

Multinatural Infrastructure and Phnom Penh Sewage

Casper Bruun Jensen

[Draft for *Infrastructures and Social Complexity: A Routledge Companion*, ed. Harvey, Jensen & Morita, please do not circulate]

Sinkholes

Over bar foods and beer in a Japanese *izakaya* in the Boeung Keng Kang district in Phnom Penh, I engage in leisurely conversation with Mr. Inoue, a Japan International Cooperation Agency (JICA) specialist in urban infrastructure. Our discussion centers on a large project to upgrade the deteriorating sewage system of the inner city, and the various problems and controversies surrounding this work. We talk of politicians, moto pathways, flooding, sewage treatment plants, the laying of pipes, and much else.

Thinking of roads, digging and pipes, I recall having read recent news stories about Chinese cities, in which road intersections suddenly collapsed and massive, deep sinkholes opened up to the underground, right in the middle of busy cities.¹ Inoue has not heard these stories, but he is undaunted; he can imagine something of what causes them. He says that roads often follow old drained river ways, since they are natural pathways. However, underground rivers continue to run along the same paths. There may thus have been hollow cavities underneath new infrastructures. If, he says, roads are made of poor quality materiality and transport intensifies as it has done in Chinese cities, then the entire road may cave in, opening massive cracks able to swallow cars and buses in the process. On a smaller scale he has seen this happening himself in the process of laying the new pipes in Phnom Penh.

Whereas an increasing and vigorous body of work focuses on the social and political dimensions of this work (e.g. Anand 2011, Jensen and Winthereik 2013), on the symbols and imaginaries of infrastructure (e.g. Barker 2005,

¹ See e.g. Sam Webb. 2014, July 9. Carnage! Giant Sinkhole Opens Up Under Chinese Parking Lot and Takes All the Cars With It. <http://www.dailymail.co.uk/news/article-2686237/Car-nage-Giant-sinkhole-opens-Chinese-parking-lot-takes-cars-it.html>. (Accessed 31 October 2014).

Sneath 2009, Larkin 2013), and on their organizational and technical dimensions (e.g. Bowker 1994, Pollock and Williams 2009), sinkholes indexes another kind of process, which STS scholars and anthropologists have explored to a lesser degree. These are processes that elicit what might be called the multinatural characteristics of infrastructure.

In common usage, infrastructures form the material basis for the provision of social services – as in roads and railroad tracks. Infrastructure has been viewed by conventional engineering and social science as a layer added on top of, or sunk into, nature. As ‘first nature’ becomes ‘covered over’ by infrastructure, it is gradually severed from social experience. When people need water or heat, that is, they increasingly interact not with rivers or sun, but with faucets and radiators. Thus, infrastructure turns into ‘second nature’ (Bowker 1995). In the case of the sinkholes, however, it would be as valid to say that nature has become infrastructure as *vice versa*. In Inoue’s rendition, roads often tend to follow dried riverbeds, and it is because of cavities underneath those beds that some roads are prone to reverting to quasi-natural states – taking the form of holes, uncannily opening up in the midst of urban space.

Alberto Corsin-Jimenez has recently developed the argument that infrastructure is neither a human ‘entitlement’ nor simply a nonhuman object. What he refers to as the “right to infrastructure” defines a certain analytical sensibility, which facilitates an escape from “the human–nonhuman and epistemology–ontology dichotomies ... by opening up the agential work of infrastructures as a source (an open source) of possibilities *in their own right* (2014, 343).

In this chapter I suggest that such an escape demands even more than heeding the agency of *infrastructures*. It obliges the researcher to focus on the unstable, emergent interrelations between infrastructures, their human developers and numerous other entities, like animals and trees. One way of getting into view infrastructural capacities is by exploring how this motley multinatural array makes, sustains, and disrupts such capacities. More decentered ethnographies and conceptualizations of infrastructure, I argue in the following, might shed light on the complex entwinement between

infrastructures, the human and nonhuman worlds they produce, and their possibilities and dangers.

