Introduction

TILL MOSTOWLANSKY AND MAX HIRSH

Since the end of the twentieth century, the development of infrastructure has undergone a seismic shift from West to East. Once concentrated heavily in Europe and North America, global infrastructure production today is focused squarely on Asia. Countless statistics testify to that geographic pivot, and to the resulting social and financial realignments. In 1995, for example, road investment in Germany—home of the autobahn—was triple that in China. Twenty years later, China outspent Germany by a factor of thirty-five. While German road budgets saw only marginal growth during that time, Chinese budgets ballooned by more than 12,000 percent (OECD n.d.). Similar patterns can be detected in other domains of infrastructure. Until the 1990s, for example, North America was the world's largest aviation market, hosting one-third of all global air traffic. Asia's contribution—7 percent of the total—was small by comparison. In the quarter-century that followed, Asia quintupled its share, overtook North America as the top source of air travelers, and built thirteen of the world's twenty busiest airports, most of them from scratch.[1]

The media frequently cite these kinds of figures in order to contrast the rise of Asia (especially China) with the perceived decline of Western societies. In this book, we seek to go beyond the statistical and the sensational, and to investigate the deeper implications of infrastructure's pivot from West to East. The book offers a new understanding of how geopolitical ambition, social change, and technological innovation converge and cross-fertilize one another through infrastructure projects in Asia. Drawing on fine-grained analyses of transportation, energy, resource extraction, and telecommunication systems, the book transcends two conceptual approaches that have long dominated the study of infrastructure: one emphasizing invisible power relations, and the other focusing on spectacular political symbols. By contrast, we focus on infrastructure's scale, a concept that opens up new ways of understanding how infrastructure is planned, produced, implemented, and used. To do this, we investigate infrastructure both from above (as seen from the perspective of experts and decision-makers) and from below (as perceived and experienced by middlemen, laborers, and everyday users). Analyzing

infrastructure through the lens of scale allows for more nuanced interpretations of its social, spatial, and political dimensions. And doing so powerfully illustrates the multifaceted connections between infrastructure and three global paradigm shifts: climate change, digitalization, and China's emergence as a superpower.

We have put together a collection of essays from scholars who are recognized as leading experts on infrastructure across six academic disciplines: anthropology, geography, history, science and technology studies, landscape architecture, and urban planning. The book is conceived as an act of interdisciplinary translation: linking up related—yet thus far disconnected—scholarship on infrastructure across a variety of fields, and making that research accessible to an audience of practitioners.

In recent years, a number of scholars have reviewed the state of infrastructure studies within the confines of their own disciplines.[2] Our book builds on that work by extending the conversation across disciplinary boundaries and by narrowing the geographic focus to Asia. Synthetic and selective rather than comprehensive in scope, the book draws upon the expertise of individual scholars in order to identify key intellectual concerns, concepts, and conclusions emerging out of these various fields. The book thus addresses multiple audiences working in, and on, all regions of Asia. Combining ethnographic and archival approaches from the social sciences with mapping techniques native to the design professions, the book establishes a dialogue between scholarly approaches to infrastructure and the more operational perspective of the professionals responsible for its planning, design, and governance. This multidisciplinary research method is uniquely positioned to shed light on the mindset and motivation of those practitioners, while also attending to the materiality and embodied agency of the infrastructures that they create. We apply this blended approach to ten case studies from China, Central and Southeast Asia, the Arctic, and the Middle East. The chapters that follow thus introduce new empirical strategies and conceptual lines of inquiry into the study of infrastructure's scales within an Asian context.

Infrastructure and Asia

Infrastructure is commonly understood as the backbone of national development, regional growth, and industrial modernization. It embodies technical innovations that are designed to move people, goods, and information, and it acts as a vehicle for paradigmatic shifts in the social and spatial organization of cities, nations, and regions. Infrastructure also serves a didactic purpose, both as a training ground for skilled and unskilled workers, and as a showcase for modern modes of geographic displacement. In that sense, the introduction of novel technologies via

infrastructural networks facilitates new kinds of knowledge transfers, the formation of distinct cultures of expertise, and the development of new kinds of people trained to use and consume innovative technologies.

