested, constructed, and maintained, and as they fall into disrepair. The platform offers space for reflection, for engaging in conversation with others, and a place to test new ideas before developing them into full-length articles and books.

The aim of *Roadsides* is to consider the work that infrastructure does culturally, politically, and socially, as well as the labour that goes into the making of infrastructure itself. We are also interested in the social biographies of materials, discourses, technologies, and knowledges out of which infrastructure is fashioned. A further aim of this platform is to understand how social relations are articulated through infrastructure, become layered into it, and produce new publics and subjectivities. The ways in which humans engage and disengage infrastructure, as well as how infrastructure (dis)engages humans will be at the core of the debate. At the same

time, we want explicitly to embed infrastructure in topography and climate, and to trace its trajectories through other-than-human temporalities. Devoting space to discussing and further developing an ethnographic methodology of infrastructure research is yet another goal for which we establish this platform.

In addition to providing space for exchange among students, academics, and non-academics, space that is currently still in-the-making, we will publish two curated thematic collections of texts a year, each comprising several individual contributions. The aim of each contribution will be to introduce one central argument or piece of analysis, and to illustrate it with an ethnographic vignette, photographs, drawings, video clips, and the like. The texts are meant to be short – around 1500 words each. As well as texts, we welcome multisensory contributions combining word, image, and sound. The intention of *Roadsides* is to create a graphically pleasing and, format-wise, lighter forum for exchange than a typical academic journal. Calls for contributions to thematic collections will be put up on the website twice a year.

Roadsides is a collaborative project. There is no editor-in-chief but an editorial team of eleven peers, among whom the position of managing editor rotates for each collection. The editorial team and guest co-editors oversee an open, double peer-review process to ensure consistently engaging and high-quality inputs, as well as timely publication on the website. *Roadsides* is a non-commercial project. The platform and the e-journal are funded by the Swiss National Science Foundation and the University of Zurich.

It has been less than six months since we started playing with the idea of creating this platform in the fall of 2018. The process of learning about digital publishing has been highly engaging. After these first few hectic months, we are delighted to present the initial collection of *Roadsides* entitled "Infrastructural Times" and curated by Agnieszka Joniak-Lüthi. For the upcoming collections we have a fascinating line-up of themes relating to infrastructural labour, the sounds of infrastructure, archival lives of infrastructure, logistics, and architecture – so stay tuned and consider subscribing to our publication alert!

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Introduction:
Infrastructure as an Asynchronic Timescape

Agnieszka Joniak-Lüthi

Infrastructure engages time, and vice versa, in countless ways. Thinking infrastructures as "complicated pleated arrangements," extensive, even if inconsistent, "fractal" orders (Harvey, Jensen and Morita 2017: 13) and as an aspirationally planetary system, draws attention to temporalities related to the systemic quality of infrastructure. This systemic quality underpins the role that infrastructure has been given in the linear temporalities of the modernization theory, progressivist historiography and various colonial projects (Bowker 2015). A different perspective, in which a road or a dam is not a module or "eye" in a chain of infrastructural links, but a specific place – a lifeworld – redirects the spotlight to a plethora of other temporalities which are specific to the environment and the social-political terrain in which any road, dam or airport is embedded. In this perspective, each infrastructure is a unique temporal event (Massey 2005: 138-42), that is, the ways in which an infrastructure "is" is contingent on the place and time in which it is embedded. Hence, as every human is part of humanity, every road, for example, is part of the planetary infrastructure order. However, the ways in which they are elements within these larger systems are contingent on a whole range of locally specific conditions. In this collection of short interventions, our initial aim is to focus on how each tunnel, border fence and other

Building the past for the future tourists: "Old town" in Kashgar under construction, 2011.
Photo: Agnieszka Joniak-Lüthi.

more or less temporary items of infrastructure "travel" (Clifford 1992) across such spatial and temporal scales. At the same time, the authors pay particular attention to how infrastructure and time become entangled in locally specific ways at their field sites – in the Canadian Arctic, in Tajikistan, in India, at the eastern borders of the European Union, in Switzerland and in England. As a collective effort, these texts intend, first, to show a few examples of the variety of temporalities that make and unmake infrastructure. Second, the aim is to advance an argument that, perhaps counterintuitively, infrastructure is inherently lively and fragile as it is always a complex web of multiple temporalities. Third, focusing explicitly on those temporalities should provide food for thought in terms of rethinking infrastructure as an asynchronic "timescape" (Adam 1998).

Analytic philosophy differentiates between "A-series time," that is, time as perceived by humans through subjective, embedded relationships, and "B-series time," which relates to time as an incessant physical multiplication (Hodges 2008). In contrast to natural scientists, social sciences and humanities scholars have focused on the former, discussing the sociality of time, its representations, politics, geometry, economy and the ways it figures in epistemology (Evans-Pritchard 1939; Fabian 1983; Gell 1992; Munn 1992; Bear 2016). When thinking infrastructure through time, I take inspiration from Tim Ingold's (1993) elaboration on the temporality of place. A place is, in Ingold's understanding, the accumulated experience of an ongoing engagement between human and nonhuman forces. Paraphrasing Ingold's proposition, I suggest thinking infrastructures such as roads, tunnels or kitchens as *places* in which specific social relations intersect and accumulate over time, forming unique social-material-political

Returning from the pasture in the evening: Animal commuting rhythms on state-built infrastructure, northwest China, 2011.
Photo: Agnieszka Joniak-Lüthi.

terrain (Massey 1994). In this collection, the authors examine specifically the multiple temporalities that reveal themselves upon infrastructural encounters – temporalities that are multi-vectoral, often significantly out of sync and which multiply at different speeds. It is thinking through infrastructures as specific bundles of relationships that accumulate over time and thus make each infrastructure embody a different thing at any given moment that facilitates their understanding as inherently lively.

Numerous engineering studies have considered the difficulty of matching the time horizons of various materials used for construction, such as asphalt and concrete (Chiu, Hsu and Yang 2008), while social scientists have elaborated on the social-political consequences of neglecting these materials' lifespans or on the protracted environmental effects of infrastructure (Flower 2004; Carse 2017). The argument here builds on those studies and goes a step further, proposing to think infrastructure as a "timescape" (Adam 1998). Barbara Adam's notion of the timescape, which stresses the asynchronicity between the temporalities of the environment and, for instance, industrial food production, is a helpful heuristic tool for incorporating multiple temporalities, both human and nonhuman, in one analytic frame to highlight their mutual entanglements. The notion of timescape allows us to reconsider infrastructure through the time horizons, lifespans, rhythms and cycles of the environment, materials, capital, humans, discourses, technology, the state and other agentive forces that make and unmake it. For example, asphalt used in road construction has its own design lifespan, which is destabilized through the temporal cycles of ecosystems and climate. The capital necessary for construction and maintenance is entangled in the temporal cycles of its turnover and, in countries such as China, where I conduct my research, depends on the time horizons of bureaucratic appointments of party and government cadres who determine where and for how long the capital flows. This capital is further dependent on the strategic goals of the state, which have their own dynamic temporalities. Construction companies also run on their own rhythms of profit, which are additionally bound to investment priorities set by particular national agendas. Yet another temporality that affects infrastructure is geological and climatic

deep time (Irvine 2014), which becomes visible when long-term time horizons are considered. For example, the extraction of crude oil, which has fuelled a specific kind of infrastructure construction worldwide (Appel 2018) indexes extensive planetary temporalities that contrast sharply with the current pace of resource consumption. Other crucial components of most infrastructural timescapes are the temporal cycles of humans living along roads, railway tracks and pipelines, the complex temporality of their memories, the rhythms of the businesses that live off infrastructure (Klaeger 2012), and the specific temporalities of repair and maintenance work.

Thinking infrastructure and time together makes clear once again that construction alone does not assure connectivity and "flows." Understanding that every infrastructure is an asynchronic timescape indexes the inherent fragility of a connectivity that can only emerge when these multiple temporal relationships are, more or less successfully, synchronized in the work of construction, maintenance and mundane utilization. The omnipresent processes of ruination and decay reveal the challenge of this task – a challenge that results from the fact that each infrastructure is not only itself a bundle of relationships but also connects to a plethora of other relationships on which it depends and which it enables, transforms or severs (Campbell 2012; Joniak-Lüthi, forthcoming).

