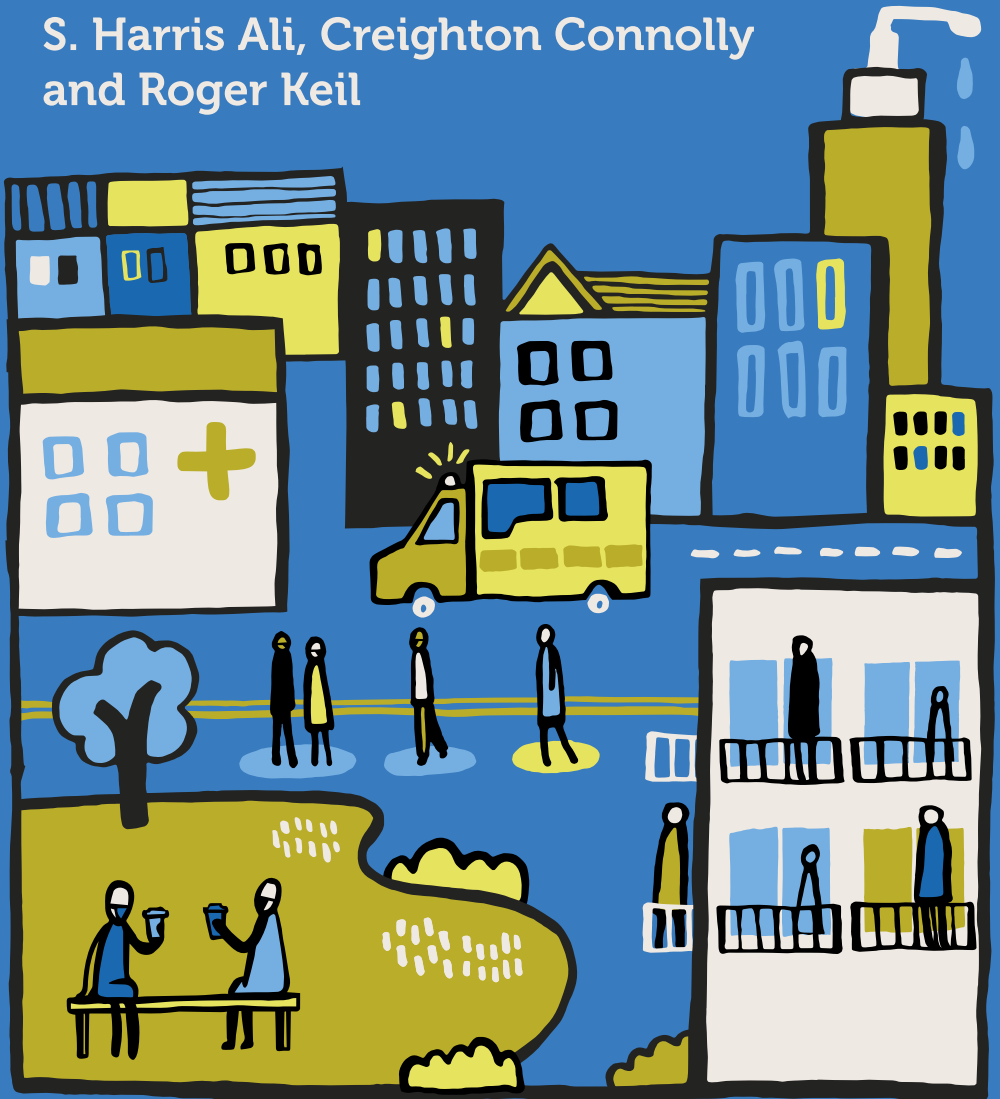


URBAN FUTURES

# Pandemic Urbanism

S. Harris Ali, Creighton Connolly  
and Roger Keil



# Pandemic Urbanism —————

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# Pandemic Urbanism ---

## Infectious Diseases on a Planet of Cities

S. Harris Ali, Creighton Connolly, & Roger Keil

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S. Harris Ali, Creighton Connolly, and Roger Keil  
Toronto and Hong Kong, July 2022