The present chapter experiments with such a decentered, multinatural mode of exposition. It takes the reader on a tour of Phnom Penh's sewage infrastructure, in order to relativize the perspective from which infrastructure is seen or experienced – a relativization that does not refer to different groups of people -but to the infrastructural work done by various kinds of nonhuman agent – trees, bacteria, sludge, water plants and cockroaches. The result is a series of figure-ground switches, in which nature and culture not only begin to hybridize, but in which their descriptive and analytical relevance quickly begins to fade.

Ultimately, like sinkholes, they collapse.

Sewage

Sinkholes occur in consequence of relations between the eroding force of water, the material qualities of gravel and earth, and the load of traffic. This imagery is one of entities external to one another. Nature and society intersect at the point of infrastructure, yet as the ground collapses the two re-emerge as wholly distinct. In the case of sewage systems, however, this image, too, collapses rather quickly.

Phnom Penh's sewage infrastructure is in a fairly acute state of disorganization. Long-term neglect, due to the civil war, lack of bureaucratic organization, and of funds, means that only part of the city is served by the sewage system. Many pipes are leaking, clogged, or missing. The result is that waste does not flow smoothly. During regular periods of heavy rain the city floods. The JICA project for sewage improvement, conducted in collaboration with Phnom Penh city hall and Japanese contractors is meant to improve this state of affairs. It does so by replacing old pipes, adding to the network and building treatment plants and pumps, all of which entails complex social, political and technical arrangements (see Jensen 2016). Yet, something is also going on *inside* the pipes.

Underneath Phnom Penh's roads, in the pipes, or sometimes next to them, in open sewer channels, flows liquid sludge. It is not particularly nice to look at,

and worse to smell, as I had occasion to realize, joining an 'educational trip' organized by JICA experts into the sewers. Outfitted with protection helmets to match sandals and shorts, our small group passed no-entry signs and fences at one of the locations where new pipes were in process of being connected to the existing sewage network. Descending a ramshackle staircase with loose scaffolding, this little troupe of curious outsiders, NGOs consultants, officials, trainees, and a single STS ethnographer, toured underneath the city streets. It was dark down there, though sharp white lights lit part of the interior. Khmer workers, scarves wrapped around their faces to protect against dust, dirt and the unpleasant smell, were in process of finalizing this particular bit of new piping. At the end of the new 50-meter section, a barrier had been erected to prevent the sewage flow entering from the side of the already functioning pipe. When the section was ready, the barrier would be removed and the liquid sludge would flow into the new pipe section.

The water was still and black. Even so, the interior of the underground pipes is awash with life. Comprised of excrement, urine, rainwater, foodstuffs, offal, chemical compounds from medicine, insect repellent and cleaning stuff, motor oil and much else good stuff, the waste is organic, at least in part, and home to thriving bacteria cultures of all sorts.

That sewage sludge is not a single thing became visually obvious as we proceeded to visit a new sediment chamber, built behind the Royal Palace, next to the riverside. The area basically consisted of an open stream of water, running a circular route towards a meshed gate where sediment would filter. The channel had been carefully dug to prevent cutting down a magnificent old tree, growing on a small patch of land in the middle. Sewage entered the stream from different pipes. And how different it looked: one stream pitch black, another brownish, yet another almost milky white. These streams comprise mixtures of culture and nature in liquid form, their composition highly variable (see also Schneider 2011: 89, 113). One stream might constitute an environmental health hazard even as another is more or less harmless. In the sediment chamber they are combined and led on as new mixtures.

Bacteria

Sludge flows through the complicated arrangement of pipes. Or ideally so. For part of the problem with the pipes of Phnom Penh is that they have never moved sewage very well. The article “Noses bent by city sewage”, published in the Phnom Penh Post in 2001², explained that most houses use locally built septic tanks. This is still the case in 2014. These tanks tend to overflow during the rainy season, turning the streets into a “stagnant e-coli rich bacterial soup”, in which people nevertheless continue to wash, work and play. Nobody disputes the overall tenor of this description and the prevalence of gastro-intestinal disease and other water and airborne ailments is generally recognized. It is disputed, though, whether the problem is worse in the dry or rainy season.

