

Producing an urban hazardscape beyond the city

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Abstract

Urban socioecological risk, like other urban metabolic processes, embodies relations between the city and the non-city. In this paper, I trace the production of urban risk within and beyond the city through the lens of the hazardscape using the case of Metro Manila and Laguna Lake in the Philippines. Building on recent interventions in urban political ecology that seek to map the terrains of extending urban frontiers, I examine the processes that construct city and non-city spaces in urbanization through flood control. I synthesize narratives of the material-discursive production of risk mediated by infrastructure with histories of landscape and livelihood change in an urban socioecological frontier to make two related arguments. First, discursive constructions of city and non-city and the material flows that connect them shape the production of urban ecological risk, with material consequences for non-city vulnerabilities. Second, infrastructure plays an important mediating role in the production of hazardscapes. The intersection of flows of water, discursive urban imaginaries in state plans, and livelihoods in Metro Manila and Laguna Lake exemplifies metabolic relations that reveal the spatio-temporal connections of cities with landscapes that make their functioning possible.

Keywords

Urban political ecology, risk, infrastructure, flood control, Metro Manila

Introduction

On 23 October 2012, a few months after one of the worst floods struck Metro Manila, I visited the operations center of a flood control infrastructure that managed stormwater flows. An engineer showed me a map of the stations that recorded water levels and pointed to the channel capacities of different streams within the hydrological complex of Metro Manila. She explained where flows ended up during periods of intense rainfall, and where they were diverted when they exceed channel capacities. Through floodgates and floodways, engineers are able to channel stormwater flows destined for the downstream urban core to nearby Laguna Lake, a large body of water situated to Manila's southeast. The idea of stormflow diversion as designed, she explained to me, was "so people downstream won't

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suffer too much from floods, because economically, if you will plot it, the population is concentrated there” (Interview, October 2012).

During the time of this interview, Laguna Lake had been flooded for ten weeks, and water levels that rose to double the lake’s volume would not return to average conditions until December, some two months after. I visited the two fishing villages where I did fieldwork prior to the 2012 floods, and observed submerged houses and damaged aquaculture structures. Small-scale cage aquaculture producers, in particular, have been hard hit by nearly annual 4-month inundations, beginning in 2009, with the disastrous floods brought by Tropical Storm Ondoy (Ketsana). Recognizing the urban infrastructural source of flood hazards, groups of lake dwellers demanded the opening of the floodgates in Metro Manila, which they believed were to blame for the extended lake swelling.

These encounters revealed three things to me. First, Manila’s urban core depended on Laguna Lake to keep it flood-free and enable its daily functioning, reflecting a sense of modern control of urban nature. Second, discursive imaginaries of the city in relation to the non-city underpinned the massive material flows conveyed between these two places through infrastructures. And third, flood risk materially and discursively configures the socioecological terrains of non-city spaces. The spatially uneven implications and the deep temporal roots of this transference of flood risk seemed to be an urban socioecological problem that required transcending the traditional focus of urban research largely concerned with processes that take place within cities.

In this paper therefore, I frame the spatio-temporal elements of these flood disasters as an urban metabolic process that enrolls non-city spaces through the production of hazardscapes or landscapes of risk. Urban socioecological risk, like other uneven urban metabolic processes examined by urban political ecologists and urban scholars, embodies relations between the city and its non-city frontiers that supply flows vital to its everyday operation through infrastructure networks. Using the history of flood management and infrastructure in Metro Manila and Laguna Lake, I synthesize readings of the urban hazardscape as the non-city emerging from the material-discursive urban production of risk that is also a lived and contested social space.

By turning to urban hazardscapes beyond the city, I make two related arguments. First, discursive constructions of city and non-city spaces and the material flows that connect them shape the production of urban socioecological risk. Second, infrastructure plays an important mediating role between these spaces in the production of hazardscapes. Urban risk production relies on a differentiation between the city and the non-city, inasmuch as infrastructure matters in this process. Flood control infrastructures – constructed in the context of changing urban ideals from the colonial sanitary city to the modern developmental and neoliberal megacity – were crucial in realizing the state’s modern visions for Metro Manila and Laguna Lake. Infrastructures and hazardscape production were also vital in making the lake legible – although not without contradictions – as a resource frontier for Metro Manila through the metabolic exchanges of water, food and wastes.

In claiming that Laguna Lake as an urban flood hazardscape can be understood in relation to its construction as the non-city other to Metro Manila, I wish to engage and build on calls to urbanize urban political ecology (UPE) by going beyond the city as the primary analytical focus of studies of urbanization. This is an argument made most explicitly by Angelo and Wachsmuth (2015) in response to the erstwhile “cityist” orientation of much UPE work. By casting attention to Laguna Lake as a (non-city) urban hazardscape through its historical metabolic relations with Metro Manila, I however underscore the need to maintain the city as an empirical and conceptual anchor amid calls to move beyond the

city as a useful concept in critical urban studies. Urbanization through material flows and discursive imaginaries construct the city and the non-city, making both concepts empirically necessary in analyses of extended urbanization. This paper, therefore, focuses on both city-making in Metro Manila through the history of flood control infrastructure, and the production of Laguna Lake as an urban resource frontier, where risk entangles with deeper histories of modern development interventions tied to urbanization.

I investigated the production of urban hazardscape through ethnographic fieldwork in 2012 and follow-up visits in 2015 in five Laguna Lake villages, and a review of state plans on Metro Manila flood control. Fieldwork was asymmetrical in the two areas: I talked primarily to Laguna Lake aquaculture producers, fisherfolk and residents about intersections of livelihood and flood risk while interviewing a handful of Manila-based state engineers and administrators to understand urban flood control management. Data from state plans on flood control projects published in the 20th-century and newspaper articles also provided material for a discursive reading of Laguna Lake as a landscape of risk in relation to Metro Manila.

This paper proceeds as follows. In the following section, I begin by explicitly engaging with a UPE approach to risk, hazardscapes and infrastructures, and to a methodological extension beyond the city. Next, I track the emergence of flood control in Metro Manila through a history of infrastructure construction and channeling of flows, linking it with recent 21st-century disasters. Then, I discuss development interventions and state optics that discursively underpin Laguna Lake as a flood hazardscape, focusing on discourses that enabled risk to take place in the lake, the metabolic contradictions of producing the lake as a multi-purpose urban resource frontier, and how notions of risk are subsequently mobilized by the state. Finally, I turn to the implications of risk transference and demonstrate hazardscape as a contested space by presenting accounts of how lake dwellers live with and resist magnified vulnerabilities in fish production and conflicts surrounding infrastructures.

Urban political ecologies of metabolic flows and hazardscapes

In this paper, I engage with the field of UPE by emphasizing entanglements between urban socioecological risk, infrastructure, material flows and modern visions of the urban. I build on calls for a UPE of urbanization to extend beyond cities without losing sight of their analytical usefulness of as a concept. I also employ the hazardscape heuristic and contribute in conceptually unpacking discourses of risk and their intersections with the material while stressing the role of infrastructure as mediator of risk between the city and non-city.

