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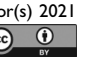

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Extending the boundaries of 'urban society': The urban political ecologies and pathologies of Ebola Virus Disease in West Africa

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Abstract

A disease outbreak is an emergent product of social and ecological processes. To more fully understand disease outbreaks and their response, we must therefore consider how these dual processes interact in specific locales within the context of an increasingly urbanized world. As such, in this paper we examine the Ebola Virus Disease (EVD) outbreak and its response in West Africa by adopting the lenses of two approaches that are usually treated separately – namely, urban political ecology (UPE) and urban political pathology (UPP). The UPE approach sheds light on how the material/biophysical basis of the EVD outbreak was influenced by the socio-political-economic and vice versa. The UPP approach gives us insight into how the EVD response was influenced by broader socio-political-economic forces, particularly the historical legacy of colonialism. Through the adoption of this dual lens we are able to gain greater insights and a more comprehensive understanding of the EVD outbreak and response in West Africa.

Keywords

Urban political ecologies, urban political pathologies, Ebola Virus Disease, West Africa

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Introduction

If Urban Political Ecology (UPE) is, at its core, about urban life, infectious disease, its origin, trajectory and the response to it, must be among its prime occupations. After all, cities and infectious disease have a joint history which is shaped and characterized by the relationships between human and non-human nature in and around urban settlement. Zoonosis – the leap of diseases from animal to human reservoirs, the spread of disease vectors such as mosquitoes and ticks in the outskirts of growing cities, and the mobility of bodies through an increasingly urbanized space are all aspects of those ever-changing relationships (Wolf, 2016). They are not separate from other physical and social articulations of what is commonly referred to as 'city' and 'nature'; disease spread is related to metabolic exchange which is a signature concept of UPE.

The hygienic city of the 20th century in many parts of the world created infrastructures and public health institutions that contributed to the containment of outbreaks which had plagued urban life in previous centuries, yet recent decades have seen a (re)emergence of infectious disease in cities. This emergent phenomenon coincides with what has been referred to as planetary urbanization/suburbanization and the formation of what Lefebvre (2003) calls 'urban society'. While Lefebvre is concerned about how 'Mastery over nature, associated with technology and the growth of productive forces, and subject solely to the demands of profit (surplus value), culminates in the destruction of nature' (2016: 149), he also holds out the possibility that urban society brings forth new forms of 'nature' and new modes of management of scarcities related to that emergent nature (2003: 25–27).

Somewhere in there, urban society also needs to find new ways to live up to the challenges of human biophysical nature, including the management of health and disease (left, as we know, to the methods, devices and physical infrastructures of the industrial city in the past). One obvious point of entry into this discussion is the recognition of public health as part of the development of 'social needs' which Lefebvre says '*defines socialism*' (2016: 131). Lefebvre explicitly exposes the fallacy of equating the city with disease – although he carefully explicates Engels's early writings on the deprivations of the working class quarters (2016: 3–18). He critiques the tendency in some of the 20th century's revolutionary efforts to assume that 'the large city is nothing but vice, pollution, and disease (mental, moral, social)' (2003: 92). Instead, he proposes a dialectical model that notoriously argues that the urban revolution is predicated on the end of the city and its replacement by urban society (2003).

The relationships between urbanization and health/disease have long been subject of scholarly study (Rossi-Espagnet, 1983). It has been known that patterns of urbanization can increase the statistical odds that microbes are being spread, which has resulted in a tripling of the total number of disease outbreaks per decade since the 1980s (Keil and Ali, 2007: 848; Yong, 2018a). The 'promiscuity' of urban interaction is seen as key to the spread of infectious disease (Wald, 2008: 14) and the proliferation of urban settlement initiates a new research agenda. Thus Wolf (2016: 959) asserts that:

> [T]here is something peculiar about urban environments and their impact on human health and that this problem is potentially global in scale. This observation presents a problem worthy of more detailed exploration: seen from a theoretical angle, the ways in which urban complexity can be distinguished from other kinds of complexity are still far from clear. What exactly constitutes 'the urban' within the complex assemblages of disease interactions?

The most significant global disease outbreaks in recent years have originated in China and Africa, known to contain areas of particularly rapid urbanization, and where the urban periphery has been a focus of attention (Ali et al., 2016). But of course, under current conditions of mobility

and connectivity, infections are not contained to their point of origin. Diseases that used to be exclusively isolated and rural phenomena, like the Ebola outbreaks of the past, are now becoming urbanized (Yong, 2018b). Hence we can observe that recent outbreaks of hemorrhagic fever have typically occurred in the sprawling towns and cities of West and equatorial Africa (Fallah et al., 2015a). Both in the case of coronavirus contagion during SARS in 2002–3 and the ongoing COVID-19 pandemic, zoonotic transmission was shown to occur between rural sites and urban markets, ultimately spreading to the entire world in days and weeks, rather than months and years.