# 1

## Introduction: Emerging Infectious Disease and the “Urban” Condition

This is a book for our urban age. It sits at the crossroads of global – some would say planetary – urbanization and the emergence of new infectious diseases. Here we consider the socio-spatial logic of the urban environment and how that can influence the course of and response to epidemics. COVID-19 has demonstrated to the world how quickly contagion can spread through the networks of trade, tourism, and technologies, and through what we will later refer to as the political ecologies of extended urbanization. Epidemiologists had warned of an outbreak like the COVID-19 pandemic for a generation (Coker et al., 2011; Yong, 2018). What had been hypothetical before 2020 is now experiential: COVID-19 has been the first pandemic of the urban century and has affected cities around the globe. Now that the “monster has entered,” to paraphrase Mike Davis (2020), we can be certain that it is not the last one to come around. Understanding how a majority urban world can survive under the onslaught will be a crucial piece in our collective response in the future.

COVID-19 hit at a time when cities – understood here in the first instance in the most general sense, which we will complicate later in this chapter and throughout this book – were enjoying a period of optimism and emphatic positivity. In the new century, economic success, creative economies, and smart urbanism ostensibly had lured people “back” into the urban centre for work, life, and play. High densities were considered preconditions for hip and healthy lifestyles, free of the automobile, and virtuous allies in the struggle against

the climate emergency. COVID-19 called some of that optimism into question, at least for a while. The pandemic reordered the ways we have been thinking about and acting in cities. In this sense, the pandemic has simultaneously refracted and recast urbanization. Like the financial crisis, Occupy Wall Street, the Black Lives Matter protests, and the climate emergency, the pandemic offered us a glimpse into a different urban future: thinking of the city as an arena of everyday life, of urbanization as the process that makes such life possible, and of urbanism as a collective project of shaping city and urbanization. The pandemic was both a disaster and an opportunity for urban life, much as climate change has challenged cities to redo their fundamental ways of operating (Goh, 2021).

Disasters are always cascading and complex and tend to harm those that are most vulnerable while exposing the hotspots of systemic injustice (Frisina Doetter et al., 2021) – those who had been forgotten or taken for granted when times were good. When people were first ordered to stay at home, the advantages and conveniences of urban life were severely curtailed and were only partially replaceable by new technologies of communications such as Zoom. When the lockdown lifted and the outdoors became open for use, urbanists everywhere called upon urban dwellers to occupy the streets on foot and with bicycles and to reorganize life around the necessities of collective sharing of roads and public spaces (Aaditya and Rahul, 2021). In the shadow of the new mainstream urbanist mantra of “we are all in this together” lay the danger of the dissolution of the urban fabric itself (see Burton, 2021). The tissue of urban life became threadbare under pressure as the most vulnerable fell to the virus. Diversities revealed themselves to be cut through with class and race in ways that were hard to reconcile with the official dogma of the open, creative, and multicultural city. Access to public space and *ownership* of private space became definitive markers of one’s chance for survival in the pre-vaccine city. As cities – ostensibly places that should work for everyone – more

recently pivoted towards reopening, they were called upon to improve the conditions of those who suffered most. We take up this discussion in the two final chapters of the book.

Cities have always been defined by their relationships with and response to disease. For most of human history, cities were particularly vulnerable to outbreaks and contagion due to a diverse set of socio-spatial factors, including those pertaining to mixed economies, high densities, connectivities across borders, and situatedness along distant trade routes (Bollyky, 2019). Of course, the plague outbreaks of the Middle Ages were largely urban in their impacts, but urban settlements were still somewhat insular and situated within a largely agrarian context in which the spatial distribution of cities was sparse and non-contiguous for the most part. In the industrial era, hygiene became the main concern of overcrowded working-class quarters as typhoid, cholera, tuberculosis, and other infectious diseases were recurring threats. As the twentieth century came around, scientific advances bolstered the prominence of the germ theory of disease and with that came an increased awareness of and more widespread emphasis on hygiene. With the protections offered by these developments, cities reversed their historical position as being the “natural” place of disease (due to filth, overcrowding, pollution, etc.) to become healthier than the countryside – at least in those urban environments where running water, sewage systems, and other hard infrastructures were working in conjunction with the newly adopted soft infrastructures associated with public health and social reform. In many cities, such technical, institutional, and socio-economic change was accompanied by changes in the built environment that literally or aesthetically brought more light and air, park and open space as well as other significant improvements to the built environment.<sup>1</sup>