Mr. Inoue, JICA’s sewage expert insists that the main problem is not flooding but drying. It is true, he says, that the water that inundates streets in the rainy season is dirty. But, not least due to JICA’s long term project to improve the sewage system, begun in 1999 and still continuing, at a cost of at least 450M\$, flood levels are in fact decreasing. New piping has been laid in central areas, sludge suckers have been acquired to prevent clogging, and new pumping stations have been built along the riverside, and elsewhere, to get rid of excess water. Even as these efforts are compromised by other initiatives, especially the draining of lakes and marshes in order to clear space for upscale residential areas and shopping malls, inundation is slowly decreasing. No, Inoue says, the real problem is the dry season, when the flow stops.

During this period, large quantities of semi-dried sewage simply get stuck in the pipes. Perhaps it lives quite a satisfying existence there. But even as it does not move as intended by engineers – southward towards the marshes of Phnom Penh -- it is not quite immobile. Instead it evaporates and moves *upwards*. The stench of sewage wafts across the scorching hot city streets, engulfing shops, motos and homes. And, so Inoue insists, it is these foul odors that are the true bringers of disease. The pumping stations built by JICA therefore also have the task of ensuring adequate movement of sewage in times of drought.

² Bainbridge, Bill & Bou Saroeun. 2001, March 16. Noses Bent by City Sewage. *The Phnom Penh Post*. <http://www.phnompenhpost.com/national/noses-bent-city-sewage>. (Accessed 2 September 2014).

In his seminal paper “Second Nature, Once Removed”, Geof Bowker (1995) argued for the importance of analyzing interactions between first nature and second nature (infrastructure), but *also* between second nature and organizational-bureaucratic representations *of it* (which he called second nature, *once removed*, to emphasize that turning infrastructure into second nature required long trails of bureaucratic documentation). In this process of mediation, Bowker wrote, “we can trace in operation the convergence between nature and the bureaucratic representation of second nature in forms, flow charts, and other representational devices” (1995: 63).

Such efforts are everywhere manifest in the JICA project. It requires a broad range of plans, budgets, forms of evidence and technical documentation to articulate links between flows of water and sludge, networks of pipes, locations of pumping stations, and projections of decrease in illness and inundation. Indeed, it would be utterly impossible imagine the Niroth treatment plant which opened in 2013 with a 135,000 m³/day treatment capacity, filtration unit and a tank capacity of 23,000 m³ without a complex set of administrative and engineering plans.³ Certainly bacteria live inside pipes and treatment plants, but these infrastructures in turn depend on trails of documentation.

Nevertheless, inside Niroth, there they are, the bacteria, and they are neither dominated nor fully specified by paper trails. Inside the plant, pipes lead different sewage composites into a basin, where solids sink to the bottom while grease and other substances float. After separating these substances, the leftover liquids are treated -- consumed by -- populations of bacteria. And *their* leftovers are flushed.

Though pivotal to public health outcomes, these interactions between bacteria and sludge are quite peripheral to commentators and politicians, if not, of course, to specialists in sewage treatment (Schneider 2011). They rarely lead to controversy or even garner public attention (Harvey 2013, Hird 2016). Operating at a scale imperceptible to the otherwise discerning public busily

³ See JICA Press release. 2013, June 11. Phnom Penh Water Supply Extends to 1.7M Residents – Inauguration Ceremony of Niroth Water Supply Facilities on June 4th 2013. <http://www.jica.go.jp/cambodia/english/office/topics/press130611.html> (Accessed 31 October 2014).

scrutinizing JICA's projects, the organisms inhabiting the Niroth basin quietly solve social and environmental problems.

We might say that the bacteria are hybrid entities put to work to solve hybrid problems. After all, sewage is itself a mixture generated by changing socio-cultural practices and demographic changes in conjunction with changing climates and environments. Inside Niroth's basin and tanks, bacteria work upon bacteria in order to deal with socio-natural problems. But though the main protagonists are nonhuman, the effects of their actions are felt by people.