Taking up Lefebvre's dialectical method that builds on the contradiction of general urbanization and the end of the city, this paper looks at the ways in which a 'spatialized political ecology' (Connolly et al., 2020) can help understand the challenges a generalized urban will encounter and how it can contribute to mitigating the impact of disease outbreaks that appear endemic to emerging urban society. It examines the histories and geographies of the relationships of cities and infectious disease as a problem of the political ecologies and political pathologies of extended urbanization (Connoll et al., 2020; Tzaninis et al., 2021). In particular, we discuss the political ecologies and the political pathologies of urbanization in West Africa – Liberia and Sierra Leone to be specific – where an outbreak of Ebola Virus Disease (EVD) affected more than 30,000 in 2014/15, with the tragic loss of over 11,000 lives (Abdullah and Rashid, 2017: 2). The disease, which had never before existed in this part of Africa, emerged in the urbanizing hinterlands and at a crossroads of mobilities in the rural southeast of Guinea, where trading and travel routes connect to Sierra Leone and Liberia. Paul Richards (2016: 21–2) notes that at the time '[i]nsufficient attention was paid to the intensive cross-border networking that catapulted the disease in the direction of adjacent, crowded, capital cities on the coast'. There were concerns at the time that an 'epidemic in city environments, with crowded slums, was uncharted terrain, and a degree of panic ensued' (ibid: 22). Though the epidemic was eventually contained, the outbreak revealed deeply entrenched weaknesses in the early response by government officials and the international community. The narratives that dominated early understandings of the disease and informed policy in the region tended to focus on West Africans' cultural practices, extensive social networks, and non-compliance with public health directives. However, the reality was being dictated by a much more complex socio-political landscape; one shaped by a nexus of imperial and colonial rule, civil war, political strife, corruption, and exploitative economic arrangements.

Political ecologies and pathologies of the 'urban' dimension of emerging infectious disease

In developing our conceptual argument, we bring together two areas of thought that have different origins and histories but are compatible in our current context. The first is UPE which looks at the urbanization of nature and investigates 'urban metabolisms' through a material and materialist lens. UPE, recognizes that urban environments are products of interrelated processes of exchange and circulation (of e.g. food, water, fuel, money, labour, and pathogens) that are mediated through uneven relations of social and political power (Swyngedouw, 2006). The metaphor of 'urban metabolism' that figures so centrally in UPE scholarship is used to analyze and situate the dynamic relationships between society and nature as co-dependent, co-evolutionary, and mutually constitutive in the formation of socio-natural landscapes. UPE helps overcome distinctions between 'cities' and nature by examining how continuous socio-ecological transformations dialectically reshape the urban core and periphery, local and global, and inside and outside (Tzaninis et al., 2020). In this sense, UPE has strived to avoid a 'methodological cityism' and analytical bias that favours the city as a bounded space and social world in opposition to or separate from nature. Yet despite

these ambitions which shaped the field in its early days, significant doubts have been raised as to whether UPE has lived up to its Lefebvrian promise (Angelo and Wachsmuth, 2014).

In light of these debates, we contend that an integrated research agenda to move UPE's analytical focus beyond the city has yet to be concretely developed. Such a move is particularly relevant for examining the dynamics of infectious disease which are not contained within what is traditionally understood as the 'city'. Both urbanization and the production of nature have changed in recent decades as we have seen more extended forms of urbanization around the world (Connolly et al., 2020; Tzaninis et al., 2020). Indeed, during the current period of urbanization much attention will be on urban peripheries (Keil, 2018). We can therefore speak of a *Sub*urban Political Ecology, i.e. the interrelationship of peripheral urbanization with the spread of (re-)emerging infectious disease as well as new and persistent chronic health conditions (Connolly et al., 2020). It is here where vast swathes of residential territories in which people make their home around the globe come into full relief but also the spaces where people work, travel, and dispose of their leftovers like airports, oil fields and garbage dumps as 'non-places.' Instead of seeing the peripheral expanse as a mere appendage to the central city, we propose to look at the metabolism of the urban region from the outside inwards (Tzaninis et al., 2020).

It has been noted that the notion of 'extension' in today's form and period of urbanization also has a temporal dimension adding layers of complexities to how these emerging spaces and times are (auto)constructed, repaired, and cared for (Bhan, 2019; Simone, 2020). This active and dynamic multi-layeredness is particularly virulent in the emerging peripheral lands where colonial, extractive, Indigenous/endogenous, technological landscapes of the rapidly extending city are 'sutured' into new urbanities. Filip De Boeck and Sammy Baloji have examined these ever changing spatial and temporal matrices of extension:

> The 'hole' of the living city strikes back in all kinds of ways and often uses all the decentring power it can muster to force us to reconsider categories we take for granted and common definitions we tend to use in order to figure out the qualities and shortcomings of urban life in Central Africa. In the living city, these decentring forces and energies spring from various (including pre-urban and precolonial) pasts that, even when ruptured, mutilated and mutated by the city, continue to strongly resonate underneath the surface of the 'modern' city. In the process, the urban is remolded into something else (De Boeck and Baloji (2016: 257–8).