In *The Infrastructure Toolbox*, Geoffrey Bowker (2015) posits that infrastructures do not have "plotlines," the "temporality that we associate with much historical storytelling." This leads him to conclude that "infrastructures do not inhabit human lifetimes." The contributions to this collection appear to suggest something else. They rather

Arrested "flows:" Waiting for a bridge to be repaired, Xinjiang 2011. Photo: Agnieszka Joniak-Lüthi.

show the ways in which human and nonhuman temporalities become entangled, discussing how the asynchronicity of the relations that make infrastructures affects the lifeworlds of people who live with and along them, and also how the sediments of earlier relations impact the social life of infrastructures in the present and in the futures that they are imagined to embody. For example, Ignaz Strebel, Moritz F. Fürst and Alain Bovet demonstrate how time is perceived by maintenance workers in Switzerland as highly intersubjective, with a functioning water infrastructure being "a collective endeavour over time" between the owners of buildings, tenants, maintenance workers and other actors. Next, Francisco Martínez and Tarmo Pikner's contribution takes us to the very different ethnographic setting of three borders: between Georgia and Abkhazia, Georgia and South Ossetia, and Estonia and Russia – to observe how geopolitics translates onto highly unstable infrastructural forms that affect the cycles of agricultural work, fishing, commuting and settlement. Carolin Maertens, in the following contribution, leads us to the southeastern border of the former Soviet Union, to analyse the visit of Tajikistan's President Emomali Rahmon to the Wakhan Valley as a "temporal event." Like a powerful lens, this visit reveals highly divergent temporalities: the future-oriented vision of the president, an extraordinarily rich potato harvest that happens to ripen perfectly in time for his visit and, on the other hand, crumbling infrastructure and the feeling that modernity has in fact already happened – in the past. Next, we have three contributions that look at infrastructure in relation to the larger temporalities of geology and climate. Mabel D. Gergan discusses the entangled temporalities of geological science and infrastructure construction in India, focusing in particular on "geological surprises" – that is, the ways in which the "young" Himalayan terrain interferes in state plans of dam construction. In the following essay, Mia M. Bennett walks us through the suspended reality of the polar day and ponders how things thought of as permanent, such as permafrost, have turned out to be much less than that in the Canadian Arctic. As people dig ever deeper into the thawing cryosphere, Mia wonders whether a return to mobility might not be a better option. In the last contribution to this collection, Richard D. G. Irvine encourages us to pay attention to the time-depth of the terrain beneath the A14, a major road in east England. Built on the route of a Roman road and skirting the subsiding Fens, recent construction also uncovered the 100,000-year-old remains of a woolly mammoth, thus revealing very different environmental pasts. Encounters with deep time along the A14 make us pause to consider the extensive temporalities that we are part of but tend not to perceive, being overwhelmed by the much "noisier" cycles of labour, capital turnover, extraction and politics.

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Making Time in Maintenance Work

Ignaz Strebel, Moritz F. Fürst, and Alain Bovet

Infrastructure, in a simple (though somewhat flawed) formulation, refers to the prior work [...] that supports and enables the activity we are really engaged in doing.

Slota and Bowker (2017: 529), emphasis added.

In engaging technologies and the built environment within the social sciences, there have increasingly been appeals to escape what Arjun Appadurai calls the "trap of trajectorism" (2013: 223) guiding a great many narratives of socio-technical change, by more thoroughly examining the intricacies of time and temporalities in our collective interactions with science and technology, and recognizing their many and diverse "temporal textures and choreographies" (Felt 2016).

This proposition seems particularly relevant when we consider the rhythms, cycles, rituals, (a)synchronicities, and time horizons of infrastructural configurations. The

modernist "infrastructural ideal" (Graham and Marvin 2001) is all too often one of progress and evolution after all, and frequently linked to understanding developments over time in terms of linearity and coherence. What the modernist ideal makes provisions for are networks that evolve into publicly owned services available to everyone at any place. The modernist ideal understands infrastructure gladly as a matter of moving through a directed, systematic series of technological and innovative *additions* that make up its evolution.

Science and technology studies remind us that such "evolution" is not linear. For Star and Ruhleder (1996), infrastructure evolves in a modular fashion and is never built in one go. Neither is it built from one central place nor by one single institution or person. Such modularity is instructively visualized in Thomas Hughes' classic study *Networks of Power* (1983). Here, a series of monochrome schema reproduces the historical evolution of the Pennsylvania electricity network in 1900, 1910, 1920, and 1930. Until 1930, an uncounted number of distributed power stations and local networks were connected in a unified and cohesive electricity system that covered the entire state of Pennsylvania. The picture of modular evolution is even more complicated, though, when Stewart Brand, in his book *How Buildings Learn* (1994), elaborates on a hotel building on the seafront at Popham Beach, Maine. As he places two photos taken 86 years apart (1905 and 1991) side by side, the degradation of the building is made clearly visible. Here, modular evolution seems to move away from the progressive understanding of linear addition and upgrading; subtraction and downgrading become relevant parts of the modularity of infrastructure. Such accounts produce an awareness of more elaborate relations to time than trajectorism provides.

Important to this reconfiguring is an understanding of an infrastructure that "advances" in time not only through adding or demolishing new and old parts but through a multiplicity of other engagements, such as investment, maintenance and repair, adaption, misuse, or neglect. In the case of the Popham beach building, the absence of continued upkeep (maintenance) is the main driver leading to its downgrading over the years. Once we take "infrastructures-in-use" (Shove 2016) into view, it makes sense to not set progress or stagnation as the sole configurators of infrastructural time. Rather we would think of infrastructure "as a moving modulator regulating different intensities of engagement, redirecting users' attention, mixing and putting people together, concentrating flows of actors and distributing them so as to compose a productive force in time-space" (Latour and Yaneva 2008: 87). Instead of asking how infrastructure moves from one state to the next along a single progressive timeline, this mini-programme invites us to wonder when infrastructure is (Star and Ruhleder 1996: 114), at what places, for whom, and how. Studying practices of repair and maintenance work opens up possibilities to understand how time is mobilized and brought to bear by different actors within infrastructural settings.

"Prior work" revisited: How time is produced in a maintenance setting

In what precedes, time is addressed from the perspective of its effects on infrastructure. But while these effects can take several forms, time itself nevertheless

appears as an external and stable variable. Such a reification of infrastructural time can be avoided if we pay attention to what ethnomethodologists call "perspicuous settings" (see e.g. Garfinkel and Wieder 1992; Garfinkel 2002) – in this case, situations where time is actively produced by those involved in infrastructure work. In such settings, time is intersubjectively oriented to, defined and established as relevant, and consequential for the infrastructure at hand. In other words, and inspired by Lynch and Bogen's (1996) study of the endogenous production of historicity in the Iran-Contra Hearings, we can treat the historicity of the infrastructure as first and foremost a practical concern of its parties and practitioners.

To illustrate this aspect of infrastructural time, we draw from our studies on the work of caretakers as professionals in charge of housing infrastructures in Switzerland (Strebel 2015; Sormani, Strebel and Bovet 2015; Bovet and Strebel 2019). Among numerous ways in which time matters to the participants in these settings, we can first mention the retrospective-prospective orientation of repair interventions, where the repaired thing is compared to how it was before it failed, but also anticipated in its future, post-repair, uses. For example, when the caretaker M. invites a tenant to manipulate a repaired tap, he warns him that "it's still running a little hard because it has new joints in it." This formulation acknowledges that the tap is not restored to its initial state but also promises that it will improve over time. In other words, the tenant is asked to give time to the repaired tap.

While in the previous case, time remains a variable external to the intervention, it can also become a defining and internal aspect of repair. We have found several instances where a central concern of the caretaker is to know who intervened before him in the housing infrastructure. This concern is institutionalized through the increasing requirement to protocolize interventions into an infrastructure, which

The tenant is asked to give time to the repaired tap.
Photo: Ignaz Strebel.

makes available a record of what was repaired or maintained and by whom. In the absence of such a protocol, the diagnosis is part of the situated work that prepares for the intervention. Take, for example, E., a caretaker working full time for a real estate agency, who enters the flat of a family who had called him to let him know that there is hardly any water coming out of their bathroom taps. E. goes into the bathroom and begins working on the aerators on the faucet. As this is not success-ful, a few moments later he moves to the kitchen. The tenant informs him that "less and less water has been running since this guy [a sanitation technician] mounted that." E. recognizes that someone else has worked here before by mumbling, "Yes, he didn't open up there" and pointing at the main water tap for the flat. With this conversation, the tenant and E. not only immediately establish the continued func-tioning of running water as a collective endeavour over time, but also acknowledge its complicated temporal configuration, going against what would be the common-sense "temporal sequence" of a maintenance intervention (and, thus, of the temporal unfolding of infrastructure): It is not simply a breakdown that has "occurred" and is now followed by a repair. Rather, someone else maintained this faucet *before*, and it broke down *after* such work, and because of it. In what follows, E. speculates that through talking to that previous technician on the phone he will eventually be able to diagnose and fix the problem.