One of the enduring challenges in writing about infrastructure is the slippery nature of the term, or what the historian Rosalind Williams (1990) has referred to as its promiscuity (see also Carse 2016). Nonetheless, infrastructure's denotational malleability can account for its enduring appeal. At various times over the past century, the term "infrastructure" has been applied both to tangible development projects, such as hydroelectric dams, seaports, and suspension bridges, and to intangible support systems of education, social welfare, and governance (Rankin 2009; Simone 2004). Scholars have conceptualized these manifold manifestations through a variety of epistemological frameworks. For example, critical Marxist scholars have theorized capitalism by employing Marx's distinction between infrastructure (the social and technical forces that make up a society's economic base) and superstructure (the laws, ideologies, and aesthetics that are determined by that infrastructure). Meanwhile, the fields of development studies and urban studies have deployed infrastructure as a lens to use in the critical analysis of public space and material politics (Appel, Anand, and Gupta 2018; Soja 1989), and science and technology studies have emphasized the expert knowledge underlying infrastructural innovation, the social life of technical systems, and the politics of engineering.[3]

Infrastructure's variability and flexibility thus pose a challenge for a book with multidisciplinary ambitions. In response, we have developed a working definition of infrastructure that connects our authors' various objects of inquiry and is coherent with the common usage of the term in the professional worlds of planners, policy-makers, and engineers. We define infrastructure as the physical, material backbone of transportation, energy use, resource extraction, and telecommunication. This definition has achieved broad consensus across a variety of academic disciplines, and it has endured across time, cultural contexts, and intellectual trends. At the same time, by merging conceptual approaches from the fields of anthropology, urban planning, and science and technology studies, we locate infrastructure at the intersection of its social, material, and regulatory components—none of which could effectively operate without the others.

The early twenty-first century has seen the production of several excellent studies of infrastructure in Asia, grounded in rigorous, site-based research.[4] Most of them, however, have been conducted within the boundaries of a single nation-state. The promotion of China's Belt and Road Initiative has also led to a flurry of cross-regional surveys on China's infrastructural forays into Asia, Africa, and further afield (Lim et al. 2016; Sidaway and Woon 2017). While these studies provide

a helpful overview of China's broad geopolitical ambitions, they often lack the depth of insight that on-site fieldwork can provide. By bringing together the expertise of twelve authors in a single volume, this book uses the rigorous, site-based, empirical research of individual experts as the basis for conceptual connections across regions of Asia that rarely invite comparison, such as Southeast Asia and the Middle East. By foregrounding circulations, connectivities, and mobility—which are, after all, what infrastructure is designed to abet—we are able to examine cross-cultural and cross-regional transfers of infrastructural technologies, knowledge, and practices throughout Asia (Duara 2010; Tagliacozzo, Siu, and Perdue 2015).

Specifically, *Infrastructure and the Remaking of Asia* demonstrates the multiple pathways through which infrastructural expertise is transferred from place to place, and interrogates how infrastructural ideals are subsequently appropriated, modified, and hybridized with vernacular and local practices. In so doing, the book enhances the understanding of how the mobility of experts, building materials, technical plans, and infrastructural models has effected broader changes in the making and remaking of Asia. This framework also allows us to interrogate the social dimensions of infrastructural development by situating the role of experts and expert knowledge in relation to infrastructure's modification by end users. How are infrastructure networks envisioned by those who design and finance them, and to what extent are those visions shared by the people who build, operate, and use them? What happens when infrastructural techniques and technologies are transferred from one social and geographic context to another? What is the nature of the interactions among governmental agencies, transnational funding bodies, and design firms, and what types of infrastructural strategies do those collaborations either create or foreclose? And how do people experience, engage with, and make use of infrastructure in mundane settings?

Attention to infrastructure is particularly crucial in the case of Asia, for reasons both historical and contemporary. In the nineteenth and twentieth centuries, European powers devoted considerable financial, intellectual, and human resources to the construction of infrastructure in Asian entrepôts and colonial hinterlands, building railway and telegraph lines, dredging deepwater ports and erecting reservoirs, and installing basic sanitation systems throughout the region. As elsewhere, in Asia these projects were positioned both as part of a broader civilizing mission and as an effort to bind colonies' populations and natural resources more closely to the mother country—geographically, economically, and ideologically (Tilley 2011). In the twentieth century, these European powers were joined by Japan—which, under the guise of "co-prosperity," transformed vast swaths of East and Southeast Asia into laboratories of infrastructural modernity in the

domains of transportation, resource extraction, and water management, among others (Seow 2014). That approach persisted after World War II in Japan's export of infrastructural technologies (chiefly in the form of hydroelectric, aviation, and skyscraper projects) through technical assistance and development aid programs (Moore 2014).