Extensive urbanization is now the conditioning process through which political ecologies and political pathologies gain shape (Simone, 2019). It is an engulfing process that is not restricted to specific confined places but creates an overreaching way of life that is resourced by planetary streams of goods and services and is vulnerable to often unexpected shocks (health emergencies, disasters, economic crises). Martin Murray has called the 'distended urban form … the template for global urbanism' (2017: 46). To Murray and other urban theorists, the bloated, unbounded form of urbanization finds its equivalence in the solution of political governance and rational planning. The result is 'a seemingly random aggregation and spatially discontinuous collection of fragments always in motion' (2017: 31). Yet, there are differences across the globe that are etched into narratives of progress, stasis, and decay. The creative city discourse that has characterized the urbanism of the West for much of this century was counterposed to the 'deadening homogeneity – characterized by slums and informality – [in the so-called] prototypical Third World City' (Murray, 2017: 31). Both extremes and stereotypes have subsided as the creative city has been largely illusionary and the city of the global south has become characterized less by homogeneity than by splintered enclave urbanism. We might stress that essentially two aspects of extension come together that need to be taken into account: the extension of the urban into a form that has variably been located in-between (Sieverts) or called continuous (Lerup) (see Keil, 2020a); and urban life

that has been 'stretched' along various registers of political ecology, economy, and pathology that seek for a new lexicon in an already oversupplied dictionary of the urban. For the purposes of the discussion we resist the temptation of naming this 'zone' definitively, not least with another neologism, but we recognize them as 'situated peripheries' no less (Keil, 2020b).[1]

The second area of thought that informs our argument is *Urban political pathology* (UPP), here understood as the intersection of urbanization and the governance of health. This is based on David Fidler's use of the term during the SARS crisis when he noted that political pathology 'contains a message that responses to pathogenic microbes are deeply political' (2004: 18). Fidler's notion of political pathology entails an attempt to 'analyze the scientific, medical, and public health challenges [a given infectious disease] creates through a political lens' (2004: 8). The political aspect of UPP does not just mean hierarchical or networked institution-building. Urban society develops in a dialectic of exposure and containment that needs political contestation, negotiation, and decision-making. Politics is therefore critical in any discussion of disease governance and political pathology in urban society. As research on SARS, widely considered the first pathogen of the global era, has shown, past hierarchical and hermetic, nation-state based regulation needed to be complemented by institutions and actors at the sub-national, sub/urban, and community level, especially through civil society based advocacy and monitoring systems (Ali and Keil, 2008: 50). Consequently, asking how and why suburban or peri-urban areas are conducive to disease outbreaks is an important question to explore, and one that necessitates deeper examinations of the social, economic, and political governance arrangements that shape urban life (Connolly et al., 2020)- and perhaps increasingly so as we all grapple with the consequences of the current COVID-19 pandemic. Indeed, while West Africa's 'Freetown and its peri-urban fringe' (Richards, 2016: 24) and the large Monrovia informal settlement of West Point became hotspots of the Ebola outbreak, they also became centres of political and community intervention that helped eventually to stem the outbreak. In fact, Richards reports that '[r]esponding was in some ways easier in urban environments since so much in Ebola prevention hinges on logistics' and '[u]rban community structures proved to be not noticeably less effective than their rural counterparts in supporting activities requiring citizen support, such as case-finding and quarantine' (2016: 40). These events demonstrate the importance of taking seriously the dynamics and governance of sub-urban, ex-urban, and peri-urban space as part of a wider, interconnected, yet constantly evolving urban fabric.

Through these two lenses, we subject the political *pathologies* and the political *ecologies* of the urban periphery to similar analytical principles: humans are embedded in ecologies of more-than-human environments that are structured by human action while being both enabled and constrained through the conditions of what we refer colloquially as nature. In an era of climate change and species extinction, it appears humans are claiming ever more space and putting more and exceedingly damaging pressure on natural systems. Yet at the same time, massive urbanization also remakes those natural conditions, some would even speak of influence on evolutionary change.[2] More than 3 billion people are projected to be added to the 7 billion that already inhabit the planet before the world population is projected to plateau. It is likely that most of these new residents will live in some form of an extended, suburban environment. This settlement pattern cuts into existing agricultural land and drives urbanization into feral and previously uninhabited regions of the world. It involves the loss of prime forest areas which has been associated with the spread of disease (Olivero et al., 2017). The consequences of this massive expansion in human settlement add up to a redefinition of what urban life, or life generally, will mean for humans on the suburban planet. They test the conditions of our collective existence in ways we haven't seen since the emergence of the 'bacteriological city' (Gandy, 2006) a century ago and they challenge the socio-technological networks we have introduced to live in what Lefebvre (2003) calls 'urban society'. The breadth and variety of the intersections of political ecologies

and political pathologies in the current urbanization process suggests the importance of close analysis of particular outbreaks and health emergencies to increase our understanding of the interrelationships of the societal relationships with nature and disease in a world of extended urbanization.

The distended urbanization that is now common in the world poses fundamental questions to political ecology and political pathology alike. Bollyky (2018) has pointed to the 'paradox of progress', meaning that 'the world is getting better in worrisome ways', in a spiral through which metabolic processes like sanitation, and the establishment of healthier environments are intertwined in rapid urbanization. Today, the fastest and most extensive forms of urban growth, uneven and convulsive as they are, occur in what Bollyky calls 'poor world cities' like Dhaka, New Delhi, Jakarta, Lagos or Kinshasa. Those cities, with their dramatic socio-economic disparities and socio-ecological deficiencies (densely populated informal settlements and generally no clean water, sewage disposal, or networked infrastructure), one might assume, are also the most vulnerable to emerging infectious disease.