Extending urban political ecology beyond the city

Urban political ecology has on the outset emphasized a relational-processual understanding of urbanization, premised on the dialectical relation between city as form and urbanization as process (Harvey, 1996; Swyngedouw, 1996). As spatial forms, cities are thus constituted by multilayered flows that are contested, power-laden and spatio-temporally uneven, suggesting that “there is no longer an outside or limit to the city” (Swyngedouw and Heynen, 2003: 899). A recent provocation sought to put UPE to task on its unfulfilled promise of taking seriously urbanization beyond the confines of cities, arguing that cities – as bounded, self-enclosed spatial units – have become the ontological priority in explaining urban environmental change (Angelo and Wachsmuth, 2015). While a few classic UPE works have shown the often violent mechanisms of enrolling hinterlands in urbanization,

paying attention to both city and countryside (Cronon, 1991; Gandy, 2002; Swyngedouw, 2004), most others, according to the critique, focus mostly on hybrid socioecological processes within cities. Efforts are underfoot – explicitly or otherwise – to engage UPE with the planetary processes of urbanization by linking emerging spatial forms of agglomerations with their expanding frontiers, examining how landscapes, bodies and communities are shaped by urbanization beyond the city (Arboleda, 2016; Gustafson et al., 2014; Hommes and Boelens, 2017; Kanai, 2014; Lepawsky et al., 2015).

Angelo and Wachsmuth rightly challenged much of UPE for overlooking socioecological frontiers in examining the urbanization of nature. However, moving beyond the city should not necessarily entail discarding the city as a concept that has outlived its analytical usefulness. While planetary urbanization promises to bring attention to how non-city landscapes are produced in urbanization, I echo the argument that the city remains analytically useful to anchor such processes empirically (Davidson and Iveson, 2015; Rickards et al., 2016; Storper and Scott, 2016). Keeping the city in the narrative enables us to trace historical shifts in metabolic relations of other places tied to decisions made about and for these spaces of agglomeration. While planetary urbanization begins with assumption of a novel global urban condition qualitatively distinct from past versions (Brenner and Schmid, 2015), I find it productive to demonstrate the material and discursive shifts in city and non-city relations through time. Imaginaries of the city (and the non-city) continue to shape the terrains of urbanization even as new urban spatial forms emerge. Thus, empirically tracing how 20th-century interventions in the built environment of the modern city produce particular city and non-city landscapes still require the city as a starting point. As Davidson and Iveson argues, non-city spaces like Laguna Lake are “*urban* because of their relation to unfolding processes of city-making” (2015: 655, emphasis on original). There is a need therefore to keep the city and non-city in productive tension, while recognizing the changing configurations of urban forms.

In this paper, I draw narrative inspiration from first-wave UPE work of city-hinterland relations but cast attention to how non-city landscapes are transformed through exchange of flows and construction of infrastructure. This involves examining their emergence through state interventions, their discursive framings, and the resulting material metabolic flows that configure socioecological possibilities in non-city spaces.

Hazardscape and infrastructure

A UPE lens highlights the historical, political and relational production of unequal risk and vulnerability. Urbanization transforms city and non-city spaces, and amplifies or transfers forms of socioecological risk (Eakin et al., 2010; Pelling, 2003) that are distributed unevenly among groups and across places. Urban vulnerability, as conceptualized in recent UPE works, is not a static singular condition at a specific point in time but a bundle of multiple conditions produced at different temporal and spatial scales (Collins, 2009, 2012; Dooling and Simon, 2012; Rebotier, 2012; Simon, 2014). This dynamic scalar reframing allows scholars to identify causality of vulnerability and trace sources and preconditions of risk that may extend beyond the city or that are layered in landscape (Dooling and Simon, 2012; Simon, 2014), involving human and sociomaterial assemblages (Ranganathan, 2015). How and why risk is transferred elsewhere deserve more attention to understand unequal risk in urbanization (Collins, 2012; Etkin, 1999), where discourses and representations of city/non-city spaces configure risk transference as uneven urban metabolism.

Hazardscape zooms in on the material-discursive intersections of everyday practices of negotiating exposure to hazards and the production of socioecological risk as they are

inscribed in the landscape. Mustafa defines the term as “an analytical way seeing, which asserts power, and a social space where they gaze of power is contested and struggled against” (2005: 570). It is a constructed vision of landscape that is contested at the level of ideological representation, but it simultaneously refers to the social space produced out of grounded struggles over the landscape materially transformed by these power-laden ways of seeing. Beyond the discursive and representational, the production of hazardscapes matters materially in that it configures people’s everyday lives and struggles. As bridge between lived experiences and ideological representations, hazardscapes embody contested meanings of both risk *and* landscapes.

There is a need however to underscore the multiple ways that the discursive matters in hazardscape production, and here I seek to contribute to how discourses shape risk and hazardscape production in two ways. First, discourses about landscapes enable risk to take place materially, producing hazardscapes, territorializing risk and differentiating the city and the non-city. The urban political ecological turn to discourses as root of uneven urban spaces (Kooy and Bakker, 2008; Schramm, 2016) and to urban imaginaries that shape city-making (Angelo, 2017; Gabriel, 2014) illuminate such moments as risk transference through material flows and “how things *other than the city* are understood through it” (Angelo, 2017: 16, emphasis on original).

Second, risk is also constructed and mobilized for particular ends to create contested notions of riskiness and risky landscapes, where communities come to be identified as at risk. For some scholars, risk or vulnerability therefore not only results from the uneven production of space as a property of the landscape or people, but also emerges through techniques of government that make spaces legible (Gustafson, 2015; Zeiderman, 2012) or through the coming together of practices, events and objects that translate discourses into material realities (Blok, 2016; Walker et al., 2011; Yamane, 2009). In this paper, I draw on these two approaches to risk to illustrate the production of Laguna Lake as a non-city hazardscape where both conceptions operate simultaneously and further reinforce riskiness in landscape. Deploying both notions of risk – as socially constructed and as a characteristic of a landscape produced through material flows – also points to the ways that the material and the discursive intersect in risk production, and to the multiple, contested visions of landscapes. The hazardscape heuristic may thus be enriched by emphasizing discourses that construct both riskiness and landscapes, while also illustrating the differentiation of the non-city as the urban other.