Towards the end of the twentieth century, however, many of the new and accelerating waves of urbanization began to take place in informal settings, and many cities that were once flourishing in the

industrial age started to deteriorate as deindustrialization intensified with the economic recessions and stagflation of the 1970s. Still, until HIV/AIDS started to ravage urban communities in the Global North, the existing belief was that infectious disease was the preserve of the underdeveloped world that had not yet undergone the epidemiological transition in which infectious disease threats diminished due to mass vaccination programmes and lessened population growth, leaving only those ailments associated with the Western “lifestyle” such as cancer and coronary heart disease. Infectious disease therefore was thought to be less of a concern to inhabitants of European and North American cities. The 1990s saw the beginning of a re-evaluation of this perspective due to the perceived threat of a global Ebola outbreak and the 1997 Hong Kong bird flu event (Sims et al., 2003).

A real threat to our now majority urban world came from the Severe Acute Respiratory Syndrome (SARS) epidemic of 2003 that hit many large, globalized urban centres, especially in East Asia, but also in Toronto, Canada (this is the subject of longer discussion in chapter 3 below). The West African Ebola virus disease epidemic of 2014/15 (covered at length in chapter 4) added to the concern, as it was the first of its kind that hit major cities such as Monrovia, Liberia, and Freetown, Sierra Leone. But a more universal and recognizable reality check occurred with COVID-19, which started to spread in a manner similar to SARS, in and through a network of global cities such as Wuhan, Madrid, Milan, New York, and London before ploughing its path through the social and spatial peripheries of those cities and becoming recognized as a universal problem by the international community (Biglieri et al., 2020; see chapter 5 for an extended discussion).

This pattern of infection seemed to confirm what scholars had predicted: extensive urbanization was playing an important role in the origin and spread of, and response to, epidemic outbreaks of emerging infectious disease (Connolly et al., 2021; chapter 2 below). From an

urban geographic point of view, it was also important to see how the disease itself contributed, in a variety of ways, to our understandings of typical urban tropes like centrality, dispersion, density, urbanity, etc. (McFarlane, 2021; Mullis, 2021). While much early attention tended to be on the particular urban centres from where the disease seemed to have originated, and where it first went (Wuhan, Milan, Madrid, London, Seattle, New York, Detroit, Montreal, etc.), there was also much speculation regarding the massive urban informal settlements around the world where the virus was expected to hit particularly hard (Wilkinson, 2020). In the Global North, the lockdown was treated as a unique and new phenomenon; in the Global South, scholars and urban practitioners pointed to the different realities shaping urban life that made a clear line between a before, during, and after the pandemic more difficult to determine. Some observers noted that in the Global South, “lifeworlds ... cannot be so clearly divided into ‘before’ and ‘after’ the pandemic, and ... ‘crisis’ and the ‘everyday’ are not so neatly separable” (Bhan et al., 2020). In chapters 6 and 7, we discuss the dimensions of governance and urban planning with regard to the current and past infectious disease outbreaks in cities.

The association of cities with infectious disease has a long history, but we will argue and demonstrate in this book that today’s world of “complete urbanization,” especially in its form of extended urbanization – a typically characteristic pattern of settlement in the twenty-first century – changes the ways in which diseases emerge, spread, and are contained. As we elaborate at length in chapter 2, we refer to extended urbanization as development occurring at the peripheries of metropolitan cores and including a full range of non-city geographies that are now evident in the suburban (or post-suburban) zones and hinterland areas. Extended urbanization therefore refers to spaces where people work, for example in warehouses, factories, slaughterhouses, and oil fields, or places they occasionally travel to, such as airports or garbage dumps, or where they live, for instance in suburban



residences or informal (slum) settlements. Notably, with the increasing gentrification of the metropolitan core areas, those referred to as the “precariat” in pre-pandemic times, and as “essential workers” during the pandemic, were forced to find places to live and work in exactly these zones of extended urbanization.