In West Africa, (post)colonial rule has intricately shaped socio-economic trajectories and patterns of mobility and settlement. The recycling of colonial strategies such as indirect rule employed by foreign companies (Frankfurter et al., 2018) and the use of foreign direct investment and debt to facilitate the extraction of resources out of Africa promise to continue the legacy of underdevelopment of the region and continent; a process that began when African environments and people were incorporated into the global economy through the Atlantic slave trade and subsequent 'scramble for Africa' by European colonists (Rodney, 1972). Efforts to commodify land and labour have resulted in new waves of enclosures and displacements, driving small subsistence producers to urban centres where informal sectors serve as the predominant (albeit precarious) source of employment (Makki, 2015). Today, Guinea, Liberia, and Sierra Leone rank among the poorest countries in the world with rising levels of rural impoverishment and rapid population growth heavily concentrated in urban informal settlements that are highly susceptible to disease spread (Howard, 2017; Wilkinson, 2020a, 2020b). It is unsurprising that the legacy of colonial domination and its enduring significance in structuring decades of political corruption and strife and continued plundering of the region's natural resources has led to the severe underdevelopment of social, physical, and health infrastructures, the fragility of which became exposed once the Ebola pandemic hit.

The remainder of this paper examines the Ebola outbreak and its governance in West Africa. We draw upon the existing political economic and historical literature on this outbreak as well as some of the conceptual implications of a larger retrospective study conducted three years after the Ebola outbreaks in Sierra Leone and Liberia. This qualitative study analyzed the role of social, political, economic, and environmental dimensions of the outbreak response at various urban and rural settings in Sierra Leone and Liberia. The study involved twenty interviews with community members and public health officials and eight focus group discussions within the two countries. For the present analysis, we focus on how some of the empirical implications of the study can be subjected to the lenses of UPE and UPP.[3] Thus, our emphasis here is more conceptual rather than empirical.[4] In this light, we first briefly consider accounts of how Ebola emerged as a result of urban expansion into the relatively remote, forested region of Southern Guinea. Next, we discuss how the region's politically mediated patterns of mobility and settlement helped amplify the rate and expand the geographical scope of infection as the virus moved across and between the densely populated and interconnected capital cities in Guinea, Sierra Leone, and Liberia. In the following section, we focus on informal settlements on the urban edge, which provided a breeding ground for the virus. Moving our focus to political pathologies, we discuss how the very same political-economic arrangements predetermined much of the public health response to the pandemic which was heavily politicized and sutured onto a weak social and health infrastructure. Finally, we outline how the highly politicized response cannot be understood outside of particular (neo)colonial context in which many West Africans struggle daily for basic survival.

Regional political ecologies and extended urbanization

It is now well established that the spread of EVD in West Africa followed a regional trajectory, moving from the remote, forested hinterlands of the border region to the heavily interconnected capital cities of Monrovia, Freetown, and Conakry. According to Howard (2017), Guinea, Liberia, and Sierra Leone have historically been integrated by complex social, economic, and cultural networks and 'constitute a single region with complementary ecologies … integrated from the nineteenth century onwards by socio-cultural commonalities, flows of people and ideas, and commercial and social exchanges' (Abdullah and Rashid, 2017: 4). Though the movement of people and goods grew out of earlier pre-colonial routes of commerce (Howard, 2017), patterns of mobility and settlement have been augmented in significant ways as a result of the region's colonial history and present-day socio-political arrangements.

This section discusses how the changing socio-political landscape has altered metabolic flows in ways that increase the probability of disease emergence and amplify its spread vis-à-vis forms of extended urbanization. We explore three factors relevant to extended urbanization that have elsewhere been considered key dimensions of the Ebola outbreak of West Africa in 2014. These include: (1) deforestation and extractive industry as a drivers of zoonoses; (2) intensified cross-border mobilities based on the search for food and work; (3) and the rapid growth of informal settlements in peripheral urban spaces.

Deforestation, extractive industry, and the contested zoonotic origins of the West African Ebola outbreak

Despite countless investigations of exactly how the Ebola Virus came to spread so rapidly across the region, the origins of the outbreak and the particulars of the index case of the disease remain unclear. According to the commonly accepted narrative adopted, for example, by the WHO, the outbreak is presumed to have originated in the remote forest region of Guinea where a young boy in the village of Méliandou was believed to be infected while playing near a roosting place for free-tail bats (WHO, 2020). The socio-ecological profile of the village and its surrounding region is interesting for several reasons. First, Méliandou is located in a triangle-shaped forested region which borders Liberia and Sierra Leone. During the peak of the civil war, it was home to a large number of refugee encampments inhabited by those fleeing conflict. Poverty and widespread food insecurity has driven people deeper into forested regions for basic survival needs. Indeed, this has been an important dimension of the global narrative which posits that the EVD epidemic is likely to have originated from the movement of people into previously uninhabited regions and ecological niches in ways that increase the risk of zoonotic infection (WHO, 2020). In particular, the bush-meat thesis became a popular explanation, suggesting that consumption of fruit bats, a key reservoir for the virus, was a likely source of the outbreak (Saéz et al., 2014) (Figure 1).