Moreover, examining the role of infrastructure in mediating flows and risk may contribute to unpacking the dynamics of urban hazardscape production. Sociotechnical infrastructure networks configure and enable the metabolic connections of cities with the non-city, as they sustain everyday life by bringing material flows from elsewhere (McFarlane and Rutherford, 2008; Monstadt, 2009; Ranganathan, 2015). As networked infrastructures and urban forms co-evolve, extending further out with planetary reach, they deserve a central place in narratives of socioecological risk production. Embodying visions of modernity and control of nature, infrastructure networks are vital sites in the struggle for access to flows yet are often rendered technical and invisible (Kaika and Swyngedouw, 2000; McFarlane and Rutherford, 2008; Monstadt, 2009). Infrastructures reflect ideals of modernity and, reworking Larkin’s definition (2013: 329), create the grounds for the operation of the non-city in relation to the city.

Apart from serving as provisioning systems, infrastructure networks are also conduits of risk displacement. Risk is not just produced through dysfunctional or disrupted flows and infrastructures, such as when dikes or pipes break (Furlong, 2014; Gandy, 2008), but is magnified by their very presence. The politics of the urban production of hazardscapes in

non-city spaces are situated both in the discursive framing of the engineering design and modern imaginaries of infrastructures, as well as in the material implications of the displacement of these flows. Infrastructure can also be considered political in another sense – as sites and objects that become the visible target of resistance as conveyor of socioecological burdens for people.

Spaces and flows of flood control in modern Metro Manila

While widespread floods have occurred in Metro Manila throughout the 20th-century, the scale of the 2009, 2012 and 2013 floods was unprecedented. In what follows, I trace the material, infrastructural and discursive origins of these recent floods, ranging from the sanitary city vision of the American colonial period to the state infrastructure boom during the Marcos authoritarian regime, concluding with notes on the place of the non-city in these narratives.

The large-scale movement and channeling of massive material flows of water are relatively recent interventions enabled by state construction of infrastructure amid a postwar urban growth and developmentalist planning. Efforts to manage Metro Manila's floods through engineering projects, however, date back to at least the early years of American colonial occupation (1898–1946). Embedded within a particular colonial ideal of the sanitary city – with its faith in scientific knowledge and engineering interventions to address urban problems (Melosi, 2008) – these efforts were part of modern city building under a nascent colonial project (Anderson, 2007; Shatkin, 2005). The extensive system of urban waterways or *esteros* – and the problem of their drainage became the subject of engineering studies commissioned by the Manila Municipal Board as early as the 1900s. Efficient conveyance of stormwater and wastes in the system of waterways through the application of scientific principles was seen as crucial in the modern growth of the colonial sanitary city.

It was only in 1952, however, with the Plan for the Drainage of Manila and Suburbs, that large-scale interventions to manage and convey stormwater away from the urban core were put into a city-wide plan. After almost a decade of studies and prompted by widespread floods in the 1940s, the plan aimed to address flooding by responding to both the expansion of the built environment and the flows of water from outside. The plan carried a comprehensive, holistic scheme of addressing the flooding problem at a larger metropolitan scale that went beyond earlier piecemeal interventions in the built environment. It recognized that control of the Pasig River flood flow required control of the Marikina River further upstream. Consequently, the plan called for a restructuring of metropolitan governance to address the broader scale of the flood problem. However, except for small-scale localized projects in the older sections of the city, proposals remained unrealized until the 1970s.

A confluence of several factors led to the flurry of flood control infrastructure construction and a rescaling of flood management in the 1970s. The Ferdinand Marcos regime (1965–1986) relied heavily on foreign borrowing through development assistance and loans to fund infrastructure projects throughout the Philippines (Boyce, 1993). The strategy addressed the primary financial limitation of the 1952 plan and built on the emergence of Japanese development and technical assistance in the 1970s. The construction of flood control infrastructure and disaster management were significant politically in shoring up support for the regime and quelling dissent against Martial Law, which Marcos imposed a few weeks after the 1972 floods (Warren, 2013). The 1972 Manila and Suburbs Flood Control Plan, which in many ways relied on the earlier 1952 plan, also coincided spatially with the emerging concept of a Metropolitan Manila region, governed by the First Lady Imelda Marcos (Pante, 2016).

The flood control infrastructure projects displayed many elements of high modernist thinking (Scott, 1998). The 1952 and 1972 plans inherited the colonial concern for efficiently ridding the city of sanitary flows through application of scientific expertise and economic calculations (DPWTC, 1972; MPWTC, 1952). Both involved collection and modeling of best available data to allow for the efficient conveyance of stormwater flows through physical interventions in the urban built environment. They also required a topological understanding of Metro Manila and its connections with surrounding areas, rescaling the focus to the scale of the watershed and the hydrological regime of the Pasig River, Marikina River and Laguna Lake basin. The 1952 and 1972 plans recognized that solutions to spare the city from inundation would require interventions in these non-city spaces by reducing or redirecting upstream flows that cause the most disastrous flooding, notably those of the Marikina River.

As part of state building and urban reconstruction after World War II, the political context of the two flood control plans from the 1950s to the 1960s reflected tensions between local city governments and the national government in the responsibility for managing floods (Pante, 2016). The centralized, authoritarian Marcos regime of the 1970s, which blurred the distinction between the two levels of government best demonstrated by the creation of Metro Manila as a unique urban political entity in 1975, actualized key aspects of these plans and made possible dramatic interventions in the control of stormwaters. Flooding, for instance, was framed by then Metro Manila governor Imelda Marcos as one of the major ills that plagued the growing city and that prevented efforts toward beautification and attracting investments (Pante, 2016; Warren, 2013). Thus, the centralization of political power enabled the massive flood control infrastructure construction between 1972 and 1987, and in turn helped strengthen the legitimacy of authoritarian rule. These mega projects were underpinned not only by high modernist ideals of control of urban nature, characteristic of the regime (Pante, 2016; Saguin, 2016b) but also required the modern spatial separation of the city and the non-city.

The construction of the Mangahan Floodway is instructive of how flood control infrastructures differentiate between the city as space that needs to be protected, and the non-city as a space that could serve as a sink for stormwater. Carved out of marshy suburban land east of Manila in the 1980s, the 7-km-long floodway was designed to divert stormwater flows from the Marikina River away from central Metro Manila and was deemed the most cost-effective solution to downstream Pasig River flooding (DPWTC, 1975; SOGREAH, 1991). The floodway is a crucial node in a network of flood control structures that also includes the Napindan Hydraulic Control Structure (NHCS), the Rosario Weir (with floodgates) and pumping stations. These structures – financed by foreign loans – operate synchronistically in a manner that seeks to avert widespread flash flooding in Metro Manila by spatio-temporally controlling stormwater flows (Liongson, 2008).

Laguna Lake is crucial to the overall flood control design, as 70% of the discharge flow from the Marikina River is meant to be temporarily stored in the lake through the floodgates and the floodway. Doing so would reduce stormwater flows in the Pasig River to channel capacity. At the height of the flood events in 2009 and 2012, state engineers diverted around 4000 m³/s peak discharge to the lake, well beyond the capacity of the Marikina River and Pasig River channels (Liongson, 2008). This diversion explains the more-than-usual water flow that resulted in the swelling of the lake not seen in almost three decades.