Yet, far from everything comes together in the manner wished for by planners and bureaucrats. For far from all sewage makes it to the treatment plants.

Loops of Nutrition

In the context of Johannesburg's collapsing infrastructure, AbdulMaliq Simone (2004) examined how people come to take on infrastructural qualities. On the one hand, people need to find ways of providing the services that the ruined city infrastructure fails to offer. On the other hand, becoming infrastructure implies a kind of neutralization of social identities. Having become infrastructured, for example, the intense dislike Nigerians and South Africans may feel for one another "does not really stop them from doing business with each other, sharing residences, or engaging in other interpersonal relations" (2004: 419). Thus, as infrastructure, people manage to form relatively stable patterns that allow them to pursue their goals.

Though compelling, Simone's argument is one-sided. It leaves out of the picture any discussion of the materialities that after all still crowd urban spaces, Johannesburg included. There is but a short step from recognizing infrastructure as "ruined" to not seeing it all. Once 'regular' infrastructure has been rendered invisible, the ground is cleared for examine the infrastructural qualities of people. Yet even in states of ruination, material infrastructures remain, and they remain lively.

Phnom Penh's sewage system, for example, though in many ways ruined, survived not only the civil war and the Khmer Rouge period, but also a subsequent, decade-long lack of attention and maintenance. It did not do its job

well, according to many measures. Still cracked and leaking pipes, full of life, continued their secret existence⁴ under the city's increasingly busy streets. Only occasionally did they show their cards, bursting and flooding neighborhoods with dirty liquids. Yet, even in the days of total disrepair, not *all* sewage flooded the streets. So where did it go?

Geography speaks. Phnom Penh, Penh's Hill, named after its legendary founder, is located on a stretch of elevated land, created by the Mekong, Tonle Sap, and Bassac rivers. The most pronounced slope of Penh's hill runs south. Phnom Penh's piping system is therefore also oriented in this direction. Most of the city's sewage, estimated in 2008 to consist of a daily output of "234 tons of feces, 2,335 cubic meters of urine and 8,154 cubic meters of gray water"⁵ ends up in a series of marshy lakes, Boeung Trabek, Boeung Tumpun and Boeung Choeung Ek (infamous for Khmer Rouge mass killings in the 70s). After filtering through these lakes, the "gray water" eventually reaches the river.

This may sound like bad news, but recent evaluations have drawn the conclusion that the lakes function rather well as bio-filters, "effectively reducing pollutant loads in Phnom Penh's wastewater before it reaches the Bassac River".⁶ Operating akin to an ad hoc "natural infrastructure", the marshes deliver "critical services for human communities and economies" (Carse 2012: 540).

Officially the southern marshes are government owned, but this has not prevented people moving in from rural areas from building squalid houses at their edges. The stench there is almost unbearable, the water dirty and dangerous but also extremely nutritious. In Boeung Tumpun and Boeung Choeung Ek, water plants, including lotus and morning glory therefore grow easily, and in abundance. Indeed, it is just these plants that absorb and naturally cleanse most of the sewage before it enters Bassac River. The natural infrastructure for Phnom Penh sewage cleansing consists of "dense morning

⁴ Secret existence is no exaggeration. To this day Phnom Penh city hall has no complete maps of the pipelines. Apparently they vanished with the civil war. In collaboration with JICA, city hall is now gradually trying to piece together knowledge of whether the older pipes run.

⁵ Otis, Daniel. 2013, November 18. Putrid Lakes Offer Sweet Relief to a City Lacking Water Treatment Plants. <http://nextcity.org/daily/entry/putrid-lakes-offer-sweet-relief-to-a-city-lacking-water-treatment-plants/>. (Accessed 2 September 2014).