The socio-spatial configuration of extended urbanization in relation to work, residence, and travel, as we shall discuss later in the book, has significant implications for disease spread and response. This is particularly true in relation to the differential exposure and vulnerability to infectious disease for particular social groupings of people. In everyday life, the places where people live and work, and the infrastructural patterns that connect them, have been changing. In geopolitical terms, extended urbanization now connects any location to processes elsewhere (food, energy, labour), and in regional terms, it connects displacement and relocation of vulnerable populations from prime areas of investment (the “creative core”) to urban peripheries, sometimes in informal settlements. Through such processes, permanent socio-spatial inequities are created across urban territories. Henri Lefebvre hypothetically framed these developments (2003) as “generalized” urbanization, where the urban is to be understood as a multi-scalar process of socio-spatial transformation.

From this perspective, the “urban” should no longer be equated with simply the city core as has been the conventionally held view. The “urban” should not be treated as a fixed, unchanging entity – as a universal form, settlement type, or bounded spatial unit (“the” city) that is being replicated across the globe following basic mechanisms of development (Scott and Storper, 2015). Rather, that which informs urban processes should be traced far beyond the physical boundaries of cities, and increasingly analysed as global or planetary phenomena (Brenner, 2014; Keil, 2018b) – an insight that we shall see has tremendous implications for understanding a global pandemic. Building on this broad conceptual framework, we see that at the core

of our analysis stands the dialectics of infection in an era of complete urbanization: *we are getting exposed because we are too connected and then we are getting sick because we are not connected enough*. In other words: the reach of the urban footprint, the acceleration of connectivity, and the particular conditions of urban life together create the conditions for disease to proliferate.

Thus, increased and intensified connections between formerly disparate locations around the world, and between different groups within a city, have facilitated disease spread by providing opportunities for the disease to jump from locale to locale and from person to person. At the same time, increased societal polarization between groups within the city has meant that we were not readily able to immediately mobilize resources and mount a response that would beneficially improve everybody's chances of surviving the pandemic. Some, for example, will have less risk of exposure to COVID-19 because of their ability to self-isolate without the loss of income, while others lower in the social hierarchy are less able to protect themselves from exposure in the same manner. In sum, the increasing social, spatial, economic, and environmental disparities in the urban world have led to gross differences in the impact of outbreaks in different communities, the abilities to fight the disease, and the likelihood of surviving it. It is upon these issues emanating from both these processes – increased connectivity and increased social polarization between and within cities – that the bulk of the analysis in this book focuses.

## INFECTIOUS DISEASES AND THE URBAN CONDITION

Anthony J. McMichael (2001) observes that, over the *longue durée*, significant shifts in the relationship between human beings and nature have always been accompanied by major outbreaks, epidemics, and pandemics. Inevitably, such shifts involved changes in the nature of

interactions of humans with animals and the environment that were in turn due to the adoption of new settlement and mobility patterns. Such historic shifts included, for instance, the transition from societies based on hunting and gathering to settled livestock agriculture; military conquests pertaining to empire building and the movement of troops; and the establishment of trade channels such as the Silk Route – with each transition associated with a significant increase in infectious disease outbreaks of various kinds. Because of the dramatic increase in new and emerging diseases over a short period of time, McMichael (2001) hypothesizes that as we entered the new century, we were likely also to undergo a fourth great transition – one based on the inter-related processes of globalization and unprecedented urbanization. Since that time the number of people living in cities around the world has reached new heights. As early as 2007, the United Nations noted that more than half of the world’s population lived in cities (UNFPA, 2007), and since then, the influence and impacts of urbanization in many different aspects of cultural, economic, and environmental life have intensified on a global scale, leading some to refer to this new phenomenon as planetary urbanization (Brenner, 2014).

Concerns about the relationship of the city to infectious disease is obviously not a recent development. Problems pertaining to urban settlement patterns and infectious disease date back to antiquity: epidemics of tuberculosis, smallpox, and the plague, for example, devastated cities of ancient empires from the beginning (Kelly, 2006; Woolf, 2020). Medieval cities became “burgeoning disease incubators” (Hassett, 2017: 204), and eventually Europeans would bring disease to the western hemisphere and beyond in deadly waves of colonization and settlement that have influenced the histories of New World societies dramatically since. In the European context, earlier efforts to deal with contagion included the practice of quarantining ships. First introduced in the port of Venice in the fourteenth century, this involved requiring the crew and cargo of newly arrived ships to remain on board

for forty days to ensure that no infected person could enter the settled coastal area (Banta, 2001). Such a practice, however, disrupted international trade and financial transactions and led to tension between nation states as they dealt with imposed quarantine measures. Such international tension served as an impetus for diplomatic dialogue that led to increased formal attention to issues of international health in the realm of high politics, eventually culminating in the formation of the World Health Organization. Things changed again with the onset of industrialization.