Second, the forested area near Méliandou has been a site of extensive deforestation, with more than 80% of the forest-cover cleared for oil palm production and fruit tree plantations (Dorit, 2015; Wallace et al., 2014). Historically, infectious disease outbreaks have occurred in areas of heavy deforestation (Dorit, 2015) where intensive mining and agribusiness have exploited land for resources. Deforestation has been suggested as a significant driver of emerging infectious disease and, in the context of the Ebola outbreak, has been hypothesized to facilitate increased contact between humans and infected animals (Olivero et al., 2017; Rulli et al., 2017). Some theories suggest the opening up of the densely-forested region to intensive extractive industries has changed the ecology of the forest in ways that brought fruit bats closer to human settlements. Azétsop et al. (2020: 10) note: 'It is well known that large-scale mining, through migration and demands for social services, may affect the ecosystem in ways that may prompt the emergence

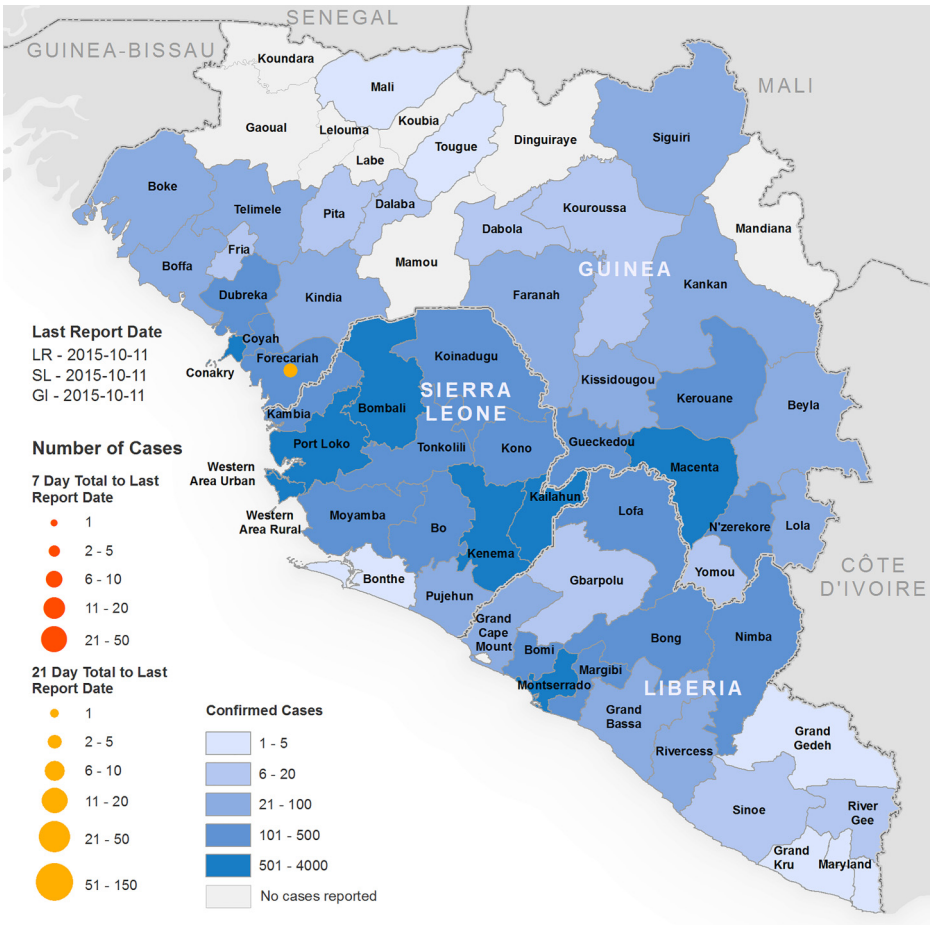

Figure 1. New and total confirmed cases in Guinea, Liberia and Sierra Leone, October 14, 2015, retrieved from the World Health Organization.

of zoonotic diseases'. This applies also to the broader amalgam of extraction activities including mining, logging, and capital-intensive farming that have catalyzed a number of what Azétsop et al. (2020) refer to as social and ecological disruptions, including widespread food insecurity resulting from the use of land for extraction activities rather than food production as well as increasing human contact with animal reservoirs (Bausch and Schwarz, 2014; Obilade, 2015). Wallace and Wallace (2016: 4) claim that while Ebola may have been circulating in the region for some time, changes in agro-forestry likely 'expanded the human-bat interface over which the virus crosses'. In an earlier piece, Wallace et al., (2014: 2539) suggest that changes in policy or the wider socio-economic landscape that may, for example, intensify farming activities can induce 'desterilization' of 'a natural or human ecosystem in which a pathogen has been largely held in check at a low-level equilibrium value, or simply had not previously evolved'. By the same token, the diversity and composition of relatively in-tact agricultures, unimpeded by large-scale anthropogenic change, can limit or contain pathogenic evolution and spread. Dorit (2015) suggests that most viruses typically exist at low densities in reservoirs, but present considerable risks when human populations breach ecological barriers or boundaries that once contained pathogens.