⁶ Ibid.

glory fields” gardened by squatters.⁷

It is no surprise that squatters, living, fishing and swimming in this noxious, yet oddly beautiful environment, are prone to disease. A WHO report identifies diarrhea, worms, and protozoan infections as common among the local population. From the point of view ‘natural infrastructure’, however, it is especially interesting to observe the *loops* through which this system works. For the ‘dense fields of morning glory’ are not grown for personal consumption. Instead, they are harvested and transported back to Phnom Penh’s markets, where they are turned into delicious smelling street meals, sold to restaurants or for home cooking.⁸

Government reports as well as scientific articles point to the presence of e.coli and parasites in morning glory grown in the southern marshes.⁹ Human waste, transported by leaking, lively pipes, is bio-filtered by plants, protecting the river but making their growers sick, and eventually ending up on Phnom Penh’s dinner tables, ready to begin a new infrastructural iteration. Within this infrastructural loop, the fields of morning glory in dirty waters operate akin to Jacques Derrida’s (1981) *pharmakon*, at once poison and cure.

The ambivalent qualities of this natural infrastructure is vividly exhibited by the ongoing project to turn Boeung Tumpoun into landfill by 2020, presumably to be sold to private investors. On the one hand, it is hard to regret the demolition of this stinking marsh, dangerous to inhabit, and growing disease-ridden produce. On the other hand, landfill will inevitably lower the bio-filtering capacity of the marshlands and this will lead to heightened levels of pollution of the Bassac river. It will also diminish the water absorbing capacities of the land, likely increasing flood levels in southern Phnom Penh. In this way it works directly against the JICA sewage and flood protection project.

⁷ Ibid.

⁸ Similar cases have been reported in Mexico City (Rosas *et al* 1984), and the phenomenon can likely be found elsewhere. I thank Ashley Carse for this information.

⁹ Irvine, Kim N., *et al.* n.d. Spatial Patterns of E. Coli and Detergents in the Boeng Cheung Ek Treatment Wetland, Phnom Penh, Cambodia.
<http://geography.buffalostate.edu/sites/geography.buffalostate.edu/files/uploads/Documents/publication7.pdf>. (Accessed 31 October 2014).

Considering people as infrastructure, Simone takes an interest in the “incomplete, truncated, or deteriorated forms and temporalities” of seemingly incompatible forms of rationality and modes of production (Simone 2004: 410). With some minor but consequential adjustments this formulation makes excellent sense in the context of Phnom Penh’s sewage infrastructures. They are about incomplete, truncated and deteriorated forms of *relationality* (rather than rationality) and modes of *co-existence* (rather than modes of production). Relations and forms of co-existence, that is, between entities that are *much else besides human*.

Trees

Sludge flows inside the pipes, a teeming mass of organic and non-organic entities, whose underground activities affect peoples’ lives on the ground in different ways. When the flow is obstructed it creates health problems as toxic fumes engulf city quarters. When the flow is regular, sewage turns into food for morning glories, which end up in the stomachs of Phnom Penh’s population. And when the flow is beyond capacity, it leads to floods that impede normal city life, though in one sense, of course, this *is* normal city life. Whatever is going on underneath is thus highly consequential for what occurs above. But though the *processes and interactions* that generate these outcomes are mostly hidden from view, except to select specialists, the negative *effects* are broadly discussed. Thus, newspaper articles regularly criticize the city hall and JICA for their inadequate efforts to improve infrastructure.

In fact, though, significant efforts go into just such improvement, and they are orchestrated not least by Mr. Inoue and his colleagues. In collaboration with the Phnom Penh Water Supply Authority, JICA is engaged in a large-scale and long-term project for flood protection and drainage improvement. In 1999, when JICA began the project, the focus was on improving and constructing sluiceways, reinforcing dikes, and making pumping stations in the South West area. The second phase turned to the North East and built underground reservoirs, pumping stations, riverbank revetments, and an interceptor pipe along the Tonle Sap River. During the third phase, coming to an end in 2015, an old sediment chamber has been rebuilt, cleaning equipment for the pipes have been acquired

(sludge suckers and high-water jet machines), and the gradual repair and extension of pipes continues.¹⁰

In spite of all these activities, the project is not met with unequivocal praise, and at the surface level of Phnom Penh's streets, the reason is not hard to see (Jensen 2016). Wherever one goes in the central area of the city, parts of roads, sidewalks and intersections are fenced off. Inside the fences, workers with hard-hats, surrounded by heavy equipment, dig into the ground, uncovering old pipes, repairing, fixing, replacing. When I described descending into the pipes, it was underneath one of these sites, next to the Olympic stadium. This kind of work is highly visible and it frustrates people. For one thing it invariably slows traffic, for the pipes always run under roads. For another it prevents people from easy access to their homes or shops. In addition, the holes are magnets for flies and mosquitoes that enjoy the humidity.