Matthew Gandy (2006) observes that responding to infectious disease outbreaks was an integral element in the transformation of the modern city, especially in relation to the institutionalization of various urban infrastructure networks that mediated the relationship between the body and the city. While urban infrastructures of sanitation had already been part of urban life in ancient and medieval cities (Kelly, 2006: 67–71), the focus on infrastructure was necessary and unavoidable in the nineteenth century after the birth of the industrial city, spurred on by the receding of feudalism and the massive influx of people to cities to pursue work in the newly constructed factories. With rapid and dramatic population growth, the existing infrastructure of the industrial city simply could not support such numbers. For instance, the population of Manchester doubled within a decade, resulting in overcrowding and a significant increase in waste accumulation. The general state of existence at this time was a marked deterioration in urban living conditions punctuated by devastating infectious disease outbreaks. In this context, Gandy focuses particular attention on the development of water infrastructure and its relation to the prevention of cholera outbreaks.

At first, concern about urban disease outbreaks led to investigations and explanations based on the miasma theory. This approach attributed cholera epidemics to “bad air” emanating from the rotting of organic matter such as food and fecal waste (see UN Habitat, 2021). Later

on, bacteriological explanations of disease came to dominate (Gandy, 2004). In effect, though, both perspectives contributed to the drive for sanitary reforms that called for a fundamental change in the structure of sanitation systems, such as using separate drainage systems so that the reflux of noxious sewer air would be prevented from entering back into homes (Gandy, 2004). With the implementation of these changes, the number of cholera outbreaks decreased. This led to the recognition of the link between contaminated water and ill health, which in turn served as the impetus for the physical reconstruction of cities based on explicitly public health criteria – a shift referred to by Gandy (2004) as the rise of the “bacteriological city.” The enduring influence of sanitary reforms and the bacteriological city was dramatic and led London to become the first city to create a complex administrative structure that would coordinate modern urban services ranging from public transport to housing, clean water, and education. The success of the London model encouraged local governments of other European cities to follow suit.

In our present era, informed by globalization processes, anthropogenic environmental change, and an unprecedented level of planetary urbanization that have only intensified in the last quarter century, we may first ask if these conditions have prompted the introduction of new and emerging diseases as McMichael (2021) hypothesized. Second, if this is the case, we may ask, how can we then develop an analytical lens to study the socio-ecological processes on the basis of which these new and emerging diseases arise? In addressing the first question, we see that a great deal of evidence reveals that over the recent years there has been a disproportionate increase in the number of newly emerging infectious diseases, as well as outbreak, epidemic, and pandemic situations (Morens and Fauci, 2013), including COVID-19, Zika virus, Ebola virus disease, Middle East Respiratory Syndrome (MERS), Lassa fever, HIV/AIDS, hantavirus, Lyme disease, *E. coli* O157:H7, and Nipah virus. Also, on the

rise are re-emerging diseases such as the Dengue virus and West Nile virus (Morens and Fauci, 2013).

“Emerging diseases” denotes new pathogens that appear in a population in a new region (Mayer, 2000), while “re-emerging diseases” refers to those disease agents that first appeared long ago, but have survived and persisted by adapting to human and environmental change (Morens and Fauci, 2013). To study the emergence and re-emergence of infectious disease, Jonathan D. Mayer (2000) builds on virologist Stephen Morse’s (1993; 1995) concept of “viral traffic.” Extending the concept to include other pathogens (and thus adopting the term “microbial traffic”), Mayer notes that the utility of the concept stems from the geographic implications of what is referred to as “traffic.” Specifically, the notion of traffic draws attention to the movement and interaction of pathogens.