Large infrastructures as structural solutions to flooding may be effective in reducing flood in one area, but often transfers risk upstream or downstream through hazard conveyance (Jha et al., 2012). The process of risk transference and hazard conveyance to divert flows away from an urban center is not unique to Metro Manila. Examples in Hanoi, Bangkok,

Mexico City and New Orleans show contestations in where to divert flows and who gets affected (Jha et al., 2012; Lebel and Sinh, 2009). Decisions are fundamentally political in that they rely on identifying particular places to serve as a sink. Politicizing risk then unearths how discourses shape flood risk, how these are produced, mobilized and made concrete via infrastructures, and with what material effects and responses from people.

The topological space of Metro Manila's flood control reflect the sanitary city's preoccupation with distinct separation of flooded/dry and city/non-city. Flows were to pass through the city waterways as quickly and efficiently as possible, with those that cannot be channeled through urban waterways displaced to non-city sinks. Control of metabolic flows as a form of sanitary services, even as there was an eventual breakdown later on, becomes an important element in the continued functioning of the city. In this vision, Laguna Lake plays a significant role as the outside that makes a drier city possible. Its legibility as a particular kind of resource was produced parallel to and with the same logic as urban flood control infrastructure, which coincided with the emergence of the modern city.

Seeing the non-city in producing a hazardscape

Material and discursive elements of risk intersect in the production of hazardscapes through infrastructure networks that extend further out of the city. In many cases, these discursive framings about risk and landscapes necessarily further the distinction between the city and its non-city other. For example, infrastructure does not only produce Laguna Lake as a hazardscape through risk transference; the production of Laguna Lake as a hazardscape is itself necessary for the functioning of these hard technical systems. I show in this section (1) that discourses about Laguna Lake as a landscape resulted in particular visions that enabled risk to take place, (2) that these narratives are part of historically-evolving framings bound with urban metabolic relations between the lake and the city, and (3) that risk transference creates new discourses of a risky lake that justify further state interventions. These three narratives of risk show the ways that discourses of risk operate in a hazardscape.

Territorializing risk in the Laguna Lake hazardscape

In the project plans of flood control infrastructure, Laguna Lake is an intrinsic part of the hydrological complex as space for storage of excess urban stormwater. Plans identified Laguna Lake as a node in the system that comprises the Marikina, Pasig and Napindan Rivers. Assessments saw the proposed infrastructural interventions as key in facilitating lake development schemes of harnessing resources, along with alleviating Metro Manila floods. The presence of Laguna Lake as a large body of water that can serve as a retention space for water flows had been considered as far back as discussions of designing a modern water supply and drainage system under the American colonial period (Manila Municipal Board, 1905). However, stormwater conveyance from Marikina River to Laguna Lake to mitigate downstream flooding had origins in the 1952 plan, which recognized the impacts of upstream stormwater flows on central Metro Manila floods. Observations and measurements of earlier floods showed that the lake, owing to its huge storage capacity, absorbed a significant percentage of stormwater flow from the Marikina River which prevented further flooding downstream (MPWTC, 1952).

The 1952 and 1972 flood control plans, as well as feasibility studies of Laguna Lake development schemes, justified the lake as a storage space because its large surface area (90,000 ha) spreads water more slowly, which creates a time lag in peak water level stage relative to the constrained capacities of river channels. The plans expected the rise in lake

water levels to be minimal or negligible and will spread “harmlessly” over a vast area where lakeshore flooding was not considered a serious problem. Flash flooding in Metro Manila could be averted through synchronic operations of stormwater diversion into and out of the lake – the promise of modern control.

The lake is therefore vital to the operation of a flood-free city and its eventual flooding is rationalized in relation to impacts on the city. The plan for the diversion channel infrastructure, for example, suggested that “while the diversions are critical to the prevention of flooding in Manila, they are nominal when compared with the size of Laguna de Bay” (DPWTC, 1975: I-4). State narratives see Laguna Lake as a space or territory that contain excess water and where flood risks can take place (Rebotier, 2012). Such ways of seeing produces technocratic-managerialist discourses (Collins, 2009; Mustafa, 2005) that emphasize techno-scientific control of biophysical processes and dimensions of risk, which can in turn be addressed through technical solutions and bureaucratic management. Thus, discussions of possible solutions to Metro Manila and lake flooding after the 2009 and 2012 events revolved primarily around the provision of more or better flood control structures.

Seeing the lake as a smooth space, however, necessarily renders invisible social spaces and differences in the lake, and justifies projects to solve issues of risk away from the more difficult, extra-local causes. As an intrinsic part of the operation of urban infrastructure, the non-city Laguna Lake becomes fetishized or hidden from view (Arboleda, 2016; Kaika and Swyngedouw, 2000) in the process of its discursive imagination as a hazardscape and in maintaining the continued operation of the city as an economic agglomeration.

The lake provides, through diversion of stormwater, a natural, technical and modern solution to the problem of Metro Manila flooding. This, however, is complicated by broader problems that continue to hound managers of Laguna Lake, including rapid siltation that has made the lake shallow, turbid and highly eutrophic; reception of industrial, agricultural and domestic wastes; and socioecological conflicts associated with the expansion of aquaculture (Lasco and Espaldon, 2005). These processes are inseparable from the lake’s relations to the growth of Metro Manila, and shows how risk production is inseparable from other processes that produce the lake as a modern urban resource frontier, with implications for those rendered invisible in the non-city other.

Managing the metabolic contradictions of a non-city hazardscape

Risk discourses in Laguna Lake are embedded in imaginaries of the lake as Manila’s multi-purpose resource frontier. Thus, the successes, failures and implications of hazardscape production need to be situated within broader history of urban metabolic processes initiated by the state. Modern dualistic tendencies of separating nature from society, city from non-city, and parts from the whole underlie much of the technocratic-managerialist discourses about the lake. Project plans from the first assessments of the lake in 1970 to water management and flood infrastructure projects of the 1980s, have prioritized the multi-purpose usage of Laguna Lake.

The creation of the Laguna Lake Development Authority (LLDA) in 1966 realized this modern vision of multi-use resource urban frontier – part of a postwar developmental state building through the creation of new spaces and bodies of resource management – by knowing, rationalizing and controlling various components of the whole and harmonizing conflicting uses. Infrastructure is crucial in this vision, as exemplified by plans claiming infrastructure as “the key point to the overall Laguna de Bay development scheme,” which becomes “indispensable to emphasize or support the other various projects for

water supply, irrigation, fishery industry, etc.” (Pacific Consultants International, 1978: 6). However, the history of lake resource use conflicts suggests the continual undermining of this modern ambition as one use – abstracted from the whole – creates incompatibilities with others.