From the point of view of JICA project workers, these tangible irritants give rise to frustrating exercises in public relation management. As they see it, temporary and minor problems visible at the surface (traffic jams, pipe replacements), cast shadows over the long-term objectives and real achievements of the project (preventing floods and disease). Whereas intrusion into the underground creates a "visible transformation of dark surroundings" (Sneath 2009: 75), this visibility also obscures. Particularly obscure to the public eye are the very real difficulties inherent in achieving infrastructural improvements *amidst* these dark surroundings.

The fact that sewage infrastructure are something like the dark and invisible underbelly of visible urban lives, makes large-scale, long-term intervention in the crowded city-space a very hard sell to skeptical observers. They would prefer infrastructure to act as modern infrastructure is *supposed to*: invisibly but efficiently servicing human needs rather than very visibly invading urban space. In fact, however, one of JICA's other problems is that the sewage

¹⁰ JICA Topics and Events. 2013, October 28. JICA, City of Phnom Penh, and Local Residents Cooperate Together to Combat Flood in Phnom Penh –Flood Protection & Drainage Improvement in Phnom Penh (Phase 3). <http://www.jica.go.jp/cambodia/english/office/topics/131028.html>. (Accessed 31 October 2014).

pipes *do* invisibly and efficiently serve *other nonhuman needs*. Those of trees, for example.

The architectural and urban outline of modern Phnom Penh owes much to the French Colonial period (1867-1949). Parks, villas and boulevards were inspired by French urbanity. Known as the “Paris of the East”, Phnom Penh reputedly caused a visiting Charlie Chaplin to compare its avenues to “little sisters” of the Champs Elysées.¹¹ It is underneath these avenues that pipes now run. Majestic trees line the French inspired avenues. And it is the needs of these trees that are quite efficiently served by the pipes. Seeking nourishment, their roots branch downward. Finding no underwater streams, instead they touch upon sewage pipes.

Even small flowers are known to crack asphalt to get out into the open and the material of the original Soviet pipes was never of the best quality anyway. Picture the upward movements of flowers in reverse: massive roots working downwards to get into the pipes. Clearly this is not a fair competition. Just as the morning glories of the Southern swamps, Phnom Penh’s beautiful trees also find nourishment in the sewage. Only they do so before it has left the pipes. And thus, the sewage maintenance crew is waging a constant low-intensity battle against trees. At the ground level these skirmishes are invisible. They take place on the inside, where roots are cut and materials reinforced. And this is how it must be, for imagine the uproar if JICA was to advocate felling the trees that turned Phnom Penh into the Paris of the East in the name of *sewage*.

In Ashley Carse’s story, the landscapes surrounding the Panama Canal *become* infrastructure that delivers services to humans. “As infrastructure”, he says:

nature is irreducible to a non-human world already ‘out there’. It must, in its proponents’ terms, be built, invested in, made functional, and managed. This is an active and inherently political process. As nature

¹¹ National Museum of Cambodia. n.d. Streetscapes of Phnom Penh: A Leisurely Architectural Exploration. http://www.cambodiamuseum.info/en_information_visitors/streetscapes.html. (Accessed 31 October 2014).

becomes infrastructure through work, human politics and values are inscribed on the landscape, much as they are embedded in arrangements of steel and concrete (Carse 2012: 540)

Yet, if one considers the case of Phnom Penh's trees this sequence can be rearranged. For example, as nature (food source for trees and morning glories), infrastructure is irreducible to a human world. It is not just that infrastructure must be built, invested in and so forth, but that it is inhabited, exploited and lived by nonhuman others. More than an issue of human politics shaping what gets to count as nature, this is a process in which innumerable entities invisibly transform infrastructures *and* human environments. Though human politics and values are surely embedded in infrastructures, as Carse and many others insist, once infrastructure becomes a source of nutrition for trees, the values and politics inscribed on the urban landscape ceases to be based on the human.