These projects functioned both as indispensable diplomatic tools and as fundamental components of economic policy, opening up markets and spreading technical norms and standards abroad. That strategy was instrumental in the spatial and economic transformation of cities like Hong Kong, Singapore, and Taipei, all of which adopted Japanese approaches to infrastructure-led urban and regional development. Elevated skywalks, high-rise apartment blocks, and railway-oriented, air-conditioned retail environments quickly became essential signifiers of what it meant, in the East Asian context, to be modern. Those ideas subsequently filtered into post-Mao China through the transfer of capital and infrastructural expertise originating in Hong Kong, Singapore, and Taiwan.

Attending to the broader historical role that infrastructure has played in Asia's development is essential to understanding the twenty-first-century fixation with infrastructure-driven models of socioeconomic development and infrastructure-led diplomatic overtures such as China's Belt and Road Initiative. After the end of the Cold War, investments in infrastructure were heavily and disproportionately concentrated in Asia. Between 1992 and 2013, China devoted nearly one-tenth of its annual gross domestic product to building infrastructure, which accounted for one-third of all infrastructure investments worldwide (OECD n.d.). From the perspective of Asia's political leaders and policy-makers, infrastructure occupies an almost sacred position as the material precondition for future growth; as an emblem of modernization, efficiency, and progress designed to win over domestic publics and attract foreign direct investment; and as a safe bet for equity funds and institutional investors looking for stable long-term returns. Amid that enthusiasm, it is relatively rare for the near-term utility of individual projects to be called into question.

In that future-oriented context, infrastructure projects are often prized more for their symbolic foreshadowing of a better tomorrow than for their present-use value (Hirsh 2016). They function almost as objects of piety, combining a heady dose of faith and fantasy: faith in the legitimacy of existing political and economic structures, and fantasy about a future when technologically advanced infrastructures can compensate for broader deficits in governance and social development.

It is through infrastructure's symbolic value and its use as a political tool that infrastructure has been analyzed across a variety of academic disciplines—and not without reason. Particularly in developing countries, infrastructure is an easily

decipherable index of technical progress and economic development, as well as of effective stewardship by political elites (Khan 2006). It also operates as a shorthand to explain complex geopolitical relationships, as governments deploy transportation, energy, telecommunication, and resource extraction projects both as physical manifestations of bilateral ties and as confirmation of their socioeconomic benefit. As the architectural historian Cole Roskam (2015) has noted, Maoist cadres positioned infrastructure projects as material demonstrations of the People's Republic of China's solidarity with developing nations in the Third World, in contrast to the exploitative practices of the capitalist West. Echoes of that infrastructural diplomacy reverberate outward from Asia in the present day, as countries like China, Japan, South Korea, and Turkey export infrastructural know-how abroad. State-led policy initiatives—including both China's Belt and Road Initiative and its intellectual progenitor, the Greater Mekong Subregion—rely on infrastructure to signal intensified economic ties and to create novel geopolitical alliances throughout Africa, Asia, the Middle East, and the former Soviet sphere.

Infrastructure's political symbolism, and particularly its capacity to instantiate a variety of ideological concepts, especially of the "neo-" variety (neo-liberalism, neo-colonialism, and perhaps nowadays neo-Maoism), is an understandably tantalizing area of inquiry for academic researchers. In this volume, however, we would like to propose a more nuanced approach to the analysis of infrastructure. To begin, let us turn to the word's etymology. The historians Dirk van Laak and William Rankin trace the term's origin to the domain of engineering. In the latter half of the nineteenth century, French engineers used the term to describe the literal substrate upon which France's railway network was being built: that is, man-made structures and physical alterations of the landscape such as embankments, bridges, and level crossings. That infrastructure, in turn, supported a so-called superstructure of rails, electrical lines, and train stations (van Laak 2004; Rankin 2009).[5] By the early twentieth century, the word "infrastructure" had transcended its narrowly technocratic roots and developed a broader conceptual meaning. The 1925 edition of André Lalande's *Vocabulaire technique et critique de la philosophie* defined it as an "underlying structure, generally hidden or unnoticed, that supports something visible and apparent." Additionally, infrastructure denoted "unconscious behavior that enables or determines a conscious act," as well as "social structures, and especially economic phenomena, that are the unconscious origin of certain ideas" (Lalande 1925, 73, translation by the authors).