A case in point would be the contentions surrounding aquaculture in Laguna Lake, which established the primary urban connection between the lake and the city through the production of fish commodities. The LLDA introduced aquaculture as one of the first modern development projects that enabled multiple resource use of the lake, guided by an urban vision of producing more fish for an expanding city (LLDA, 1966, 1970). It framed capture fisheries as a problematic sector in crisis and proposed aquaculture as an efficient solution through livelihood programs, scientific research, governance strategies and construction of infrastructure to regulate water flows (Delmendo and Gedney, 1976; LLDA, 1970). Throughout its history, Laguna Lake interventions have been framed in the modern language of efficiency (converting lake nutrients to supply fish for the city), rationalization (managing unruly aquaculture fish pen structures through state mechanisms of regulation) and democratization (introducing technologies to benefit those displaced by capitalist aquaculture enclosures) (Saguin, 2014, 2016a).

The continuing resource production of Laguna Lake in relation to Metro Manila has made the lake a site of conflict that range from violent encounters between large-scale aquaculture producers versus small-scale fisherfolk (Saguin, 2016a) and lake dwellers opposing various state projects, such as water extraction and construction of flood-control dikes. These conflicts have strong urban connections and is tied to the production of the lake as the non-city other to Metro Manila. The absentee owners of large-scale aquaculture farms, for example, have urban roots, taking advantage of the opening up of the lake as a resource frontier for fish production. The postwar emergence of capitalist fisheries corporations in Metro Manila, which control a significant share of fish flows to the city, have shaped the political contestations surrounding lake resource use between aquaculture and fisherfolk as they continue to maintain extensive operations in the lake (Saguin, 2016a).

Private water concessionaires that operate in Metro Manila have initiated large-scale efforts to extract domestic water for urban consumption (Olchondra, 2010). These projects resulted from the rolling back of state functions and increased private sector involvement that led to the privatization of urban services (such as water and electricity), decentralization and creation of market-oriented urban policies (Ortega, 2016). Neoliberalizing processes have also extended to the provision of urban transportation and flood control infrastructure. For instance, former president Benigno Aquino III proposed the construction of Laguna Lakeshore Expressway Dike (LLED) project in 2013, a key infrastructural centerpiece of his private-public partnership agenda, to address urban flooding and congestion in the expanding southern portion of the city (Rappler, 2014). The state plays an important role in initiating these projects guided by shifting ideologies: from postwar developmentalist, centralized visions of control via mega-infrastructures to more recent neoliberal turns toward privatization of water supply and infrastructure construction, as well as in regulating and managing eventual conflicts and opposition in the lake. Political contestations, therefore, emerge in conjunction with these attempts to tap the lake as an urban resource, nowhere more so than in infrastructure and flooding.

We can read the discursive differentiation between city and non-city and among various productive uses of the lake implicit in these modern plans. The city emerges from its relations with Laguna Lake as a spatial entity to be supplied with material flows and services from the

lake. It serves as the justification for producing Laguna Lake as a space for resource production, which in turn is an opportunity to initiate parallel development interventions in the lake. Thus, the state production of the lake as a flood hazardscape where risk takes place is underpinned by two components: producing the lake as a temporary storage space to protect downstream Metro Manila through spatio-temporal control of flows, and enabling infrastructure to allow development of the lake to supply urban demands. Both components discursively distinguish the lake as a separate space from the city that is necessary for the city to continue functioning but not without their metabolic contradictions such as increased risk and magnified vulnerabilities. The city-non-city differentiation also overrides the vision of the lake as a lived environment in that floods have implications for livelihoods dependent on fish production in the lake. Moreover, risk emerges as effect of state attempts to produce an urban resource frontier, while also mobilized by both the state and lake dwellers for different goals.

Mobilizing risk in a hazardscape

Risk transference and subsequent lake flooding enabled the emergence of discourses of risk that promote further state interventions through more infrastructural investments (such as the LLED) and through relocation of lake dwellers identified as residing in what it terms “danger zones” or “danger areas”. As part of the state’s discursive creation of new spaces and populations at risk after the 2009 and 2012 floods, a public works official claimed that the more than 70,000 families around Laguna Lake and more than 100,000 families in Metro Manila waterways living in “high risk” areas needed to be evacuated to both ease flooding and save lives (Calica, 2012). In the guise of promoting safety and managing risk, the national government allocated a P50-billion fund for the systematic relocation of informal settlements along Metro Manila waterways and lakeshore sites (Gov.ph, 2014).

In several communities, such as the two western lakeshore villages I visited in 2015 located near the proposed LLED project, fisherfolk recount how their villages have been identified and mapped as a risk and flood-prone area. Several families in these “danger zones” in both Metro Manila and Laguna Lake have been resettled to sites further out in the per-urban fringe as a result. However, the clearing of structures and removal of risky populations have been uneven and selective, in that subdivisions, condominiums and other commercial developments that encroach on waterways and the lakeshore remain untouched while informal settlers continued to face mass evictions (Ortega, 2016).

Risk in this context is therefore not merely materially produced or transferred to another place that is a property of the landscape but is also constructed and mobilized for particular ends. In clearing waterways and lakeshore sites to make way for new spaces of accumulation, the state assembles practices of mapping and identifying danger areas, thereby producing discourses of risk and risky landscapes and exercising state power. As I briefly narrate in the next section, lake dwellers meanwhile counter state projects by deploying notions of risk to oppose lake infrastructures that they believe undermine their livelihood. Hazardscapes are thus not only materially produced as a landscape and risk transferred to the discursively-produced non-city other, but risk is always processually reconfigured and remade within such landscapes.

Resisting infrastructure and living in a non-city hazardscape

Hazardscape is as much a contested social space as it is a way of seeing (Mustafa, 2005). Besides resulting from ideological filters, the production of an urban hazardscape beyond the

city has material consequences for vulnerability and livelihoods of people in the extended spaces of urbanization. Who bears the burden of flood risk is a central political ecological question that illuminates the material components of risk and vulnerability in non-city hazardscapes. As contested social space, non-city dwellers are active in shaping their socioecological futures to make a living in a landscape of risk. In this section therefore, I briefly turn to the production of a hazardscape from the vantage point of lake dwellers, using two examples of how people challenge and produce lived realities in a hazardscape. I sketch how the vulnerability of fishing livelihoods have been magnified by strengthening urban metabolic connections with Manila that exposed them to greater flood hazards, and how lake dwellers have correspondingly taken action against infrastructure as conveyor of risk.

In Laguna Lake, the risk production through flood control intersects with changing vulnerabilities associated with the increasingly urban orientation of lake fisheries. In several fishing villages, fish producers shifted from traditional capture fisheries – livelihood generally unaffected by flooding – to cage aquaculture, which the state introduced in the late 1970s. Unlike larger-scale and capitalist fish pen aquaculture, which tend to be relatively more physically and financially resilient to floods and typhoons, small-scale cage aquaculture is most affected during extended periods of flooding (Saguin, 2016b).