Conclusion: Time as an endogenous property of doing infrastructure

Time and the temporalities of infrastructure are not only conceptually relevant in understanding socio-material relations, but also of very practical concern to any members of society engaging in such relations. We have shown how infrastructural time can not only be pointedly alluded to through social analysis (as in the quote from Slota and Bowker above), but how remarks of a similar nature might in fact actually be mobilized and made relevant in intersubjective orientation towards an infrastructural configuration (reference to "prior work" is a very common interactional feature employed in maintenance interventions). Far from being solely a concern of social theory, or of practices of city planning and policy, time is also an endogenous property of the work that goes into the continuous doing, redoing, and undoing of infrastructure, produced in mundane, everyday situations of socio-technical engagement. Studying repair and maintenance work reveals that the production of infrastructures depends on "the coordinate nature of time" (Crabtree, Rouncefield and Tolmie 2011: 98). What we have discovered when looking at building caretaker work is that they use "time and temporal artefacts to coordinate the timely accom-plishment of work" (ibid.). The manifold temporal choreographies or the "endless dance of maintenance" (Denis and Pontille 2019: 170) are not imposed from the outside of such work by a time schedule or by step-by-step instruction; rather, they are internally produced through such work, always in rhythm with the next move that needs to be made.

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The Infrastructural Side Effects of Geopolitics:
Fortuitous Socio-Biological Modifications to Three European Borders

Francisco Martínez and Tarmo Pikner

Borderlands are often presented as political landscapes characterized by fixed infra-structures that help to regulate who comes in or out of a country. In this brief essay, however, we put the focus on the triangle of (geo)politics, nature, and infrastructure by exploring what kind of socio-biological entanglements are generated along three newly established borders. These entanglements will help us understand certain aspects of how temporal regimes and socio-material arrangements are embedded in border areas. We provide snapshots of roads at the Georgian–Abkhazian borderland, the mobile frontier fences between Georgia and South Ossetia, and both vernacular and official bordering practices at the water reservoir along the Estonian–Russian border. None of these frontiers existed prior to 1991. In all three cases (situated at the periphery of Europe), geopolitical changes are perceived as disturbances marking a much longer formation time.

A liquid border on fire

*The road through the <u>Gal/i district</u> requires continuous zigzagging to avoid
potholes, and the landscape shows a succession of burned-out houses and
skeletons of buildings. At times, the marshrutka is surrounded by cows, which
would have been able to outrun us if there had been a race. One can tell that
gunpowder has been used here, but also that there has been a lack of main-
tenance in recent years.*

Field note by Francisco Martínez, 11 February 2010

The Enguri River, or more exactly the bridge that crosses it, functions as a de facto border between two states: Georgia and the breakaway state of Abkhazia (independent since 1999, yet not recognized internationally). This frontier does not appear on any map, but nonetheless it conditions the life of the neighbouring district of Gal/i[1]. On the northern side of the bridge, the only road providing access to Abkhazia from the south begins, with the name of the district shown in Russian, English, and Abkhazian, but not in Georgian.

Approximately 50,000 people live in Gal/i, most of them Mingrelians who returned to the area after the civil war in Georgia of 1992–1993, which was followed by further conflict in 1998 and 2008. Whereas previously it took locals half an hour to travel to Zugdidi, now it takes several hours. Even worse, only those who hold an Abkhazian passport can work in Gal/i, and just 10% of Mingrelians possess one.

Locals remain in a liminal, in-between condition due to the failure of socio-political relations between Tbilisi and Sukhum/i[2]. This ultimately appears in the form of potholes, material decay, and crumbling infrastructure. Potholes are entropic affectations of time; they accelerate destruction much like fire. Potholes are also physical manifestations of a lack of sovereignty as well as a paucity of functioning state structures (Martínez 2019). In this case, the time regime and material arrangements of the borderland are conditioned by socio-political failures.

Mobile border in Khurvaleti, July 2015.
Photo: Francisco Martínez.

*Cows next to the boundary
in Dvani, July 2015.*
Photo: Francisco Martínez.

*Road block in Dvani, July
2015.*
Photo: Francisco Martínez.

*Field on the border, July
2015.*
Photo: Francisco Martínez.

An ethereal border finds its ground

Now we go to Dvani and Khurvaleti, in the vicinity of the de facto border between Georgia and South Ossetia, to see how new geopolitical lines alter lives and landscapes. There is no distinct border here; rather, we find a mobile and, in some places, invisible boundary that sometimes takes shapes and makes itself perceptible.

Russian soldiers first started putting up fences in this area in August 2008 after the war, zigzagging their way through fifteen Georgian villages and cutting people off from their livelihoods and, in some cases, water supplies. In Dvani, a village of 1,000 inhabitants 90 kilometres away from the capital of Tbilisi, Russian and Ossetian border guards (the non-recognized independence of the latter depends on Moscow's support) erected barbed wire fences to mark the new border in September 2012. Yet, they did this half a kilometre deeper into Georgia than the previous administrative boundary line, cutting off farmlands and a cemetery. Russian and Ossetian troops still occasionally creep out after dark to move the unofficial boundary farther into Georgian territory, even if just a few yards. The makeshift fences of plastic and barbed wire are easy to move.

Concrete barriers block the roads in some places, whereas in others the boundary remains unmarked. Cows and sheep often get stranded on the Ossetian side, and when Georgian farmers go out into their fields, they might discover that the fence has been moved, turning them into geopolitical pariahs readily kidnapped by the Ossetian border police. "I myself have taken such a 'forced holiday' in Tskhinvali [on

the Ossetian side] twice while working in my own apple orchard," the local farmer Zakaria explained in the summer of 2015. Overall, almost a thousand Georgian citizens have been detained for "illegally" accessing their fields, pastures, and woodlots. As the land grabs/borderization continue, despite the European Union's monitoring mission in the region, many abandoned farms in the area revert to scrub. The temporal regime of politics has thus altered local farming.

A waterline that becomes a borderline

Since Estonia regained its independence in 1991, after the demise of the Soviet Union, the Narva River has marked the border between the Estonian Republic and the Russian Federation. In 2004, it acquired additional geopolitical meaning as the EU and NATO boundary, once Estonia became a member of these transnational institutions.

For more than 150 years, the water-rich Narva River has been pushed via infrastructure into diverse circuits, contributing to modern ways of living. Narva's hydropower previously fed Kreenholm, a large textile industry complex along the western bank. When the Estonian town of Narva on the western shore and Ivangorod on the eastern side were still a twin-town in the Soviet Union, they shared a water system of dykes, channels, locks, pumps, and pipes. After 1991, joint use and ownership of the once commonly held infrastructure was no longer possible, and both figurative and infrastructural distances grew along with the political ones (Jauhiainen and Pikner 2009).

Guennadi in "Narva Venice", July 2013.
Photo: Tarmo Pikner.