This notion of disrupting equilibrium or breaching barriers is closely related to the idea that urban landscapes are embedded within a 'series of interconnected heterogeneous (human and non-human) and dynamic but contested and contestable processes of continuous quantitative and qualitative transformations that re-arranges humans and non-humans in new and often unexpected ways' (Swyngedouw, 2006: 106). Here, socio-spatial and socio-natural processes are grounded in metabolic exchanges and circulation of various physical, chemical, and biological components that can be disrupted, augmented, or transformed to form new urban 'natures'. The notion of 'metabolic rift' characterizes many of the metabolic disruptions between and within urban regions that result from industrial agriculture and urbanization processes (Foster, 1999). In the case of emerging diseases, urbanization as a process of socio-ecological transformation produces numerous pathways for new human-non-human interactions that enable microbes to exploit new ecological niches. This is particularly true of extended forms of urbanization such as those that proliferate spaces of resource extraction known to routinely breach and disrupt ecosystems on the urban fringe (Arboleda, 2015). It is, however, not sufficient to speak about environmental impact or ecological disturbances by merely referencing the various mining areas, logging camps, or monoculture plantations that dot the extended urban landscape. Rather we must consider the wider operational landscapes that result from and facilitate urban agglomeration (Brenner, 2014). These include roads, highways, power lines, satellite towns, and other infrastructures that connect spaces of extraction to the wider global urban fabric and fundamentally alter nature in an effort to produce 'frictionless', homogenized spaces for the circulation of raw materials (Brenner and Katsikis, 2020). It is here where the possibilities of zoonoses are amplified by human encroachment of nature, displacement of wildlife, destruction of natural habitats and biodiversity, and disruption of natural buffering systems that reduce the chances of 'spillover' events- that is, the transmission of pathogens from wildlife reservoirs to humans.

However, some suggest that zoonosis might only explain the index case rather than the entirety of the pandemic, the severity of which might be better explained by human-to-human transmission (Richards et al., 2015). Other scholars question the validity of the zoonotic theory entirely such as Wilkinson and Leach (2015: 145) who argue that:

> Many of the official truths about Ebola – the bushmeat connection, and its jump from bats to people due to supposed regional deforestation for the first time are inaccurate. People and bats have long co-habited in this ancient, anthropogenic forest landscape with its mosaic of forest, bush, and savannah, shaped by settlement and farming, war and trade, and everyday social and ecological life. The idea that deforestation is bringing people and bats together for the first time misconstrues regional landscape history as dangerously as it lays the blame for the epidemic at the feet of the rural people now suffering from it … [and] have contributed to the deluge of misinformation that has undermined local trust in what officials say about Ebola.

Several African scholars too have argued that despite hundreds of publications on the subject, there is still 'no clear scientific evidence or indisputable explanation of how EBOV moved from wild animals to humans in the Mano River Union (MRU) sub-region' (Abdullah and Rashid, 2017: 3). In a critical analysis of the zoonotic narrative, Bah (2017) argued that the scientific team credited with authenticating the bush meat thesis did so on the basis of circumstantial evidence, having found no conclusive proof of the virus in the surrounding animal population in Southern Guinea. Others suggest a need to consider alternative hypotheses, including examining a broader spectrum of ecological, social, and politico-economic factors (Howard, 2017; Leendertz, 2016). Despite contestation over its origins, what we might be more certain about is that beyond the index case, the rapid spread of the disease was amplified by a number of political, social, and spatial relations. Indeed, as Bausch and Schwarz (2014: 3) argue: 'Biological and

ecological factors may drive emergence of the virus from the forest, but clearly the sociopolitical landscape dictates where it goes from there'.

The politics of networks and mobilities

The Ebola outbreak in West Africa is often considered exceptional for the simple reason that the EVD had never before entered the fully urbanized context of Africa's major cities. Shortly after the first case was identified, EVD rapidly spread to several villages in Guinea before making its way to the densely populated capital cities of Conakry and Monrovia.

As Green (forthcoming) and others have argued, we should not presume the urbanization of Ebola lay in an inherent ability for the virus to mutate. Rather, we should investigate the ways human networks created and amplified pathways for its spread and how these networks were mediated by social, economic, and political factors. West Africa is not particularly distinct from the rest of urban society in this regard, but it is the historical context of the region that has shaped urban mobility and settlement patterns in ways that have made West Africans particularly susceptible to emerging disease like EVD. For example, Guinea, Liberia, and Sierra Leone have long been dependent on export-oriented, extractive economies, nearly all owned by large multinational firms. If in the past there has been economic growth, it has been largely independent from the general population's welfare and standards of living. The implications of these arrangements include the failure to promote economic diversification and regional integration, concentrated poverty, and mass unemployment (Howard, 2017). Furthermore, capital-driven changes in land use have produced land scarcities and have impeded domestic food production, while structural adjustment policies have oriented the economy towards exports, further exacerbating domestic food scarcities (Wallace, 2015; Wallace and Wallace, 2016). As a result, the region has been a site of large, daily intra-regional population movements across porous borders in search of food and informal employment opportunities. In fact, migratory patterns are estimated to be seven times higher than in other parts of the world (WHO, 2015), while poverty and civil war has accelerated movements and settlement in the forested zone where the first heavy outbreak occurred. At the same time, centralization of economic and political activity in the capital cities has accelerated Ebola's spread from villages or smaller towns to densely populated cities (Azétsop et al., 2020: 170). Many of these populations have resided in rapidly growing and overcrowded informal settlements located at the urban peripheries, providing a concentrated mass of host populations and breeding ground for the virus. However, it should be noted that the movement from the rural areas to urban informal settlements is not fixed or uni-directional. Mobility patterns are based on the periodic back-and-forth travel between these locations and this too contributed to the rapid spread of the disease not only in Liberia but in West Africa more generally (see Richards et al., 2015).