Recent flooding events are symptomatic of the changing metabolic relations between the lake and the city, subjecting lake dwellers to greater flood risks that intersect with lake producers' vulnerability. While bringing in more cash to the household, aquaculture simultaneously exposed those who adopted the technology to the risks associated with producing in an environment regularly struck by typhoons and floods. Because of the fixity of enclosures in lake space, aquaculture through cage structures allows greater control in production when compared with capture fisheries. However, it is a riskier venture because of the constant threat of damage due to winds and floods, especially when producers fail to anticipate a typhoon or when floods spill stocked fish and damage structures. Well-off producers, usually those who have more social and natural assets, are able to prepare and recover better after such events, supported by their ability to diversify their livelihood portfolios and spread the risks of production. Newer entrants to aquaculture and poorer households are often the most affected after typhoons and floods. As a small-scale cage producer noted, his limited capacity to make his cages more hazard-proof led to loss of stocked fish during the 2009 typhoon, which was weak but brought severe damage due to raised water levels (Interview, May 2012).

The shift to aquaculture with an explicit urban orientation from traditional capture fisheries heightened the vulnerability of small-scale Laguna Lake producers, particularly those who are already marginally positioned vis-a-vis large-scale capitalist pen aquaculture. Lake dwellers also frame the ensuing conflict between city-based pen aquaculture operators and lake-based capture fisheries as issues of equity and of legitimacy to make a living from the lake. Echoing sentiments of other lake dwellers, a fisherfolk commented on fish pen aquaculture owned by city-based entrepreneurs: “The rich is getting richer now. The lake used to be for the poor” (Interview, May 2012). Lake dwellers know their links with the city through infrastructure, and they recognize the consequences for livelihoods, such as how these structures control flows vital to their fishing at their expense and for the benefit of water consumers in Manila (Interview, June 2012).

Urban political ecologists have argued that risk and vulnerability are not singular, static conditions fixed in space and time, but are rather historically evolving and layered in landscape. The production of Laguna Lake as hazardscape intersects with a longer

history of development interventions that distribute risks and produce vulnerabilities unevenly over space and across groups. Lake dwellers encounter, adapt and live with new risks and also recognize their connections to the city through flows and infrastructure. The production of hazardscape therefore has been met with forms of resistance that often target these visible infrastructures.

Discursively produced as a silting space for stormwater storage, the lake has been subject to several state attempts to increase its ability to hold more water and improve its flood control functions. Many of these – including dredging and road dikes – were heavily debated and were opposed by lake producers because they threatened aquaculture and fisheries (Cinco, 2011; Silverio, 2011). Infrastructure becomes a rallying point in calls for better lake socioecologies. Because of the material and symbolic importance of flood control structures, these are seen as the root cause of lake problems such as flooding and poor fish productivity. In both 2009 and 2012, fisherfolk and other lake groups called for the opening of the panels of the NHCS to allow diverted water to flow out to Manila Bay and reduce lake flooding (Mayuga, 2012). Since the construction of the Mangahan Floodway and NHCS, there is a general sentiment among lake dwellers that recurrent floods are a result of these structures.

The precedence for resistance was in the 1980s, when the first prominent infrastructure project in Laguna Lake was built. The NHCS, constructed in a Pasig River junction in 1978, was designed by foreign consultants as an engineering solution to the problem of saline intrusion to the lake because the river's high nutrient load was believed to be harmful to the lake ecology (Pacific Consultants International, 1978; SOGREAH, 1991). Experts emphasized the importance of controlling this flux as it would enable other uses of the lake for urban domestic water supply and irrigation through decreased salinity and nutrient load. However, drawing from experiential knowledges of lake ecology, lake producers opposed the NHCS as it limited the vital saline flux that seasonally revives the fisheries (Santos-Borja, 1994).

Historically in conflict over aquaculture's enclosure of the lake commons, groups of fisherfolk and the politically well-connected pen aquaculture producers joined forces in 1985 to pressure the state to undo the NHCS's function and allow unregulated flow of water. In a series of actions that reflect the fluid connections between the lake and the city, fisherfolk mobilized a motorcade of boats from the lake to the presidential seat along the Pasig River and successfully persuaded managers to prevent the operation of the structure as saline control. For some lake dwellers, this history of mobilization against the NHCS parallels more recent opposition to the proposed LLED, an infrastructure project seen to cause widespread impacts on lakeshore communities in terms of livelihood and risk. As one older fisherfolk recalled:

We held a rally, a motorcade. We went to Malacanang riding boats but we were not allowed inside to talk to the president. This is what I want to happen again to show the government that we are against this road dike [LLED]. What happened back then was that we contributed one peso each so that we could try to blast the Napindan channel [NHCS]. . . If some of the people I know back then were still alive today, [they would oppose this road dike]. The grandfather of one of my friends once told him that there will come time someday when the lake will turn red. Maybe this is the time. The construction of the road dike is a sign of that. Lives might be shed. (Interview, August 2015)

Fisherfolk living near the proposed site of the LLED have also deployed notions of risk to oppose the infrastructure, arguing how it will magnify, rather than mitigate, flooding in their area. In the case of NHCS and LLED, the construction of a large, visible infrastructure

became the target of opposition for its ability to shape lake socioecologies and livelihoods. Opposition to the infrastructure showed not only contestations between local knowledges and state technocratic-scientific discourse of lake ecology but also resistance to the production of non-city spaces as urban resource frontiers through infrastructure.

Turning to how non-city spaces are enrolled in urbanization also extends questions of urban politics and resistance. Beyond contestations of imaginaries of the non-city spaces in relation to the city, hazardscape production shapes the material geographies that configure socioecological futures and conflicts around them. A practical implication of distinguishing urban politics in the non-city is revealing the fetishism of landscapes that makes the operation of cities possible while emphasizing the processual character of urban politics that extend to diverse places from the immediate hinterland to urbanization's planetary reach.

Conclusion

Using the case of stormwater flows and their infrastructural control in Metro Manila and Laguna Lake, I have narrated the production of risk and hazardscapes in urbanization. I have explored the differentiation of city and non-city spaces, and how their relations are mediated by material flows and imaginaries of urban spaces. These findings speak to key urban political ecological concerns of uneven access to metabolic flows and distribution of harms, and contribute to unraveling the multiple entanglements of the material and the discursive in risk production. Bringing focus to the non-city furthermore reminds us the relational processes that produce urban configurations – resource flows, imaginaries and politics, for instance – extend beyond the city. Following recent calls to move beyond the city as the primary focus of urbanization, I have turned to the production of Laguna Lake hazardscape in relation to Metro Manila. By seeing the lake as imbricated in metabolic processes that connect it with Manila, I have highlighted the importance of empirically maintaining the city as a conceptual anchor for discussing the non-city spaces of urbanization.