Mayer (2000) suggests that we focus on several mechanisms associated with microbial traffic, including (1) cross-species transfer, (2) spatial diffusion, (3) pathogenic evolution or changes in the structure and immunogenicity of earlier pathogens, and, importantly in the context of our book, (4) changes in the human–environment relationship. Notably, as we will discuss in greater detail in the following chapters, these mechanisms of microbial traffic are in fact interrelated and have profound implications for understanding the relationship between cities and infectious disease. Thus, for instance, it is important to consider how environmental change brought on by deforestation – pursued for various human-centred reasons, such as the lumber industry’s demand for trees, the clearing of land for industrialized agriculture or for residential or commercial suburban development, or the loss of trees due to drought or wildfire induced by global climate change – may impact cross-species transfer (i.e., zoonotic spillover as the virus jumps from an animal to a human). As will be discussed in chapter 4, deforestation may in part help account for the onset and spread of the Ebola virus in West Africa.

Thus, as we shall discuss with reference to the relationship of disease onset and spread with urbanization, it is not sufficient to consider only the biophysical environment; equally important is the social environment. In this light, we can see that in reference to the urban environment, it is not just biophysical parameters such as the availability and density of human hosts that enable a disease outbreak. Equally important for facilitating disease transmission are the informal and formal social norms that govern human interactions, including most notably those pertaining to social organization and governance. For example, even though many of the public health directives aimed at breaking the chain of transmission during an outbreak – such as physical distancing (commonly referred to as *social* distancing), the donning of masks, washing hands, and even vaccination – are about creating a physical barrier between disease agent and host, the effectiveness of all such interventions is contingent on a wide range of social and political factors that govern individual behaviour and social interaction. For this reason, understanding the social and spatial logics that undergird an infectious disease event is integral to understanding how an outbreak occurs, and further, to developing effective strategies for response.

Notably, as will be discussed throughout this book, socio-spatial logics undergird the transformation of a localized outbreak into a regional epidemic and ultimately a global pandemic of the sort we are currently experiencing at the time of writing. In this regard, the concept of spatial diffusion may help us understand how COVID-19 spread amongst the so-called “essential workers” who laboured in warehouse distribution centres (examples include those from some of the world’s largest transnational corporations, such as Amazon, FedEx, Apple, etc.), factories, and meatpacking plants, now situated in many suburban locales (Loreto, 2021: 273–98; MacGillis, 2021). The consideration of spatial diffusion may also help us to understand how COVID-19 spread was quite different in places of similar density, such

as the wealthy high-rise condominium towers in the gentrified areas of Toronto compared to equally dense apartment towers occupied by renters in less gentrified areas (Pitter, 2020a). In the end, as we shall discuss in more detail later, it is not the density of the built environment per se that is critical to disease spread, but the density of relationships among humans, and of humans with the natural world. The consideration of spatial diffusion may also explain how Ebola in West Africa spread from slum areas to the more affluent areas, whereas COVID-19 spread in the reverse direction – from the more affluent to the less affluent areas. A consideration of spatial diffusion may also illuminate how SARS proliferated in 2003 through the networked connections between the global cities of Toronto, Hong Kong, and Singapore.

To grasp the spatial diffusion of disease in an outbreak, epidemic, or pandemic situation therefore requires a broader understanding of how the social and biophysical contexts have been changed by the conditions wrought by planetary and extended urbanization – such as the changing relationship between the suburbs and the city core, as well as between the suburbs and the surrounding natural environment, or the networked connections between global cities around the world. By adopting such a focus, we address what Mayer (2000) identifies as a foundational question of disease ecology, namely how changing human–environment relations and social activities can result in fundamental alterations in the interaction between people, the biophysical environment, and the broader social and economic context. In particular, as Mayer (2000) observes, one important analytical advantage of adopting this perspective is that it brings into relief the question of how disease emergence may result directly or indirectly from the unintentional consequences of human action. To shift such an analytic orientation to explicitly consider the relationship of planetary and extended urbanization with infectious disease, we suggest adopting a three-pronged approach based on how the various



mechanisms of microbial traffic have been impacted by (1) socio-demographic influences (including those associated with social class and race/ethnicity), (2) infrastructure development (or lack of it), and (3) issues of urban governance and politics. We have selected these factors for special consideration in our analysis because of the role they play in other areas of urban studies.