In this sense, infrastructure does not embody political ambitions and economic goals; rather, it is the unacknowledged originator of those ideas. This definition is the antithesis of the political symbolism argument that is pervasive in

academic research on infrastructure. In this volume, we ask: What can we learn by reversing that causality? In other words, rather than demonstrating how infrastructure is the physical outcome of specific political agendas and economic ideologies, what if we begin with the idea that infrastructure has an agency and an autonomy of its own that can directly influence political outcomes, social attitudes, cultural practices, and ideological positions (Blau 1999)? As any infrastructure professional will privately acknowledge, once a project is under way, things rarely go according to plan. The reality of infrastructure development is messy, unpredictable, and multidirectional. Like a book or a work of art, over time an infrastructure project such as an airport, road, or electricity grid takes on a life of its own, one that is independent of its creators' intents (Harvey, Jensen, and Morita 2016, 10).

The chapters in this book investigate how infrastructures produce new urban forms, new ways of living, and new modes of thinking that diverge significantly from the outcomes that were intended when they were conceptualized (Hirsh and Tang 2020). We acknowledge the kaleidoscopic variety of actors, social processes, and spatial formations that are involved in infrastructure planning, financing, design, operation, and use. The prism of scale serves to connect these different dimensions, layers, and hierarchies as they interact with materiality, territory, and networks across Asia.

The Scale of This Book

In the humanities and social sciences, the concept of scale is often employed to explain how humans rely on levels, layers, hierarchies, and sizes to organize and make sense of the world around them.[6] Scales are thereby conceived of as "areal 'space envelopes,' as networked, as material social products, as mental fictions, [and] as merely logical divisions of the Earth's surface" (Herod 2011, 250). In this book, we focus on two specific aspects of scale. First, we examine how infrastructure serves as a tool to transform space, and how those transformations produce new hierarchies, levels of interaction, and imaginations of the world. Second, we analyze the social implications of infrastructure, investigating its impact on both the lives of individual people and on society as a whole. The chapters create a dialogue between big displays of infrastructure, loaded with political symbolism and designed for mass consumption, and subtler, more mundane perspectives on it by individuals on the ground. This entails a thorough investigation into the multiple locations and actors involved in infrastructure's planning, production, implementation, and use, and it requires an understanding of the specific local contexts

in which infrastructure is produced. With that in mind, we have organized the book's chapters around three central themes—materiality, territory, and networks—that illuminate infrastructure's social and spatial scales.

Part I: Materiality

Discussions of scale have historically centered on either the material or the mental constitution of the world.[7] While materiality and the social construction of ideas have both crucially informed how scholars think about scales of infrastructure, the implicit binaries between space and society and between matter and ideas persist (Collinge 2005). The book's first section offers three solutions to overcoming these binaries.

Mia M. Bennett's chapter examines how China has become a geological force in the Arctic. Since the beginning of the twenty-first century, China has been the world's largest consumer of commodities and the largest emitter of greenhouse gases. China has also expanded its infrastructure networks in the Arctic in an effort to advance its political claims as a near-Arctic state. Identifying China's infrastructure investments as a key driver of Arctic climate change, Bennett argues that China has effectively "become a geological agent, or an actor capable of substantially altering Earth's physical structure and substance." She offers a sophisticated insight into how economic policies determined at the national level—in this case, capitalism with Chinese characteristics—effect environmental and ecological transformations on a global scale.

Scaling down from planetary concerns to those of a city-state, Andrew Toland's chapter on "petroleumscaping" investigates the material, economic, and cultural motivations that led to the creation of Singapore's Jurong Rock Caverns—man-made subterranean installations that have helped Singapore become one of the world's largest oil-refining and oil-trading hubs. Singapore's limited land supply impelled policy-makers to conceptualize the country's subsurface as a new frontier for infrastructural development. That strategy is indelibly tied to Singapore's broad ambitions to produce both a new political economy and a new national identity. Investigating how technical expertise and cultural attitudes coalesced around the city-state's unique landscape and geological conditions, Toland uses petroleumscaping to illuminate the remaking of Singapore—from a city-state forever anxious about its lack of land and natural resources, to a country in which both land and resources can be entirely artificially constructed. He concludes that this obsession with transcending the limits of Singapore's land scarcity is intertwined with decision-makers' desire to play an outsized economic role on the global scale.

Bennett's discussion of the geopolitics of climate change and Toland's investigation of coastal energy experiments resurface as key themes in the final chapter of the book's section on materiality, in which Gökçe Günel charts the rise of Turkish powerships (repurposed vessels that serve as mobile power generators) as floating, provisional modes of energy infrastructure. These offshore power plants are attached to national grids and, using petroleum and natural gas, supply cheap supplementary electricity. By enabling countries to overcome chronic power shortages, the powerships operate both as vessels for short-term economic growth and as tools for long-term bilateral diplomacy, as Turkey (much like China in the Arctic) seeks to assert itself across a vastly enlarged, loosely defined Asian domain (Tagliacozzo, Siu, and Perdue 2015). At the same time, Günel reveals how a shift in temporal scale (from permanent to temporary) generates a scalar shift in spatial relations. For the recipient countries, these short-term energy fixes quickly evolve into long-term dependence on distant resource providers.