Infrastructure matters in linking the city with the non-city, and in hazardscape production. Flood control in Metro Manila has deep roots in the modern attempts to manage stormwaters efficiently through infrastructure. In keeping the city dry and enabling city-making to continue, infrastructure redistributes risk elsewhere, a process that results from and that creates imaginaries of what these non-city landscapes should be. State technocratic-managerialist discourses produce Laguna Lake as a particular kind of space in relation to desires to control urban hydrological flows and enable the functioning of infrastructures and their flood-mitigation goals. However, the production of the lake as a space to contain excess stormwater also intersects with other modern interventions that transformed lake villages, exposing vulnerable groups to increasing flood hazards and structuring the lived experiences and struggles of lake dwellers. I have argued that these discursive framings and material implications that configure the hazardscape as a lived and contested social space should not be viewed in isolation, but rather understood as moments in the history of changing urban metabolic relations between the lake and the city mediated by infrastructure networks.

The historical production of hazardscapes through risk transference and metabolic flows of the modern city parallels ongoing displacement associated with risk that contradictorily amplifies people's vulnerabilities. Risk, therefore, is in continual production as new discourses of risky spaces and communities are constructed. In Metro Manila and along Laguna Lake, recent floods have led to the systematic identification of spaces of risk or danger zones that justified evictions of informal settlements and lake fisherfolk. These invoke

notions of safety as much as they initiate or enable the preconditions for capital accumulation. Relations that produce urban hazardscapes take place in both city and non-city spaces, and emphasize the need to examine the character of urban socioecological frontier extension. Seeing connections between spatial forms and underlying processes remains a fertile analytical and political ground for further empirical inquiry.

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References

- Anderson W (2007) *Colonial Pathologies: American Tropical Medicine, Race, and Hygiene in the Philippines*. Quezon City: Ateneo de Manila University Press.
- Angelo H (2017) From the city lens toward urbanization as a way of seeing: Country/city binaries on an urbanizing planet. *Urban Studies* 54(1): 158–178.
- Angelo H and Wachsmuth D (2015) Urbanizing urban political ecology: A critique of methodological cityism. *International Journal of Urban and Regional Research* 39(1): 16–27.
- Arboleda M (2016) In the nature of the non-city: Expanded infrastructural networks and the political ecology of planetary urbanization. *Antipode* 48(2): 233–251.
- Blok A (2016) Assembling urban riskscapes. *City* 20(4): 602–618.
- Boyce JK (1993) *The Political Economy of Growth and Impoverishment in the Marcos Era*. Quezon City: Ateneo de Manila University Press.
- Brenner N and Schmid C (2015) Towards a new epistemology of the urban? *City* 19(2–3): 151–182.
- Calica A (2012) 195,000 families in danger zones face relocation. *The Philippine Star*. Available at: www.philstar.com/headlines/2012/08/14/838098/195000-families-danger-zones-face-relocation (accessed 19 December 2016).
- Cinco M (2011) Government sued for P4B for canceled dredging. *Philippine Daily Inquirer*.
- Collins TW (2009) The production of unequal risk in hazardscapes: An explanatory frame applied to disaster at the US-Mexico border. *Geoforum* 40: 589–601.
- Collins TW (2012) Marginalization, facilitation and the production of unequal risk: The 2006 *Paso del Norte* floods. *Antipode* 42(2): 258–288.
- Cronon W (1991) *Nature's Metropolis: Chicago and the Great West*. New York: W.W. Norton and Co.
- Davidson M and Iveson K (2015) Beyond city limits. *City* 19(5): 646–664.
- Delmendo MN and Gedney RH (1976) Laguna de Bay fish pen aquaculture development – Philippines. In: *Proceedings of the annual meeting – World mariculture society* 7(1–4), pp.257–265.
- Dooling S and Simon G (2012) *Cities, Nature and Development: The Politics and Production of Urban Vulnerabilities*. Surrey: Ashgate.

- DPWTC. (1972) *Manila and Suburbs Flood Control and Drainage Project: Final Project Report*. Manila: Department of Public Works and Communications.
- DPWTC. (1975) *The Mangahan Floodway: A Feasibility Study*. Manila: Department of Public Works, Transportation and Communications.
- Eakin H, Lerner A and Murtinho F (2010) Adaptive capacity in evolving peri-urban spaces: Responses to flood risk in the Upper Lerma River Valley, Mexico. *Global Environmental Change* 20: 14–22.
- Etkin D (1999) Risk transference and related trends: Driving forces towards more mega-disasters. *Environmental Hazards* 1: 69–75.
- Furlong K (2014) STS beyond the “modern infrastructure ideal”: Extending theory by engaging with infrastructure challenges in the South. *Technology in Society* 38: 139–147.
- Gabriel N (2014) Urban political ecology: Environmental imaginary, governance, and the non-human. *Geography Compass* 8(1): 34–48.
- Gandy M (2002) *Concrete and Clay: Reworking Nature in New York City*. Cambridge, MA: MIT Press.
- Gandy M (2008) Landscapes of disaster: Water, modernity, and urban fragmentation in Mumbai. *Environment and Planning A* 40: 108–130.
- Gov.ph (2014) 649 families rescued from danger zones. *Official Gazette*. Available at: www.gov.ph/2014/07/09/649-families-rescued-from-danger-zones-under-oplan-likas/ (accessed 19 December 2016).
- Gustafson S (2015) The making of a landslide: Legibility and expertise in exurban southern Appalachia. *Environment and Planning A* 47: 1404–1421.
- Gustafson S, Heynen N, Rice J, et al. (2014) Megapolitan political ecology and urban metabolism in Southern Appalachia. *Professional Geographer* 66(4): 664–675.
- Harvey D (1996) *Justice, Nature and the Geography of Difference*. Cambridge and Oxford: Blackwell.
- Hombres L and Boelens R (2017) Urbanizing rural waters: Rural–urban water transfers and the reconfiguration of hydrosocial territories in Lima. *Political Geography* 57: 71–80.
- Jha AK, Bloch R and Lamond J (2012) *Cities and Flooding: A Guide to Integrated Urban Flood Risk Management for the 21st Century*. Washington, DC: The World Bank.
- Kaika M and Swyngedouw E (2000) Fetishizing the modern city: The phantasmagoria of urban technological networks. *International Journal of Urban and Regional Research* 24(1): 120–138.
- Kanai JM (2014) On the peripheries of planetary urbanization: Globalizing Manaus and its expanding impact. *Environment and Planning D* 32: 1071–1087.
- Kooy M and Bakker K (2008) Technologies of government: Constituting subjectivities, spaces, and infrastructures in colonial and contemporary Jakarta. *International Journal of Urban and Regional Research* 32(2): 375–391.
- Larkin B (2013) The politics and poetics of infrastructure. *Annual Review of Anthropology* 42: 327–343.
- Lasco RD and Espaldon MVO (2005) *Ecosystems and People: The Philippine Millennium Ecosystem Assessment (MA) Sub-Global Assessment*. College, Laguna: University of the Philippines Los Banos.
- Lebel L and Sinh BT (2009) Risk reduction or redistribution? Flood management in the Mekong region. *Asian Journal of Environment and Disaster Management* 1(1): 23–39.
- Lepawsky J, Akese G, Billah M, et al. (2015) Composing urban orders from rubbish electronics: Cityness and the site multiple. *International Journal of Urban and Regional Research* 39(2): 185–199.
- Liongson LQ (2008) Flood mitigation in Metro Manila. *Philippine Engineering Journal* 29(1): 51–66.
- LLDA. (1966) *The Laguna Lake Development Authority Prospectus*. Manila: LLDA.
- LLDA. (1970) *Profile of Fishery Development with a Concise Project Study on Looc Pilot Lake Fishing*. Pasig: LLDA.
- McFarlane C and Rutherford J (2008) Political infrastructures: Governing and experiencing the fabric of the city. *International Journal of Urban and Regional Research* 32(2): 363–374.
- Manila Municipal Board. (1905) *Report of the Municipal Board of the City of Manila for the Fiscal Year Ended June 30, 1904*. Manila: Bureau of Public Printing.
- Mayuga JL (2012) Laguna Lake water reaches critical level. *Business Mirror*. Available at: <http://www.businessmirror.com.ph/home/regions/31078-laguna-lake-water-reaches-critical-level> (accessed 11 November 2012).