In the 1950s, the Soviet Union constructed a dam on the Narva River, creating a reservoir. Today, forty out of the basin's total 191 square kilometres belong to Estonia. The international boundary, drawn across the reservoir, is invisible to the human eye, yet it becomes manifest in the practices of accessing and maintaining the water supply. For example, the dam is partly located in Estonian territory, but it is owned
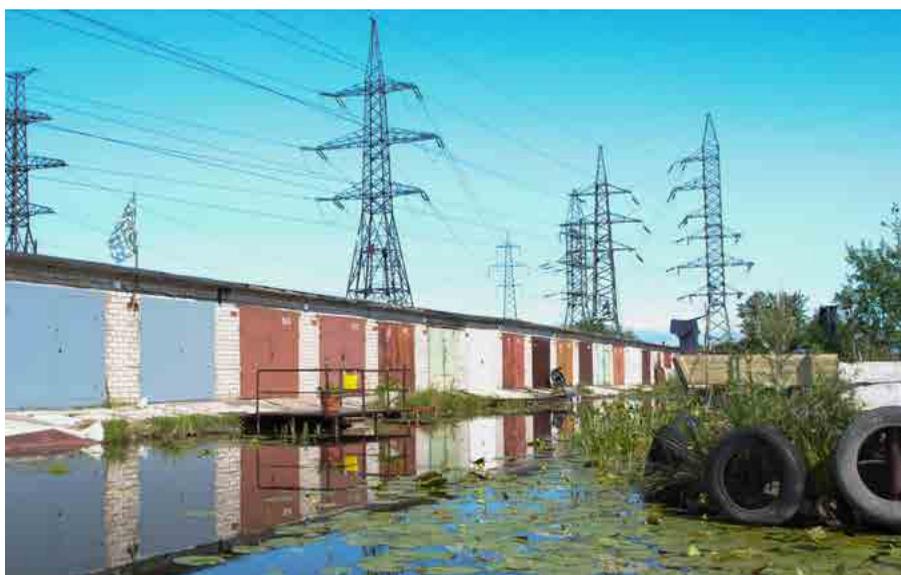
View of "Narva Venice" from canal, July 2013.
Photo: Tarmo Pikner.

The Narva Reservoir dam and the Kreeholm textile factory, July 2013.
Photo: Tarmo Pikner.
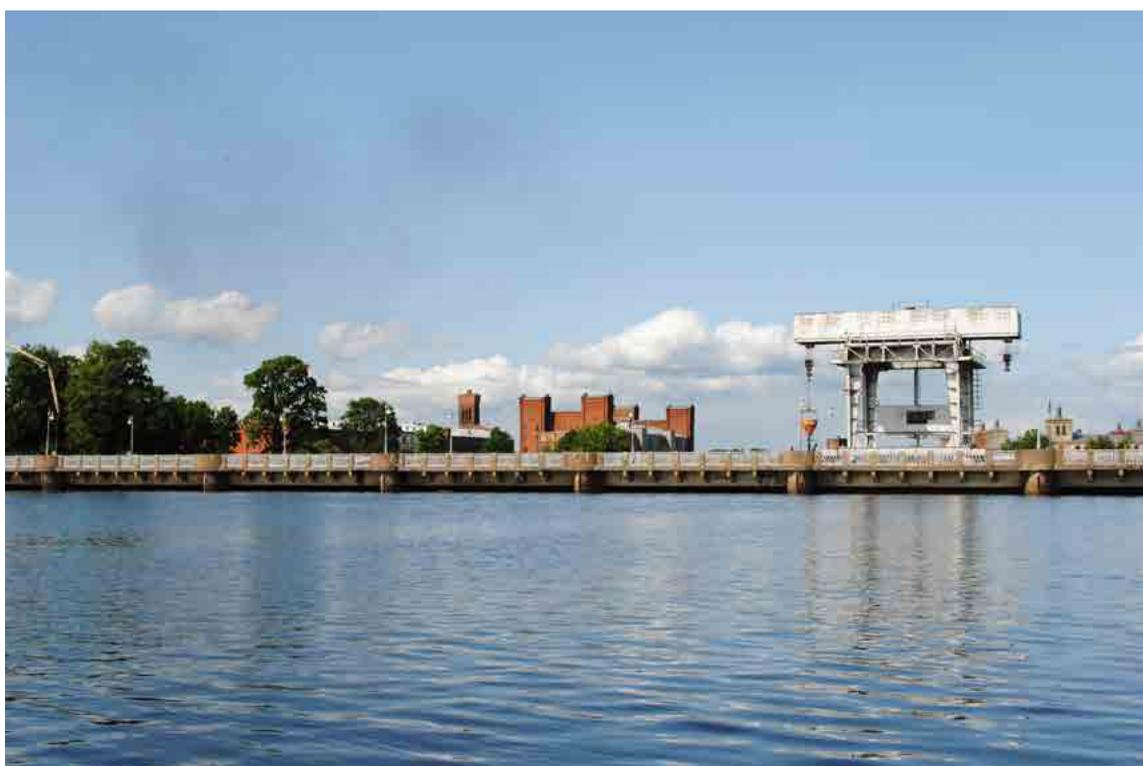
and managed by a Russian state-owned energy company, which thus controls the water level of the reservoir. An oil shale-based (with rather high CO_2 emissions) energy plant located in the region also uses the reservoir's water for its cooling circuits.

The reservoir renews itself thirty-five times a year, because in addition to the Narva River, the Pljussa, Pjata, Must, and Boroni Rivers also constantly bring in fresh water. The overflow is directed on down the Narva River, shaping the contours of the town as it flows under three bridges that are simultaneously gateways and boundaries.

People living in Narva relate to the reservoir in a variety of ways. Some dacha allotments have been established next to it, and this allows for a particular engagement with nature, such as by growing one's own food or keeping chickens. Besides traditional gardening plots, there are also a series of boathouses adjacent to the reservoir, locally known as "Narva Venice", which appear as narrow, canal-stripe structures surrounded by metal storage buildings.

In July 2013, one of the authors, Tarmo, met the local neigbour Gennadi on the shore and took a boat trip on the reservoir. Before starting, Gennadi made a phone call to the border guard station informing them of his boat number and his intention to use it on the reservoir. As we slowly navigated from the canal to the reservoir, we had the chance to observe activities in the boathouses along the canal. For example, we passed one boat shelter that included a TV aerial and furniture, where an elderly man was spending some time on his own. These vernacular modifications and additional uses of the boathouses are often related to family recreational activities during the summer. During winter, however, Narva Venice and the surrounding dachas are empty because the fragile infrastructure that provides fresh drinking water does not support permanent living there.

On the open water, Gennadi pointed out several landmarks on each side of the border – such as the historical brick buildings of the Kreenholm textile factory in Estonia, the golden domes of an Orthodox church in Russia, different radar stations used by the border guards, and wind energy generators. Over the motor's noise, he described how the border regime splintered previously open waterways leading to a land full of seasonal berries and mushrooms. Nonetheless, and despite the heavily guarded border bisecting the reservoir and the Narva River, fishing remains a popular activity. Local fishermen anchor their boats in a row to avoid drifting onto the wrong side of the geopolitical boundary. The waterscape of Narva is also a space for cross-border smuggling of cigarettes, alcohol, and petrol, which are still cheaper on the Russian side.

At the end of our route, we faced the reservoir dam, and in the background the ruins of the Kreenholm textile complex and some transboundary electricity cables cutting across the horizon.

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What can borders established in the aftermath of the disintegration of the Soviet Union tell us about the triangle of (geo)politics, nature, and infrastructure? As we

demonstrate in our three snapshots, the process of frontier demarcation has not only made crossing the border more difficult, but has also affected socio-biological structures never meant to straddle borderlines. These structures – roads, pastures, a reservoir – have become severely hampered. We thus engage in a discussion on the role of geopolitical factors in the formation or disfigurement of infrastructural links, and the way in which certain socio-biological entanglements evolve as a consequence of fortuitous relations between the political and the organic and material. In all three cases, it is the new transboundary context that modifies the existing arrangements and temporal regimes.

Notes:

[1] "Gali" is the official name in Georgian and "Gal" in the Abkhazian language.

[2] https://www.balcanicaucaso.org/eng/Areas/Abkhazia/Life-in-Gali-133720

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Back to the Future:
The Aftermath of Soviet Modernity in Tajikistan's Pamirs

Carolin Maertens

In October 2013, Tajikistan's President Emomali Rahmon travelled to the country's mountainous Gorno-Badakhshan Autonomous Region, an area often referred to simply as the Pamir(s). Among other places, he paid a visit to the Wakhan Valley, which is divided by the border river Panj between Tajikistan on its northern banks and Afghanistan to the south. The presidential committee preparing the visit had a short stretch of the adventurous and bumpy Wakhan road freshly tarmacked to smooth the president's ride from his helicopter to a nearby farm run by border troops. The astonishingly plentiful potato harvest there, to which the president himself bore witness, was rumoured to have in fact been brought from another area outside the high-altitude Pamirs, where soil is more likely to yield such abundance.