Deeper encroachment of the forest and ecological niches by humans, expansion of capital intensive agriculture at the urban edge, centralization of industry in the urban core, and increased daily movements of people between the peripheries and urban centres have amplified the geographical range and speed with which pathogens can travel (Bausch and Schwarz, 2014; Wallace and Wallace, 2016). As the next section details, the introduction of EVD in informal settlements with underdeveloped, fragmented, or otherwise inaccessible health systems left many ill-prepared to deal with an outbreak of this magnitude.

Extended urbanization and informal settlements

Africa's population is expected to double over the next 40 years with much of this growth in major urban centres and in the expanding peri-urban fringe (Bloch et al., forthcoming; Linard et al., 2013).

In West Africa, the capital cities of Freetown, Conakry, and Monrovia have more than quadrupled in size since the 1960s (Howard, 2017). Intensified sprawl of metropolitan regions and secondary cities as well as the merging of smaller villages to form new urban agglomerations is expanding the urban frontier (Moriconi-Ebrard et al., 2015). This poly-centric growth, which is now a global condition, has been expedited by high birth rates, rural poverty, and migration and settlement patterns described in the previous section. Much of the growth of cities has occurred in informal settlements where many inhabitants are forced to endure slum conditions. Today, nearly three quarters of Sierra Leone's urban population lives in informal settlements, with 68 informal settlements in Freetown alone (Conteh et al., 2020; Sanderson, 2020).

It is here where viral transmission exploded due to high population densities as well as poor access to water and sanitation, and healthcare (see Wilkinson, 2020a, 2020b). Indeed, informal settlements typically have 10 times the density of adjacent areas in the same city with overcrowding common in single dwellings, making physical distancing and quarantine challenging (Muggah and Florida, 2020). While urban infrastructures 'act as conduits, circuits and sites for processes of socio-natural transformation' (Silver, 2016: 986), their disruptions can create major barriers for containing spread (see also Graham, 2010; Loftus, 2007). The fragmented and splintered nature of infrastructural development meant that few inhabitants in West Africa's informal settlements had access to clean water, with others relying on polluted sources for drinking and sanitation. This is particularly problematic for populations suffering from food insecurity as nutritional deficiencies can heighten susceptibility to infection.

Yet, the swiftness with which Ebola spread through informal settlements is not merely a result of their physical forms, nominal densities, or availability of infrastructures, but of a complex web of historical, economic, political, and spatial relationships. In particular, the extraction-based political economy had important implications for the spatialized aspect of the EVD spread. In Liberia, for example, concentrated employment opportunities in the capital city of Monrovia served as a magnet for impoverished rural inhabitants who settled primarily in overcrowded informal settlements. This was closely related to the fact that Americo-Liberian elites who largely located in Monrovia tended to neglect the needs of those in the rural/peripheral areas while benefitting from their labour and catering to the needs of foreign investors (Howard, 2017). Those in rural areas never had any real representation and were not even considered as counties until 1964 (ibid). This bred considerable distrust and tension between urban elites and rural dwellers that was further accentuated by civil wars that caused massive displacements. Escaping the violence, many fled to informal settlements situated on the periphery of the more developed urban cores. As Howard (2017) notes during this era, cities underwent immense growth while social resources shrunk. The rapid spread of Ebola through deeply impoverished urban informal settlements and lack of resources led Liberia to have the highest caseloads among the three affected MRU Countries.

In summary, the trajectories of EVD in all the three countries of the Mano River Region of West Africa were intricately shaped by unique, yet parallel socio-political landscapes. Economically, all countries relied on export-driven economies dominated by mineral extraction and monoculture cash crops. The enclosure and privatization of land over the span of decades in favour of foreign extractive industry amplified rural poverty, food insecurity, and the movement of populations between major urban centres and urban peripheries. Coupled with displacements from civil conflict, populations have been amassing at unprecedented rates in the extended urban fabric of dense forested regions as well as the in the hinterlands of emerging cities. New urban-industrial agricultural and mining frontiers and new centres of agglomeration characterized by urban informality constitute some of the emerging nodes in this polycentric urban system (Monte-Mór and Castriota, forthcoming). As capitalist relations of production are extended into the furthest reaches of the urban landscape, they inevitably transform sociocultural and material flows in ways that increase