- Melosi MV (2008) *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present*. Baltimore, MD: Johns Hopkins University Press.
- Monstadt J (2009) Conceptualizing the political ecology of urban infrastructures: Insights from technology and urban studies. *Environment and Planning A* 41: 1924–1942.
- MPWTC. (1952) *Plan for the Drainage of Manila and Suburbs*. Manila: Bureau of Public Works.
- Mustafa D (2005) The production of an urban hazardscape in Pakistan: Modernity, vulnerability, and the range of choice. *Annals of the Association of American Geographers* 95(3): 566–586.
- Olchondra RT (2010) Manila Water to pursue plan to draw Laguna Lake water. *Philippine Daily Inquirer*. Available at: <http://business.inquirer.net/money/breakingnews/view/20101111-302658/Manila-Water-to-pursue-plan-to-draw-Laguna-Lake-water> (accessed 8 October 2012).
- Ortega AAC (2016) Manila's metropolitan landscape of gentrification: Global urban development, accumulation by dispossession & neoliberal warfare against informality. *Geoforum* 70: 35–50.
- Pacific Consultants International. (1978) *Napindan Hydraulic Control Structure Project*. Manila: Bureau of Public Works, Ministry of Public Works, Transportation and Communications.
- Pante MD (2016) The politics of flood control and the making of Metro Manila. *Philippine Studies: Historical and Ethnographic Viewpoints* 64(3–4): 555–592.
- Pelling M (2003) *The Vulnerability of Cities: Natural Disasters and Social Resilience*. London and Sterling, VA: Earthscan.
- Ranganathan M (2015) Storm drains as assemblages: The political ecology of flood risk in post-colonial Bangalore. *Antipode* 47(5): 1300–1320.
- Rappler (2014) NEDA OKs biggest PPP project: Laguna Lakeshore Dike. *Rappler.com*. Available at: www.rappler.com/business/industries/208-infrastructure/61224-neda-biggest-ppp-project-approved (accessed 31 March 2016).
- Rebotier J (2012) Vulnerability conditions and risk representations in Latin-America: Framing the territorializing urban risk. *Global Environmental Change* 22: 391–398.
- Rickards L, Gleeson B and Boyle M (2016) Urban studies after the age of the city. *Urban Studies* 53(8): 1523–1541.
- Saguin K (2014) Biographies of fish for the city: Urban metabolism of Laguna Lake aquaculture. *Geoforum* 54: 28–38.
- Saguin K (2016a) Blue revolution in a commodity frontier: Ecologies of aquaculture and agrarian change in Laguna Lake, Philippines. *Journal of Agrarian Change* 15(4): 571–593.
- Saguin KK (2016b) States of hazard: Aquaculture and narratives of typhoons and floods in Laguna de Bay. *Philippine Studies: Historical and Ethnographic Viewpoints* 64(3–4): 527–554.
- Santos-Borja AC (1994) The control of saltwater intrusion into Laguna de Bay: Socioeconomic and ecological significance. *Lake and Reservoir Management* 10(2): 213–219.
- Schramm S (2016) Flooding the sanitary city. *City* 20(1): 32–51.
- Scott J (1998) *Seeing like a State: How Certain Schemes to Improve the Human Condition have Failed*. New Haven and London: Yale University Press.
- Shatkin G (2005) Colonial capital, modernist capital, global capital: The changing political symbolism of urban space in Metro Manila, the Philippines. *Pacific Affairs* 78(4): 577–600.
- Silverio IA (2011) Pamalakaya willing to engage in 'fish talks' with government over Laguna Lake rehabilitation. *Bulatlat*. Available at: <http://bulatlat.com/main/2011/02/04/pamalakaya-willing-to-engage-in-%E2%80%99fish-talks%E2%80%99-with-government-over-laguna-lake-rehabilitation/> (accessed 11 November 2012).
- Simon G (2014) Vulnerability-in-production: A spatial history of nature, affluence, and fire in Oakland, California. *Annals of the Association of American Geographers* 1199–1221.
- SOGREAH (1991) Environmental assessment of Laguna de Bay: Final report. France Ministère Des Affaires Etrangères Direction Du Développement et de la Coopération Scientifique, Technique et Educative.
- Storper M and Scott AJ (2016) Current debates in urban theory: A critical assessment. *Urban Studies* 53(6): 1114–1136.
- Swyngedouw E (1996) The city as a hybrid: On nature, society and cyborg urbanization. *Capitalism, Nature, Socialism* 7(2): 65–80.

- Swyngedouw E (2004) *Social Power and the Urbanization of Water – Flows of Power*. Oxford: Oxford University Press.
- Swyngedouw E and Heynen NC (2003) Urban political ecology, justice and the politics of scale. *Antipode* 898–918.
- Walker G, Whittle R, Medd W, et al. (2011) Assembling the flood: Producing spaces of bad water in the city of Hull. *Environment and Planning A* 43: 2304–2320.
- Warren JF (2013) A tale of two decades: Typhoons and floods, Manila and the provinces, and the Marcos years. *The Asia-Pacific Journal: Japan Focus* 11(43). Available at: <http://apjff.org/2013/11/43/James-F.-Warren/4018/article.html> (accessed 3 February 2015).
- Yamane A (2009) Climate change and hazardscape of Sri Lanka. *Environment and Planning A* 41: 2396–2416.
- Zeiderman A (2012) On shaky ground: The making of risk in Bogota. *Environment and Planning A* 44: 1570–1588.