#### POLITICAL ECOLOGIES OF DISEASE IN AN ERA OF PLANETARY URBANIZATION

We posit that particular landscapes themselves can be structured in a way that influences the likelihood of disease transmission. Some scholars working on the political ecology of health and disease have used landscape as an analytical lens to consider how various health discourses can become materialized in particular places (Mulligan et al., 2012; Parizeau, 2015). For example, Wald (2008: 2) has described how “the circulation of microbes materialises the transmission of ideas” regarding theories about how diseases spread and attitudes towards social change. In this way, disease is not only determined through biophysical factors, but also constructed out of a particular set of social and spatial relations which are mediated through the landscape. As we will discuss later in the book, processes of extended urbanization can increase vulnerability to infectious diseases – which are themselves rapidly evolving – as the risks and mode of transmission are often neither well understood by science nor properly regulated by government, particularly in informal peri-urban settlements common in the developing world.

A landscape political ecology perspective, in concert with other spatialized lenses such as urban political ecology (UPE), remains indebted to fundamental insights of disease ecology which posit that a disease outbreak does not simply materialize in a vacuum (Kaika et al., 2022; Keil, 2020c). Rather, as described by the classic epidemiological

triad, an outbreak can only happen if a particular set of conditions is first met. Specifically, the disease agent (such as a pathogen, virus, bacterium, or parasite) and animal host must coincide in time and space. This is especially relevant with respect to viruses as they rely upon the machinery of the animal host cell to reproduce themselves. Critical to the spread of disease in this context is the presence of a conducive environment that can facilitate the travel of the disease agent to the host, thus helping to ensure the train of transmission. Conventionally, a conducive environment is conceived of exclusively in terms of biophysical or climatic factors such as humidity, acidity, temperature, and so on. But, as we shall argue in this book, the notion of environment should be expanded to include the social environment, most notably the socio-political dimensions of cities as discussed in relation to governance, socio-demographic influences, and infrastructure.

In this regard, we argue that the concept of urban political pathology (UPP) is useful for extending the insights of landscape political ecology specifically to the relationships of infectious disease and urbanization. David Fidler (2004b) originally developed the concept with respect to the SARS epidemic in 2003. He argued that SARS was the harbinger of a changing global landscape of health governance. While Fidler's attention was on the international system, we use the qualifier "urban" with "political pathology" to highlight both the role cities play in the overall architecture of global healthcare governance and how cities have responded to the COVID-19 pandemic. In both instances, we not only think of cities as municipalities or local governments, but also take into account the role of urban civil society and grassroots initiatives. Such a mobilization of the terminology of UPP builds on the existing literature from political ecology that is applied to the analysis of disease at various scales, especially in the urban context. It also recognizes urbanization's multifarious intersections and encounters with viruses and

the sometimes fraught nature of human and non-human coexistence (Perng, 2020: 153).

## OUTLINE OF THE BOOK

**Chapter 2**, entitled, “Landscape Political Ecologies of Disease: Tracing Patterns of Extended Urbanization,” is largely conceptual and focuses on how contemporary processes of extended urbanization, which include suburbanization, post-suburbanization, and peri-urbanization, contributed to increased vulnerability to infectious disease spread. Through a review of existing literature at the nexus of urbanization and infectious disease, we consider how this (potential) increased vulnerability to infectious diseases in peri-urban or suburban areas is in fact dialectically related to socio-material transformations on the metropolitan edge. The next three chapters apply our analytic framework to three case studies, each emblematic of particular aspects of microbial traffic in our present century. Our presentation in each of these chapters is guided by a general focus on how governance, socio-demographic influences, and infrastructure shape the microbial traffic and landscape political ecology of the infectious disease under consideration.

**Chapter 3**, “SARS and the Global City,” sets up the specific relationship of urbanization and emerging infectious disease in the twenty-first century. Building on and extending our earlier work on SARS and urbanization, the chapter investigates how processes of globalization have affected the transmission of and response to SARS within the context of the global cities network. In particular, we make the case that it is vital to understand how various economic, political, and social shifts related to our globalized, networked society facilitated the movement of deadly pathogens. In a prelude to what the world experienced in the 2020 COVID-19 pandemic, the SARS crisis revealed a type of enduring tension between public health