Part II: Territory

Studies that analyze how political structures are established and how political power is divided among competing institutions often discuss the intersection of scale and territory.[8] As Peter Sahlins (1989, 8) points out in his study of the emergence of national boundaries in France and Spain, this process involves a dialectic between "local and national interests" that are copresent in the production of territory. This book's second section elaborates on that discussion by investigating infrastructure's territorial scale across three different domains: electricity, water supply, and telecommunication.

Anto Mohsin's chapter examines the ongoing process of electrification in Indonesia in the twenty-first century, highlighting the entanglement of electrification endeavors with assertions of territorial integrity. Electrical infrastructure in Indonesia was first developed in urban areas, with a slow and still ongoing spread to the countryside. This center bias has persisted because of the government's priorities and the country's archipelagic geography. In analyzing this slow spread, Mohsin shows that the state perceives the electrical grid not only as central to Indonesian territory, but also as the blood in the circulatory system of modernity that is supposed to reach the country's most remote pockets. However, Mohsin demonstrates that many people in Indonesia's border regions remain electricity-poor and dependent on local or cross-border solutions, and he emphasizes the need for analyses of critical infrastructure to go beyond the scale of the nation-state and to take contested borderlands into consideration. Indonesia's electrification thus exemplifies the centrality of infrastructure's role in territorial scales.

The question of contested territoriality is similarly crucial to the following chapter, in which Dorothy Tang turns to Hong Kong's reservoirs and aqueducts to illustrate how hydrological engineering has been intricately linked to broader concerns about colonialism, geopolitics, and territorial integrity throughout the past two centuries. Focusing on Hong Kong's chronic dependence on imports to secure an adequate supply of water, Tang examines the coproduction of cross-border water management systems alongside discourses of self-determination as the British colony was transformed into a special administrative region of China. The chapter studies landscape transformations as well as territorial rescaling produced by Hong Kong's hydrological infrastructure. Tang argues that these transformations reflect the geopolitical anxieties of successive regimes, as well as the trust (or distrust) of those regimes on the part of their subjects.

In the final chapter of the book's second section, Hallam Stevens discusses Teleview, a unique videotex system that operated in Singapore in the 1980s and 1990s. Stevens links Teleview to the themes of the nation-state, territoriality, and state-citizen relations that run through this part of the book, and shows how infrastructure has played a critical role in the Singapore story. Infrastructure projects such as Teleview played a part not only in transforming the island nation from Third World to First, but also in maintaining the government's political legitimacy. By examining the state's vision for Teleview and how the system was received by its users, Stevens uses emerging digital technologies as a prism to explore what kind of society Singaporean leaders hope to build. While the global internet has been a supposedly market-driven endeavor (especially from an American perspective), Singapore's approach has remained different, and policy-makers in Singapore are still fundamentally concerned about the kinds of citizens that networked online interaction produces. The historical example of Teleview highlights the continuity of Singapore's paternalistic approach to infrastructure and how people have pushed back against as well as accommodated those ideals.

Part III: Networks

Scholars and practitioners have long used the structuring principle of networks to explore connectivity between different parts of society, between the physical and the digital, and between human and nonhuman actors (Castells 1996). The historian Antoine Picon (2018), for example, demonstrates how urban planners use the concept of the network to assert the interdependence of various kinds of infrastructure (roads, canals, and fiber-optic cables) and to emphasize the dangers inherent in planning any one of these infrastructures in isolation. Similarly,

social scientists turn to networks in order to highlight the interdependence between infrastructures' technical dimensions and the sociopolitical contexts in which they are conceived.[9] They have rethought, and at times transcended, some of the most basic scales deployed in research on cities and regions: micro versus macro, proximate versus distant, simultaneous versus sequential, mobile versus static (Dalako-glou 2017). In the third section of this volume, we investigate infrastructures that operate at the scale of networks. While they are often brought to life by top-down decision-making processes, these networked infrastructures are not necessarily hierarchically ordered and maintained. Expanding horizontally, they are both produced and reproduced via mutually reinforcing networks of data, expertise, and sociality.