In this essay, I explore the link between a demonstratively rich potato harvest, the condition of public infrastructure, and legitimacy of political rule in Soviet and post-Soviet Tajikistan. Borrowing Barbara Adam's (1998) notion of the timescape, the president's visit created an *event timescape* – a node where different temporalities and their qualities converged. Temporality, as I employ the term here, points to the *perception* of time and its course as well as the positioning of people therein. Rath-

er than indicating just a temporal condition, reference to particular time periods invokes distinctive forms and qualities of life that correspond to respective features of the built environment.

During the Soviet period, people living in the Pamirs came to relate to public infrastructure and services, and the state as the provider thereof, in a particular way. Communist utopia conveyed "ideologies of development" to a society liberated from socio-economic injustice (Kalinovsky 2018: 7). In the Soviet Union, this translated into comprehensive state interventions that targeted every sphere of life, helping and accelerating the process towards the desired future. In the Central Asian socialist republics of the Soviet Union, immense efforts were invested in their material, cultural, and socio-political "progression" from "backward" peasant, trading, or pastoralist communities entangled in "local traditions" to modern Soviet socialist societies. Thus, a sense of time was deeply inscribed in state interventions as well as in daily life. Transforming "backwardness" into Soviet modernity meant to constantly "improve" and "progress" in order to make the present past and to follow Lenin (et al.)'s vision into a communist future.

The provision of consumer goods, paid employment, welfare services, and so forth by the state was part of the larger project of social engineering, which ultimately aimed at creating "a new [Soviet] man" and a new society according to communist ideals (Kalinovsky 2018: 7). Correspondingly, as people in the Pamirs see it, having been a Soviet citizen granted not only material wellbeing but also membership and participation in modern society (Mostowlansky 2017; Reeves 2014). In this way, the building of public infrastructures and the provision of services was central to the making of Soviet citizens. Moreover, the success of the Soviet system, the legitimacy of Soviet rule that is, depended on the state's ability to meet its promise of improving living conditions through the provisioning of goods, services, and opportunities (Verdery 1996: 25).

The scale of actual provisioning varied enormously and corresponded with the particular political and socio-economic significance assigned to a place at a certain time. The south-eastern tip of the Soviet Union, today Tajikistan's Gorno-Badakhshan Autonomous Region, was of special interest to the central Soviet government as it constituted part of the Union's outer border. Situated at the Soviet Union's periphery, the Pamirs moved to the centre of state attention, which granted parts of it especially generous provisioning (Reeves 2014; Roy 2000; Shaw 2011). The small town of Ishkoshim at the entrance of the Wakhan Valley is a case in point. Founded in the early twentieth century by the Tsarists as one of their remotest military posts at around 2,300 metres above sea level, Ishkoshim developed under Soviet rule into a district centre and showcase of the good Soviet life, as its material set-up attests. Today the town features tarmacked streets lined with pavements and poplar trees as well as one- and two-storey apartment blocks endowed with central heating and little garden plots in the backyard, all built in the Soviet period. The settlement boasts a school, kindergarten, library, and hospital complex that cater to the entire district, as well as a *klub* event venue including a theatre, a stadium for sport events, administrative offices, as well as a military base. From Ishkoshim, an asphalt road runs up the valley, erstwhile connecting the villages along its course by bus, while

During Soviet times, the Lenins of villages and towns, like this one here in Murghab, pointed towards an ever greater time to come.
Photo: Tobias Marschall, 2015.

the town's airport granted access to regional hubs within a few hours (at least for the few who qualified for air transport). Crucially, in the electrification programme which was carried out across the Soviet Union, households in the Wakhan Valley were provided electricity, and the tandoor (clay oven) yielded to the *petchka*, the modern electrical oven – if bread was baked at home at all anymore and not bought in one of the shops offering state-subsidized consumer goods.

In the 1990s, Soviet modernity and progress came to an abrupt halt. With the disintegration of the Soviet Union, the state welfare system and the infrastructure through which it was implemented largely collapsed. At the beginning of the post-Soviet era, Tajikistan descended into civil war shortly after its independence. Consequently, highly qualified personnel left the country; offices, schools, hospitals, and apartment blocks remained cold in winter; equipment vanished, fuel was hard to come by, and shelves in stores remained empty. In the Winter of 1992-1993, internationally organized humanitarian aid prevented people in the Pamirs from suffering starvation. From the mid-1990s onwards, emergency supplies gradually gave way to more persistent development interventions designed and financed by foreign donors, governments, and (I)NGOs. Among these, the Aga Khan Development Network (AKDN) – a group of development agencies operating under the aegis of the Aga Khan IV, the current leader of the Nizari Ismaili Muslims – soon became the most prominent and influential actor. [1]

In some crucial ways, the AKDN has taken over the role of the Soviet state with regard to providing fundamental goods and services in vital domains of life, such as health care, education, electricity, and disaster management. Although access to such resources has become more restricted and competitive than was the case within the Soviet welfare system, the Aga Khan IV is admired for his capacity to provide, praised for his generosity, and, regarding those aspects, explicitly framed as a successor to the Soviet state. The Tajik state, on the other hand, has not fulfilled

View on Ishkoshim in Tajikistan and the border to Afghanistan along the river Panj.
Photo: Tobias Marschall, 2013.

people's expectations in terms of the provision of goods and services, or in simply maintaining what existed. Instead, roads and other public infrastructures in the Pamirs keep crumbling, hospitals and schools remain poorly equipped, their staff underpaid and libraries closed, pavements crumble and the aiport in Ishkoshim serves as practice ground for novice drivers. For many Pamiris, material decay and lack of employment and state services do not pose practical challenges alone but also affect their self-perception vis-à-vis their notions of modernity and their place therein. The course of time has reversed here, taking people back into a past from which the Soviet era appears again like the desired future.

Summer 2015, the Wakhan road dissolving.
Photo: Carolin Maertens.

Despite such decay, or precisely because of it, the relationship between infrastructure and political legitimacy persists in post-Soviet Tajikistan, although in a state of tension. The arrangements for Rahmon's visit in 2013 suggest that the state regime must address decay and insufficiency – and that it has to deny both. Yet, demonstratively declaring the situation to be the opposite to the reality only emphasizes the dilemma that the regime cannot escape: If the president had been bumped along on a bad road to a meagre potato harvest meant to feed border troops then this would have undermined his claim to authority by admitting the state's inability to provide; staging prosperity and optimism amidst decline, on the other hand, mercilessly reveals the actual discrepancies. Well trained in dialectics, the Pamiri audience noticed the contradictory implications of the president's performance and jokingly

calculated how often they would have to invite the president for the Wakhan road to be tarmacked in its entirety.

During the event timescape created by the president's visit, the diverging temporalities of local residents and the state regime confronted one another. Travelling on this bumpy road takes people back in time, as they say, implying a qualitatively "backward," pre-Soviet state of affairs. Impoverished living conditions, lack of welfare services once available, loss of occupations that provided not just income but a sense of purpose and a place in the contemporary modern world – all this adds to a sense of living a life in regress. The president alone, it seems, proceeds smoothly towards an optimistic future.

Back to Lenin. In the Pamirs, promises of the communist utopia were substantiated by a very material modernity. Today, that future lies irreversibly in the past. Yet, Lenin has not been abandoned and attempts on the part of the state to cover up this inconvenience fail, quite literally. In contrast to the crumbling roads around him, Lenin is well taken care of and, gleaming in blinding white, stubbornly keeps pointing back to the future.

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Notes:

[1] The great majority of people in the Western Pamirs adhere to this branch of Shi'a Islam.

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Geological Surprises:
State Rationality and Himalayan Hydropower in India

Mabel D. Gergan

Most hydro projects have been adversely affected by geological surprises *especially during underground tunneling in the relatively young Himalayan Mountains...* Even with the best of geological investigations, *occurrences of shear zones and underground lakes and streams can result into [sic] serious time and cost over-runs.*

Ministry of Power (2008: 2, 27), emphasis added.