Dislodging an Infrastructural World-View

Who are they, these beings so different from us and from each other?
What do they do? What worlds do they make? What do we make of them?
How do we live with them? (Raffles 2011: 3)

This paper has offered a decentered perspective on Phnom Penh's sewage infrastructure. It has done so by arguing that this infrastructure is constituted not only by technology, paper trails and social interests but also by the activities of a broad range of other entities. The sewage infrastructure is made, sustained, and disrupted by this multinatural constituency.

On the one hand, this infrastructure *depends on* flows of water, sludge, and the cleansing capacities of bacteria cultures. Yet, the sludge flowing under the streets of Phnom Penh's and the trees that intrude into the piping system also have seriously *destabilizing effects*, not only on the pipes, which leak or break, but also on the health of the city's inhabitants.

Writing about people as infrastructure, AbdulMaliq Simone's wrote that urban spaces are imagined as "functional destinations" (2004: 408). "There are

to be few surprises, few chances for unregulated encounters, as the city is turned into an object like a language". This is a nice statement of the modernist ideal of infrastructural convergence, so appealingly analyzed by Geoff Bowker (1995). But this was only ever a dream and a promise, not infrastructural reality. Dislodging this idealist view (pace Strathern 1985), this paper has elicited some of the multinatural relations that constitutes the actually operating sewage infrastructure of Phnom Penh.

Describing people as infrastructure, Simone's creative analysis highlighted the making of "social compositions across a range of singular capacities and needs" (2004: 410). In a "process of conjunction" these compositions came to operate in lieu of material infrastructure. As I have suggested, however, the agents doing infrastructural things together are much else than human. Indeed, I might suggest that the view of people as infrastructure can be accepted only if interpreted in terms of Amerindian perspectivism (Viveiros de Castro 2004) according to which *very many things, sludge and morning glories included, might turn out to be people*.

The point is obviously not about the insignificance of humans, either as planners or builders of infrastructure, or as actors that live with them on a daily basis. If the present chapter has refrained from taking human perspectives, it is rather due to a conviction that there is much more to learn about the workings and effects of infrastructure than what can be captured by such perspectives, no matter how varied. No matter how detailed, human-centered analyses revolving around politics (as conventionally understood), social organization, or cultural meaning-making, offers no help what goes on inside the pipes, amongst water plants, or in bacteria colonies, and the many ways in which these activities loop back and affect life in the city (see also Jensen and Morita).

The decentered approach with which I have experimented thus sharpens two interrelated arguments, which I believe are broadly relevant for the further strengthening of STS and anthropological studies of infrastructure.

First, even as people and societies are instrumental in building and maintaining infrastructures, they are also continuously shaped by them. However this shaping tends to occur *silently* and, to a significant degree, to the side of human intervention or even awareness.

Second, infrastructure is *made up of* an extremely varied set of entities. It is not simply that bacteria, sludge or morning glory are 'connected' with Phnom Penh's sewage infrastructure understood as "in itself" a complex technical arrangement. Rather, water plants, trees and sludge are *integral* to the infrastructure. They are part of making and sustaining it, even as they also disrupt it. People, too, are *folded into* this multinatural infrastructure. Like other organisms, they are shaped in innumerable ways by its loops, paths and relations.

On the final stop on the underground tour of Phnom Penh's sewage systems, our small group is taken to a pumping station by the riverside. During times of flood, massive pumps force vast quantities of rain and floodwater back into the river. In the dry season, the huge pipes are damp and smelly but quiet. It is hard to imagine them filled to capacity with wildly flowing water.