The chapter by Tim Oakes studies the role of big data in infrastructure-led urban development projects in China, and the emergence of a novel type of infrastructural urbanism in which wide-ranging aspirations for digital, ecological, and intellectual innovation converge and, ultimately, negate each other. Part of a nationwide network of experimental urban design projects, Gui'an New Area in Guizhou Province is a showcase of leading-edge smart-city, eco-city, and sponge city urban planning techniques and technologies. In Gui'an, planners, developers, and local officials seek to implement government-mandated innovation indicators. The area is promoted as an exceptional space of algorithmic governance, enabled by big data infrastructures and physicalized by a regional transportation grid that fundamentally reorders the conventional scale of city planning. From this perspective, Oakes writes, Gui'an New Area functions as an emerging node in a much broader network of surveillance and securitization.

The next chapter shifts our focus westward: Till Mostowlansky and Tobias Marschall explore routes in the borderlands of Afghanistan, China, Pakistan, and Tajikistan. In this region of High Asia, roads have long served as vehicles for ambitious modernization projects, resulting in the construction of the Soviet Pamir Highway in the 1930s and the Pakistani-Chinese Karakoram Highway in the 1960s. At present, the development of Afghanistan's road to China parallels the development of these predecessors, but it also follows and intersects with existing and emerging routes in the region. Against this backdrop, Mostowlansky and Marschall describe a network of pathways and roads—frequented by animals, cars, and pedestrians—that connect people and institutions across High Asia. These pathways and roads are interlinked with, but also operate in parallel to, the abovementioned highway projects. While state actors perceive these large construction projects as key drivers of modernization and cross-border trade, they do not in fact dominate everyday social and economic life. Instead, Mostowlansky

and Marschall argue, the highway projects coexist with a regional network of routes enabling the movement of goods, people, and information by less visible means.

Jessica Lockrem's chapter on motorbike taxi drivers and ride-share apps in Vietnam's Ho Chi Minh City elaborates on the intersection of physical and social networks in transportation infrastructure by attending to a digital network as well. Playing an integral role in the urban transportation system, motorbike taxi drivers highlight the importance of people as infrastructure in keeping the city moving. However, as Lockrem illustrates, these drivers provide more than just transportation for Ho Chi Minh City's residents. By spending many hours in public space, they also function as critical infrastructures of security, order, and information. That traditional role has been increasingly challenged by the emergence in Vietnam of ride-share apps. The chapter investigates how digital technologies change the way drivers inhabit urban space, and how these technologies effect changes in the social and spatial practices of their users. While the state has attempted for decades to modernize Vietnamese streets by clearing sidewalks of activities (with varying degrees of success), ride-share technology is unintentionally aiding these attempts. Lockrem charts how apps have transformed Ho Chi Minh City's urban transportation networks and affected the city's taxi drivers, streetscapes, and communities.

The final chapter of this section of the book shifts from the road to the air, and from urban transportation networks to global networks of civil aviation. Studying the development of China's airport infrastructure since the 1980s, Max Hirsh investigates the role of foreign technical experts, illuminating the multidirectional processes by which infrastructural knowledge was imported into China from Europe, Japan, and North America during the post-Mao period of Reform and Opening Up. He focuses on a series of training and technical aid programs that were organized by overseas universities and airport planning firms. Analyzing the transnational origins of China's infrastructural expertise, Hirsh argues, allows us to better understand how and why the so-called China Model of infrastructure-led urban development was subsequently exported across Asia, Africa, and the former Soviet sphere.

Afterword

In the afterword, Edward Simpson reflects on the future of infrastructure as it relates to broader multilateral processes of collaboration and disengagement. Meditating on the book as a whole, he notes that each of the volume's chapters sheds light on infrastructure's complexity and messiness on the one hand, as well as on its totalizing logic and aspirational objectives on the other. This juxtaposition,

Simpson observes, reveals an enduring ambition to modernize Asia through infrastructure, despite the growing challenges posed by climate change. For Simpson, this raises the crucial question of how to establish resource equality and ecological responsibility under worsening environmental conditions, and it leads him to conclude that Western discourses on sustainability—which propose a radical reduction in energy consumption and mobility as the solution for an uncertain environmental future—remain fundamentally disconnected from infrastructural realities in much of Asia.