When I first encountered the paragraph above, I was working in an NGO in Northern India that was collaborating with a local anti-dam movement against large dams coming up on the Ganga River. Struck by the anthropomorphic language, I pointed it out to my colleague and we laughed at the thought of the "relatively young Himalayan mountains" playfully sneaking up on Indian hydropower developers. It also seemed unlike the technocratic elite to admit their exasperation with an unruly landscape that would not yield "even with the best of geological investiga-

tions." A few years later, in 2011, when I began my graduate studies, my field site of <u>Sikkim</u>, an Eastern Himalayan state where twenty-nine dams are being planned for construction on the Teesta River, experienced a 6.9 magnitude earthquake. In reality "geological surprises" are no laughing matter. The earthquake's epicenter located in North Sikkim was close to two under-construction projects; downstream communities were forced to evacuate their homes and landslides triggered by the earthquake killed several hundred people. The visceral materiality of our planet's geological ebbs and flows serve as a stark reminder of the disparity between geological time and human and infrastructural timespans. As public opinion in Sikkim swiftly turned against these projects, I revisited the phrase "geological surprises" in the light of this disaster; this time it struck me how state innocence or what others have called "strategic ignorance" (Lord 2018) was implicit in this phrase. However, if we were to take the state on its word that, despite deploying the best of geological expertise, the Himalayan landscape's unintelligibility had thwarted its well-laid out infrastructural plans, could this absolve the state in the event of a "geological surprise" such as Sikkim's September 2011 earthquake? Building on the provocation of this collection to consider multiple temporalities that contribute to "the making and unmaking of infrastructure," I examine how geological, colonial, and scientific temporalities coalesce to produce uneven geographies of risk and development in the Indian Himalayas.

A news report from NDTV India notes how Sikkim's 6.9 earthquake in 2011 resulted in concerns around dam safety. Source: <u>https://www.ndtv.com/india-news/quake-aftermath-many-villages-in-sikkim-still-cut-off-thousands-waiting-for-help-468191</u>

Dam building is not a new technocratic enterprise for the postcolonial Indian state, but in the last decade the geographic focus has shifted from Central and Western India to the Himalayan borderlands. In 2003, India launched a 50,000 megawatt hydro-initiative that envisioned the Himalayan region as the country's "future powerhouse" (Dharmadhikary 2008). Along with a regional shift, we find a shift in technology – from large reservoir dams to run of the river or diversion dams that require tunneling through seismically fragile mountains. *The Hydro Power Policy 2008* reassured private developers of a "level playing field" (Ministry of Power 2008: ii)

and stressed how the technological shift to diversion dams would lead to speedier project completion. Since land would only be required at two ends of the tunnel this meant fewer project-affected people and less opposition. However, the policy noted other roadblocks. In addition to the inaccessibility of project sites, the temporal cycles of the monsoon rains, and accompanying landslides and flash floods, there was the matter of "geological surprises." While the policy does not unpack this term, from the paragraph cited above we can infer that earthquakes are not the primary geological surprise that concern developers. After all, earthquakes in the "young" and the restless Himalayas are hardly a surprise to anyone and most Detailed Project Reports boast of how reservoirs are meant to withstand major seismic events. Instead the geological surprise hindering these projects was the encounter with the invisible, internal properties of the landscape, its "shear zones and underground lakes and streams" (Ministry of Power 2008: 27) – that were not readily accessible for examination. Opposition was expected not so much from people but from the earth itself – the "friction" of the Himalayan terrain (Scott 2009; Tsing 2005), if you will. In

Tunneling work on Teesta Stage III in Chungthang, North Sikkim.
Photo: Mabel D. Gergan, 2012.

such a context, to keep the hydropower industry lucrative for private investors, an expert understanding of Himalayan geology, along with hydrology, seems crucial.

Critical scholars of South Asian environmental history and politics have examined how colonial scientific disciplines such as forestry (Sivaramakrishnan 1999; Robbins 1998) and hydraulic engineering (Amrith 2018; Akhter 2015) produced expert ways of seeing natural resources and how these legacies inform present-day state environmental rationality. Writing in the Canadian context, Braun (2000) demonstrates how the development of geology as an imperial science in the nineteenth century operationalized specific forms of state rationality, opening up "new epistemological spaces which, in turn, made possible new domains for economic and political rationality" (ibid.: 24). He argues that the representation of particular landscape as something from which value could be extracted constituted its "reterritorialization," "erasing existing social natures … and, in their place, restaging the landscape as a solely geological artefact" (ibid.: 15). The Himalayan landscape, specifically its geological characteristics and how they are represented by the Indian state in policy documents should therefore be understood as "historical rather than natural – situated within specific historical geographies of 'seeing' and 'ordering' nature" (ibid.: 14).

Historian of science and technology David Arnold presents a fascinating account of how geology as a discipline was rather slow to develop because of a general sense among colonial officials that India's geology had less to offer in terms of scientific interest as compared to botany or zoology. Drawing on the accounts of amateur geologists writing in the early eighteenth century, Arnold notes how early investigations, "stirred little geological excitement and yielded few fossils. In remoter, less populated regions, 'impenetrable jungles' allowed only a 'vague and scanty knowledge' of underlying strata…. Compared with Europe, the geology of India appeared 'far less complex' even 'monotonous'" (2000: 45). Much of the early interest in the discipline came not from established institutions but from colonial officers who were personally interested in geology. Hugh Falconer, a young East India Company surgeon and superintendent of the Saharanpur Botanic Gardens, is credited with the discovery of fossils in the Shivalik hills (the lower Himalayas) – a momentous find for Indian paleontology and for wider discussions of climatic change and extinction. Albeit a different kind of geological surprise the discovery of the Shivalik fossils, along with several early geological finds, occurred through an infrastructural encounter during the construction of canals and railways that "ran a scalpel through the landscape" and required deep excavations (ibid.).

Shortly after the discovery of the Shivalik fossils, as British policymakers accepted geology's newfound scientific standing and its economic utility to the Empire, the Geological Survey of India (GSI) was founded in 1851 to find coal deposits for the Indian railways. In a powerful indictment of the discipline, Neel Ahuja (2016) argues: "Like all colonial science… [geology] cannot be understood outside of the context of the relations of place, labor, and production that mobilize it." Today GSI is attached to the Ministry of Mines and is actively reproducing the colonial extractive logic through the exploitation of mineral resources primarily on tribal and Adivasi territories across India[1]. In Sikkim and other Himalayan states, GSI has contributed the geological expertise for Detailed Project Reports and Environmental Impact

BY H. FALCONER, M.D.

PART I.

A communication was made by Dr. Falconer, conveying the substance of a paper by Captain Cautley and himself on the osteological characters and palæontological history of the *Colossochelys Atlas*, a fossil tortoise of enormous size, from the tertiary strata of the Sewalik hills in the north of India —a tertiary chain apparently formed by the detritus of the Himalayah mountains.

A great number of huge fragments derived from all parts of the skeleton except the neck and tail were exhibited on the table, illustrative of a diagram by Mr. Scharf of the animal restored to the natural size.   (See Fig. 12.)

FIG. 12.
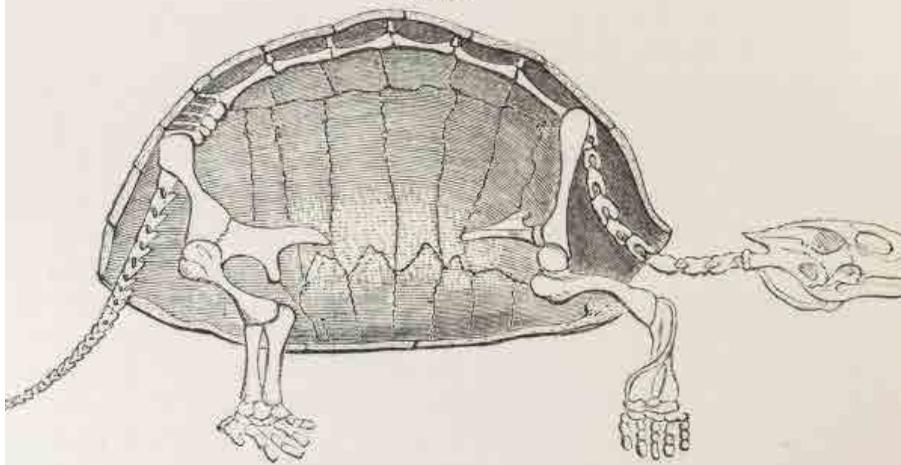
RESTORATION OF COLOSSOCHELYS ATLAS, REDUCED.

¹ Reprinted from Proc. Zool. Soc. Lond. 1844, Part xii, pp. 54 and 84.

A drawing of a fossil tortoise found in the Shivalik hills.
Source: http://falconer-museum.co.uk/falcon-er-fossil-collections/.