Something moves, barely, on the walls. I walk over, using my camera to get a bit of light -- and step back in momentary disgust. The walls are covered by colonies of cockroaches. Hundreds, thousands of cockroaches, everywhere. They too make their lives within infrastructures. Who knows what happens to them when the flood comes?

References

Anand, Nikhil (2011) "PRESSURE: The PoliTechnics of Water Supply in Mumbai," *Cultural Anthropology* 26(4): 542-564.

Barker Joshua (2005) "Engineers and political dreams: Indonesia in the satellite age," *Current Anthropology* 46(5): 703-27.

Bowker, Geoffrey C. (1994) *Science on the Run — Information Management and Industrial Geophysics at Schlumberger, 1920-1940*. Cambridge, MA & London: MIT Press.

Bowker, Geoffrey C. (1995) "Second nature once removed: Time, space and representations." *Time and Society* 4(1): 47-66.

Carse, Ashley (2012) "Nature as Infrastructure: Making and Managing the Panama Watershed," *Social Studies of Science* 42(4): 539-563.

Corsin-Jimenez, Alberto (2014) "The Right to Infrastructure: A Prototype for Open Source Urbanism" *Environment and Planning D* 32(2): 342-362.

Derrida, Jacques (1981) *Dissemination*. London, Athlone.

Harvey, Penny (2013) "The Material Politics of Solid Waste." In *Objects and Materials*, London: Routledge, pp. 61-72.

Hird, Myra (2016) "Burial and Resurrection in the Anthropocene: Infrastructures of Waste," this volume.

Jensen, Casper Bruun Jensen (2015) "Experimenting with Political Materials: Environmental Infrastructures and Ontological Transformations", *Distinktion: Journal of Scandinavian Social Theory* (special issue on "Political Materials") 16(1): 17-30.

Jensen, Casper Bruun Jensen (2016) "Pipe Dreams: Activity Trails, Infra-Reflexivity and Sewage in Phnom Penh", *Ethnos* (special issue on "Infrastructures as Ontological Experiments").

Jensen, Casper and Atsuro Morita (2016) "Infrastructures as Ontological Experiments," *Ethnos* (special issue on "Infrastructures as Ontological Experiments").

Jensen, Casper Bruun and Brit Ross Winthereik (2013) *Monitoring Movements in Development Aid: Recursive Partnerships and Infrastructures*. Cambridge, MA & London: MIT Press.

Pollock, Neil and Robin Williams (2009) *Software and Organisations: The Biography of the Enterprise-Wide System or How SAP Conquered the World*. London & New York, Routledge.

Raffles, Hugh (2010) *Insectopedia*. New York, Vintage Books.

Rosas, I., A. Báez and M. Coutino (1984) "Bacteriological Quality of Crops Irrigated with Wastewater in the Xochimilco Plots, Mexico City, Mexico," *Applied and Environmental Microbiology* 47(5): 1074-1079.

Schneider, Daniel (2011) *Hybrid Nature: Sewage Treatment and the Contradictions of the Industrial Ecosystem*. Cambridge, MA & London: MIT Press.

Simone, AbdulMaliq (2004) "People as Infrastructure: Intersecting Fragments in Johannesburg", *Public Culture* 16(3): 407-429.

Sneath David (2009) "Reading the signs by Lenin's light: development, divination and metonymic fields in Mongolia," *Ethnos* 74(1): 72-90.

Strathern, Marilyn (1985) "Dislodging a World View: Challenge and Counter-Challenge in the Relationship Between Feminism and Anthropology" *Australian Feminist Studies* 1:

1-25.

Viveiros de Castro, Eduardo (2004) "Exchanging Perspectives: The Transformation of Objects into Subjects in Amerindian Ontologies", *Common Knowledge* 10(3): 463-484.

Acknowledgments:

This work was supported by Japanese Society for the Promotion of Science (JSPS) KAKENHI Grant Number 24251017 and the Institute for Research in Humanities, Kyoto University. I gratefully acknowledge the constructive comments of Ashley Carse, Hugh Raffles and Stefan Helmreich, and especially of my excellent co-editors Penny Harvey and Atsuro Morita.