Notes

1. See, e.g., IATA 1992, 2019.
2. See, e.g., Edwards 2003; Harvey, Jensen, and Morita 2016; van Laak 2004; Larkin 2013.
3. See Bijker, Hughes, and Pinch 1987; Biggs 2008; Dinçkal 2008; Edwards 2003; Hughes 1983; Reuss 2008.
4. See, e.g., Anand 2017; Barry 2013; Mizuno, Moore, and DeMoia 2018; Seow 2014.
5. As van Laak (2004, 288) notes, the parallels to contemporary Marxist concepts of base and superstructure, which were translated into French as "*infrastructure et superstructure*" in the early 1860s, are quite evident.
6. See Berg 2004; Brenner 2001; Brown 2000; Castells 1996; Comaroff and Comaroff 2003; Latour 1996; Mahon 2006; Tsing 2000.
7. This is evident, for instance, in the distinction between Marx and Kant.
8. See, e.g., Herb and Kaplan 1999.
9. See Bijker, Hughes, and Pinch 1987; Hughes 1983; Latour 2005.

References

Anand, Nikhil. 2017. *Hydraulic City: Water and the Infrastructures of Citizenship in Mumbai*. Durham, NC: Duke University Press.

Appel, Hannah, Nikhil Anand, and Akhil Gupta. 2018. "Temporality, Politics, and the Promise of Infrastructure." In *The Promise of Infrastructure*, edited by Nikhil Anand, Akhil Gupta, and Hannah Appel, 1–38. Durham, NC: Duke University Press.

Barry, Andrew. 2013. *Material Politics: Disputes along the Pipeline*. London: Wiley.

Berg, Lawrence D. 2004. "Scaling Knowledge: Towards a *Critical Geography* of Critical Geographies." *Geoforum* 35 (5): 553–558.

Biggs, David. 2008. "Breaking from the Colonial Mold: Water Engineering and the Failure of Nation-Building in the Plain of Reeds, Vietnam." *Technology and Culture* 49 (3): 599–623.

Bijker, Wiebe E., Thomas Parke Hughes, and Trevor Pinch. 1987. *The Social Construction of Technological Systems*. Cambridge, MA: MIT Press.

Blau, Eve. 1999. *The Architecture of Red Vienna, 1919–1934*. Cambridge, MA: MIT Press.

Brenner, Neil. 2001. "The Limits to Scale? Methodological Reflections on Scalar Structuration." *Progress in Human Geography* 25 (4): 591–614.

Brown, Michael P. 2000. *Closet Space: Geographies of Metaphor from the Body to the Globe.* New York: Routledge.

Carse, Ashley. 2016. "Keyword: Infrastructure: How a Humble French Engineering Term Shaped the Modern World." In *Infrastructures and Social Complexity: A Companion*, edited by Penelope Harvey, Casper Jensen, and Atsuro Morita, 27–39. London: Routledge.

Castells, Manuel. 1996. *The Rise of the Network Society*, volume 1. Oxford: Blackwell.

Collinge, Chris. 2005. "The *Différance* between Society and Space: Nested Scales and the Returns of Spatial Fetishism." *Environment and Planning D* 23 (2): 189–206.

Comaroff, Jean, and John Comaroff. 2003. "Ethnography on an Awkward Scale: Postcolonial Anthropology and the Violence of Abstraction." *Ethnography* 4 (2): 147–179.

Dalakoglou, Dimitris. 2017. *The Road: An Ethnography of (Im)mobility, Space, and Cross-Border Infrastructure in the Balkans.* Manchester, UK: Manchester University Press.

Dinçkal, Noyan. 2008. "Arenas of Experimentation: Modernizing Istanbul in the Late Ottoman Empire." In *Urban Machinery: Inside Modern European Cities*, edited by Mikael Hard and Thomas J. Misa, 49–69. Cambridge, MA: MIT Press.

Duara, Prasenjit. 2010. "Asia Redux: Conceptualizing a Region for Our Times." *Journal of Asian Studies* 69 (4): 963–983.

Edwards, Paul N. 2003. "Infrastructure and Modernity: Force, Time, and Social Organization in the History of Sociotechnical Systems." In *Modernity and Technology*, edited by Thomas Misa, Philip Brey, and Andrew Feenberg, 185–225. Cambridge, MA: MIT Press.

Harvey, Penelope, Casper Bruun Jensen, and Atsuro Morita 2016. "Introduction: Infrastructural Complications." In *Infrastructures and Social Complexity: A Companion*, edited by Penelope Harvey, Casper Bruun Jensen, and Atsuro Morita, 1–22. London: Routledge.

Herb, Guntram H., and David H. Kaplan. 1999. *Nested Identities: Nationalism, Territory, and Scale.* Lanham, MD: Rowman and Littlefield.

Herod, Andrew. 2011. *Scale.* London: Routledge.

Hirsh, Max. 2016. *Airport Urbanism: Infrastructure and Mobility in Asia.* Minneapolis: University of Minnesota Press.