Assessments for hydropower projects, which are notorious for having glaring inconsistencies, falsified information, and plagiarized data – all in the service of easing the process of getting clearance for hydropower developers.

The uneven geographies of risk and infrastructural development in the Indian Himalayas form on historical terrains shaped not only by specific geologies but also by the powerful, unbroken legacy of colonial and postcolonial state rationality. For critical scholars invested in the Himalayan region and, more broadly, infrastructure in postcolonial contexts, geology's entanglements with state power presents an important field of inquiry. A deeper understanding of geological temporalities would better prepare this region and its inhabitants for both infrastructure development and disaster prevention, but given the colonial roots of institutions like GSI, when these two priorities are at odds it is anybody's guess which prevails. In deploying the language of "geological surprises," the Indian state attempts to displace culpability and demonstrate its incapacity in the face of geological time. However, what is obscured

in this narrative of state innocence is that despite acknowledging that tunneling through seismically active landscapes is a fraught endeavour, in places like Sikkim few measures were taken to fortify hillsides or examine impacts on underground water channels. While the invisible, internal properties of the landscape slow down infrastructural timelines, it is important to remember that development is not the only goal here (Ferguson 1994) and there is opportunity even in disaster (Paudel and Le Billon 2018). With larger geopolitical and nationalist agendas at play, it is unlikely we will see a decline in hydropower development in the Himalayas anytime soon. Therefore, the question we must ask is not why these projects persist despite their apparent failure, but how scholars can make visible and challenge the underlying logics of these infrastructures and the expertise that bolsters them. A deeper engagement with colonial histories of science and expertise is therefore crucial to both academic and policy-level responses to the intersection of disasters and infrastructure in the Himalayan region, allowing us to see pernicious continuities and perhaps even to envision, alongside the communities we work with, alternative futures.

Notes:

[1] There is a separate research institute dedicated to the study of the Himalayan region – the Wadia Institute of Himalayan Geology which began much later, in 1976, and is conducting important research on glaciers, natural disasters, and climate change.

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Midnight Blues in the Melting Arctic

Mia M. Bennett

At the peak of summer above the Arctic Circle, there is never a rush to get home before dark. Night will not come knocking until indigo skies return in August. On a late June evening in a town called Inuvik in Canada's Northwest Territories, well after the clock strikes twelve, a house party crackles with the sunlit energy typical of afternoon barbecues. Outside, children play in the streets unattended. A baseball game enters its fifth inning, the loud smack of the wooden bat against warm leather sending the ball into a streaky orange sky. At this point in the evening, it feels a little like meandering through a real-life version of Dalí's *The Persistence of Memory*, passing melting clocks on the way toward a sunset that will never arrive.

Despite the feeling of suspended reality under the midnight sun, time, of course, moves forward in the Arctic, just like anywhere else. In fact, up here, geological time could be said to be speeding up. In the epoch of the Anthropocene, glaciers are racing towards the ocean, sea ice is melting faster than ever, and thawing permafrost is turning into a giant ticking time bomb that bodes ill for the houses and roads that rest on top of this foundation.

As recently as 100 years ago, people in the Arctic could have moved when local living conditions deteriorated – say, if the shoreline started to erode or animal populations dwindled. The nomadic ways of peoples such as the Inuit, Sami, and Nenets made life in a harsh environment a little more feasible. But now, with the majority of the Arctic's inhabitants residing in buildings fixed to the ground – all too often a consequence of the forced settlement of Indigenous Peoples by colonial governments, which sought in places such as Canada to essentially use them as human flagpoles to stake out territorial claims (Greaves 2016) – upping sticks is not so simple. Yet as the homes of people erode from under their feet in places like Kivalina, Alaska, the response is actually not to flee to more solid ground, but rather to dig in.

This tendency is also true of people in Inuvik, where construction on Canada's first highway to the Arctic Ocean finished in 2017. A little over a hundred kilometers north of this town of 3,200 people, Canada's largest river spills into the Arctic Ocean. The Inuvialuit call it Kuukpak, or "Great River," the Gwich'in call it Nagwichoonjik, or "River Flowing Through a Big Country," and the Dené call it the Deh Cho, or "Big River." In English, it is named the Mackenzie River after the Scottish explorer who sailed down it thinking it would reveal a long-sought passage to the Pacific. Instead, it spat him out into the Arctic, a forbidding region for European explorers but one whose ice has provided a solid foundation for indigenous movement for millennia – and, for the past few decades, ice road truckers.

Every winter, the Mackenzie freezes into a sinuous white streak strong enough to support big rigs. Although ice presents an obstacle to ships at sea, it enables industrial

transportation on land. The great rivers that drain into the Arctic Ocean in Siberia and Canada freeze to a crawl each winter, allowing KAMAZ trucks (Argounova-Low 2012) and eighteen-wheelers to reach remote northern towns. Rumbling across the riverine ice road, trucks that have driven all the way up from southern Canada deliver crucial supplies to the coastal community of Tuktoyaktuk, population 898. Or rather, delivered, for the ice road has not been maintained in winter since the all-weather highway opened two autumns ago.

The new 137-km two-lane highway, called the Inuvik-Tuktoyaktuk Highway (ITH) after the two communities it connects, was effectively spearheaded by local and regional leaders within the Inuvialuit community (Bennett 2018), the Indigenous People who hold title to 90,650 square kilometers of the surrounding lands. Since the Inuvialuit settled their land claims with the Canadian state in 1984, they have pursued various commercial opportunities including efforts to develop offshore oil and gas resources and to build a deep-water port. Plans for the ITH have been floated since the early 1970s, when the federal government finished work on the 740-km Dempster Highway, which terminates in Inuvik. Ottawa finally granted approval and funding for the ITH in 2011, at a time when officials across the Arctic were urging the development of a fast-melting region. In some sense, the realization that the Arctic is no longer hidebound by geological time has moved the clocks forward to match capitalism's relentless pace. Communities in the Arctic, ever resourceful, are trying to leverage this sudden interest in the North to attract investment in their local economies, many of which depend on a precarious mix of revenues from resource-based sectors such as mining or fishing and government subsidies.

Like the Dempster, the ITH is supposed to be a permanent "all-weather highway." Yet this hardy turn of phrase is a little less convincing up north than down south, where "just-in-time" deliveries are more likely to live up to their name. In the Canadian Arctic, a "highway" is really two lanes of gravel, and "all-weather" means that a road holds up to snow, ice, sleet, rain, and sun – to a point. It is actually the sun that makes things tricky, for when the undulating tundra warms up, the gravel roadbed turns to mud, which threatens to swallow up heavy vehicles.

Signs of the slip-sliding terrain are already evident along the Dempster. Driving south out of Inuvik in summer, the buggy, boggy delta morphs into a funhouse forest. "Drunken" trees lean in a crooked stupor, their narrow trunks pushed sideways not by relentless winds from above but rather by shifting soils below. Hotter temper-atures – and, by corollary, the world's major greenhouse gas emitters (Sand et al. 2016) – are to blame for the thawing ground. Passing through this twisted arboretum is a little less Dalí and a little more van Gogh, all swirling trees and skies. Just west of the highway, a grassy, gnawed hillslope looks like a giant troll took a big bite out of it. This landslide-induced degradation is known as a permafrost thaw slump, a phenomenon occurring with increasing regularity as the ground stirs from its hyper-borean hibernation. But eroding shorelines, inebriated trees, and subsiding terrain seem to do little to dissuade people in the region from building roads and putting down pipelines. While all of these investments are meant to lay the groundwork for future prosperity, it is unclear whether they will even last for their typical thirty-year design lifespan.

Mackenzie River in summer.
Photo: Mia M. Bennett.

Waiting to cross the Mackenzie River in Tsiige-htchic.
Photo: Mia M. Bennett.

"Drunken" trees tipping in the permafrost laden soil along the Mackenzie River.
Photo: Mia M. Bennett.

In January 2018, the Doomsday Clock inched forward to two minutes to midnight in light of "the looming threats of nuclear war and climate change" (Mecklin 2018), the closest it has ever come to that fateful hour. But the odd thing is – and this is not just in the Northwest Territories, but in many parts of the Arctic – there seems to be a sense of living in a time that is hurtling towards that catastrophic midnight while simultaneously reveling in the extended golden hour of a polar summer night, where the good times keep on going and the color midnight blue is merely a pigment of the imagination, so to speak. Thanks to geopolitical and geoeconomic interest in the North, investments are reaching places like Tuktoyaktuk that have been off the radar of global capital for decades. In some ways, it appears as if the melting ice has finally made the region sync up with the limited attention spans of investors.

A grandfather and his grandchildren play on the shoreline in Tuktoyaktuk. Photo: Mia M. Bennett.

Seen from one angle, the determination to put more gravel down in the Arctic could be considered a form of resilience or even *niriunniq* – an Inuktituk word that roughly translates as "hope" (Kirmayer et al. 2011). Viewed from another position, however, northern infrastructure development could be seen as folly. Why are humans putting down roots in a liquefying landscape?

The answer, I think, involves a certain refusal to admit how quickly geological time has accelerated in the Arctic. While environmental changes have opened up new possibilities for access and investment, the speed at which these shifts are happening may be outpacing capitalism's time horizons. Ultimately, all-weather roads are not designed to be all-climate roads. Designing infrastructure that can keep up with the rapid-fire rate of climate change, or what might more appropriately be called climate instability, will require both new mobilities and malleabilities in light of the cryosphere's newfound fluidity.

Ironically, in seeking to adapt, capitalism and the state may need to draw lessons from the more footloose and flexible ways of life they tried to stamp out a century ago. While indigenous peoples have managed to persist in the Arctic for at least 20,000 years, it is unclear if the brittle infrastructures of settlers and industry will last for much more than a hundred.

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Tailbacks in Time, East Anglia

Richard D.G. Irvine

The A14 is an artery, squeezing traffic some 130 miles between the North Sea container port at Felixstowe and the tangle of roads at the Catthorpe Interchange in Leicestershire, where it feeds into two of Britain's major motorways. It is an urgent road, urgent in its flow of commuters and of containers. This urgency is only intensified by the routine sensation of being stuck; stuck in queues, stuck behind overturned tankers and spilled loads – sugar beet, onions, offal, ethanol.

The part of the A14 I am most familiar with from my fieldwork (see Irvine 2017) is the stretch that hugs the Cambridgeshire fens. Here the road is a margin above flat arable farmlands. Lorries join the A14 from the fens: carrying produce westwards from farms onto the motorway network, and so to wholesale and supermarket distribution centres; travelling eastwards with sugar beet for the sugar processing plant at Bury St Edmunds, a well-known A14 landmark.

This is productive land. Half of the total Grade 1 farmland in England – the highest grade under the Department for Environment, Food and Rural Affairs' Agricultural Land Classification – is in the East Anglian fens. The road keeps clear of the drained

Construction of a viaduct over the River Great Ouse flood plain. The new route has to navigate terrain where the boundary between land and water is historically uncertain, December 2017.
Photo: Highways England.

peatlands whose black soil makes the region so fertile, skirting the fen-edge, and with good reason. Intensive drainage works from the seventeenth century onward have transformed wetland into dry-land; yet this presents its own geostructural problems. Peat fen, thousands of years in formation, wastes away once drained. As the once-waterlogged organic matter is exposed to the air, it oxidises, and so land that has been drained and brought under cultivation rapidly lowers. This subsiding land poses infrastructural challenges, to be avoided if possible.

Of course, when the fen was a wetland, navigating through the soggy ground was itself a problem. During the Roman occupation of Britain, this fen-edge road was the strategic route around the wet. Here, old routes persist. Between the towns of Cambridge and Huntingdon, the tarmac of the A14 is superimposed on the Roman roadway, one section of the Via Devana (as it would come to be named in the nineteenth century) that linked the North West with the South East of England. This contributes to a temporality of repetition on the road: a daily ebb and flow along the road, nested within a rhythm of movement stretching back millennia.

In 2017, the A14 got a <u>writer in residence</u> as part of a scheme set up by the Institute of Continuing Education at the University of Cambridge. When I approached the poet L.H. Johnson, who took up the role, to ask her about her experiences exploring and writing about the road and its landscape, she remarked on its "spatially intimate" nature: the population density of the A14 corridor, the sense of being in the presence of so many stories through time. In the writing workshops she organised as part of her residency,[1] participants responded to the currents of history along the road: some wrote about the Romans along the Via Devana, for example, while Johnson herself was inspired by the serenity of the American Cemetery – the rows of crosses and walls of names of Americans who died in the Second World War – in such close proximity to the stress-inducing junction that links the A14, A428 and M11. As she explained, the road connects these strands of history with the timelines of our own lives: "we live our lives in patterns and routines, and roads form a part of that pattern. We fall in love, we move house, we find a new job – and somehow, transport networks and roads in particular help to form part of that web. The A14 figures in the pattern of a lot of people's lives."

Now the stream of traffic is veering off the route. A four-year major roadbuilding scheme will re-route this stretch of road to the south of the existing course, increasing the number of carriageways and expanding capacity. As Chris Pinney (2002) has suggested, through the expansion of road traffic into an ever wider space we come to realise that we live in worlds created not through human agency alone but by and for human/motor hybrids. So, such road building is necessary for the continuation of our combustion-engine present (a continuation that, for now at least, relies on our ongoing treatment of oil from the planet's deep past as an infinite resource).

Yet if the building of new roads fixes the present by enabling the continuation of our taken-for-granted lifestyle, the processes of excavating the route and quarrying nearby material for the road juxtapose that present with the long-term history of a landscape in motion. Glacial till, the material deposited by ice sheets, is witness to the extent of the ice during glacial cycles in the Pleistocene epoch, between 2.5

million and 11,700 years before present. River terraces show the extent of what is now the River Great Ouse during the period of substantially higher sea level as the glaciers retreated. In October 2018, while quarrying for road materials in river terrace deposits at Fenstanton along the edge of the peat fen, workers discovered remains of woolly mammoth and woolly rhino, at least 100,000 years old – creatures adapted to life on cold grasslands south of the glaciers. A very different environmental past protrudes into the present.

Road construction aims towards the production of certainty. It responds to a desire for routes that are to be relied upon, and for movement not to be left in doubt; this is the expectation, however realistic or unrealistic, that shapes day-to-day life, and the construction supports those expectations. But attention to the time-depth of the terrain beneath the A14 reminds us that the landscape is not a static container onto which we can project such certainty. This is a road being built for a future whose environmental conditions may be substantially different to those of the present.

Indeed, this has historically been a flood-prone region. Constructing a road that runs through areas with the highest grade of flood risk means taking account of flux in the surrounding landscape while trying to produce certainty in spite of it. Culverts on the scheme are designed to accommodate 1 in 100-year rates of flooding,[2] factoring in the need for additional capacity due to rising sea levels caused by climate change. Loss of floodplain from road construction will be offset by the creation of new buffer areas, and sixty-eight "attenuation ponds" are to be dug along the route to accommodate surface runoff. The rhythm of water will be made to cohabit with the rhythm of the road – it must not be allowed to get in the way. Yet the past that protrudes in the course of roadworks calls the predictability of these rhythms into question: to fix the landscape at one moment in time is to ignore the story of flux.

What I have been trying to get at is the braiding of timelines and timespans along the A14: the speed of moving along the road, the lifetimes spent travelling up and

down that route, the pace of the landscape. The road has a time-depth that protrudes even when it is at its most static, as L.H. Johnson captures in one of the poems she produced while A14 writer in residence, "The Traffic Jam":

Roadbuilding and bridge construction along the new route, December 2017.
Photo: Highways England.

> *The traffic turns the world into a gansey, woven*
> *with handfuls of wool no longer than my hand,*
> *knots of cars and lorries*
> *pushed together with shaking fingers*
> *that see a future,*
> *where the wool's pulled tight by seawater*
> *and sorrow brings it to the door*
> *and the birds form a web of black*
> *and rain begins to fall,*
> *soft and shy as pained as love.*
>
> *Eventually the vehicles around me*
> *start to experience a sense of adolescent liberty,*
> *and stay out past their curfew*
> *and go that little bit too*
> *far, too fast,*
> *stretching the knots and threads between us*
> *until it's nothing more than memory.*

Life over tarmac pressed down on river terrace. It is here that we glimpse time on the A14, somewhere between stuckness and flow.

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Notes:

[1] Some of the work produced is collected in Johnson 2018.

[2] That is, designed to take account of flood events calculated to have a 1 per cent probability of occurring in any given year.

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