Hirsh, Max, and Dorothy Tang. 2020. "When the Megaproject Meets the Village: Formal and Informal Urbanization in Southern China." In *The Routledge Companion to Critical Approaches to Contemporary Architecture*, edited by Swati Chattopadhyay and Jeremy White, 226–249. London: Routledge.

Hughes, Thomas. 1983. *Networks of Power: Electrification in Western Society, 1880–1930.* Baltimore, MD: Johns Hopkins University Press.

IATA. 1992. *World Air Transport Statistics (WATS).* Montréal: International Air Transport Association.

IATA. 2019. *Air Passenger Market Analysis December 2019.* Montréal: International Air Transport Association.

Khan, Naveeda. 2006. "Flaws in the Flow: Roads and Their Modernity in Pakistan." *Social Text* 24 (489): 87–113.

Laak, Dirk van. 2004. "Begriff und Bedeutung von 'Infrastruktur.'" *Imperiale Infrastruktur. Deutsche Planungen für die Erschließung Afrikas 1880 bis 1960*, 280–299. Paderborn, Germany: Ferdinand Schöningh.

Lalande, André. 1925. *Vocabulaire technique et critique de la philosophie*. Paris: Presses Universitaires de France.

Larkin, Brian. 2013. "The Politics and Poetics of Infrastructure." *Annual Review of Anthropology* 42 (1): 327–343.

Latour, Bruno. 1996. "On Actor-Network Theory: A Few Clarifications." *Soziale Welt* 47(4): 369–381.

Latour, Bruno. 2005. *Reassembling the Social: An Introduction to Actor-Network Theory*. Oxford: Oxford University Press.

Lim Tai-Wei, Henry Chan, Katherine Tseng, and Wen Xin Lim, eds. 2016. *China's One Belt One Road Initiative*. London: Imperial College Press.

Mahon, Rianne. 2006. "Introduction: Gender and the Politics of Scale." *Social Politics* 13 (4): 457–461.

Mizuno, Hiromi, Aaron Moore, and John DeMoia, eds. 2018. *Engineering Asia: Technology, Colonial Development, and the Cold War Order*. London: Bloomsbury.

Moore, Aaron. 2014. "Japanese Development Consultancies and Postcolonial Power in Southeast Asia: The Case of Burma's Balu Chaung Hydropower Project." *East Asian Science, Technology, and Society* 8(3): 297–322.

OECD. n.d. "Infrastructure Investment." Organisation for Economic Cooperation and Development. Accessed 4 May 2022. https://doi.org/10.1787/b06ce3ad-en.

Picon, Antoine. 2018. "Urban Infrastructure, Imagination, and Politics: From the Networked Metropolis to the Smart City." *International Journal of Urban and Regional Research* 42 (2): 263–275.

Rankin, William. 2009. "Infrastructure and the International Governance of Economic Development, 1950–1965." In *Internationalization of Infrastructures*, edited by Jean-François Auger, Jan Jaap Bouma, and Rolf Künneke, 61–75. Delft: Delft University of Technology Press.

Reuss, Martin. 2008. "Seeing Like an Engineer: Water Projects and the Mediation of the Incommensurable." *Technology and Culture* 49 (3): 531–546.

Roskam, Cole. 2015. "Non-Aligned Architecture: China's Designs on and in Ghana and Guinea, 1955–1992." *Architectural History* 58: 261–291.

Sahlins, Peter. 1989. *Boundaries: The Making of France and Spain in the Pyrenees*. Berkeley: University of California Press.

Seow, Victor. 2014. "Fuels and Flows: Rethinking Histories of Transportation and Mobility through Energy." *Transfers* 4 (3): 112–116.

Sidaway, James, and Chih Yuan Woon. 2017. "Chinese Narratives on One Belt, One Road in Geopolitical and Imperial Contexts." *Professional Geographer* 69 (4): 591–603.

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

Soja, Edward. 1989. *Post-Modern Geographies: The Reassertion of Space in Critical Social Theory*. New York: Verso.

Tagliacozzo, Eric, Helen F. Siu, and Peter C. Perdue. 2015. *Asia Inside Out: Connected Places*. Cambridge, MA: Harvard University Press.

Tilley, Helen. 2011. *Africa as a Living Laboratory: Empire, Development, and the Problem of Scientific Knowledge, 1870–1950*. Chicago: University of Chicago Press.

Tsing, Anna. 2000. "The Global Situation." *Cultural Anthropology* 15 (3): 327–360.

Williams, Rosalind. 1990. *Notes on the Underground*. Cambridge, MA: MIT Press.