possibilities for emergence and spread of infectious disease (Connolly et al., 2020). Whether it is through the pushing of urban boundaries into previously undisturbed ecological niches, the disruption of natural ecosystem homeostasis that keeps pathogens in check, or the expanding networks and geographies of mobility that accelerate the spread of infectious disease, an UPE lens helps us understand the various urban metabolisms that link together country and city. Both the physical processes of exchange and circulation and their social, economic, and political mediation are important aspects in understanding the relationships between (extended) urbanization and emerging infectious disease. Here, extended or peripheral growth can refer to, 'self-built structures and the informal communities that characterize much of today's urbanization without being necessarily spatially on the margins (e.g. refugee settlements, mining camps, and indigenous reserves near urban centres)' (Connolly et al., 2020: 4). Moreover, as the case of Ebola has shown, we cannot exclusively analyze the origins, trajectories, and responses to infectious disease at the local scale. The rapid spread of Ebola across national boundaries over the course of a few short months demonstrated that pathogens have little consideration for territorial borders. As such, consideration of how common historical contexts of countries in the Mano River Region intensified the outbreak is also an engagement with 'regional political ecologies' (see Walker, 2003) that situate local social and ecological dynamics within broader regional (and global) processes and integrations. This is of particular importance to consider as we discuss issues of governance. The next section delves into the UPP of the response to Ebola.

Urban political pathologies of extended urbanization

A consideration of the legacy of colonialism is a necessary entry point for understanding the UPP of the EVD landscape in West Africa. We take Liberia as an illustrative case for discussion here. After a brief review of the impacts of colonialism on Liberia's political economic trajectory, we review examples of how the broader socio-political context informed by a colonial-based strategy of primary resource extraction impacted not only the nature and origin of the EVD outbreak, but also how the continuity of colonialism –(maybe needs a space here) manifest in various political machinations and decision-making – constrained the pandemic response in numerous ways.

The legacy of colonialism

In comparing the MRU countries, it might seem that the Liberian case is unique given that, of the three nations, Liberia is the only one to not be formally colonized (Howard, 2017: 25). However, although Liberia was nominally independent, it was nevertheless dominated by foreign (mostly American) interests. The modern nation-state of Liberia was founded by manumitted slaves who settled in the area previously referred to as the Grain Coast (Howard, 2017; Kieh, 2017). This group of settlers referred to as Americo-Liberians came to politically dominate the indigenous peoples already living there. Brown (1941) argues that this domination was facilitated by the view that although there were slaves in the U.S., the settlers felt they had superior status to their indigenous African kin because of their American origin. Consequently, Americo-Liberians pursued a mission of 'civilizing and Christianizing' the indigenous populations (Beyan, 1991; Kieh, 2008, 2012; Liebenow, 1969; Sawyer, 1992; Wreh, 1976). Over the years, settler colonialism privileged the descendants of the repatriated Africans in every sphere – political, cultural and economic (Kieh, 2008, 2012, 2017; Sawyer, 1992). the consolidation of power by Americo-Liberians in the nation's capital of Monrovia led to alienation and disenfranchisement of the indigenous peoples who remained relegated to rural areas outside the centre of political economic power and were as such neglected by the political and capitalist elites. These power dynamics based on a central government largely staffed by Americo-Liberians meant that the nation's developmental

trajectory rooted in internal colonization of the hinterland would eventually resemble other colonial, extraction-based economies of the Global South. In particular, the Liberian import/export sector came to be completely dominated by foreign firms (Kieh, 2017). A notable example was the U.S.-based Firestone Rubber Company, who in 1926 negotiated a lease agreement with the Liberian government that resulted in the leasing of a million acres of land for 99 years at an incredibly low rate (DuBois, 1933). Firestone also provided the Liberian government a loan of $5 million at an exorbitant interest rate (Chalk, 1967). The terms of the loan agreement also gave Firestone complete authority over state revenues until the loan was paid back in 1952 (ibid). Skewed and exploitative concession agreements persist in more recent times. For instance, in 2006, Mittal Steel, one of the world's largest steel companies was criticized for gaining control over the mining of iron ore in Liberia. Again, the terms of agreement overwhelming favoured the private interests of the company over the public interests of the country with respect to: inequitable royalty rates; a five-year tax holiday (with an option for extension); takeover of state assets by Mittal Steel including a segment of the railway to transfer iron ore; the erosion of sovereignty as the company could choose which new laws it would comply with; and a lack of mechanisms for transparency in a nation where governance was known to be weak and corruption endemic (Pallister, 2006).

As a result of these predatory capitalist practices, Liberia faced conditions similar to other export-driven economies dependent upon raw material extraction and facing increasing national debt and pressures to introduce structural adjustment policies. This historical trajectory led to arrangements which predominantly favoured private economic gain over investments in basic health and human needs of the Liberian public (Frankfurter et al., 2018: 90) such as the building of physical infrastructure, health care facilities, and the training of health personnel (Kieh, 2017: 89). And, if any investments in infrastructure were pursued, such as the building of roads, these construction projects would address the transportation needs of private resource extraction companies rather than serving the mobility needs of the general population, particularly those living in informal settlements. Facing a severe national debt crisis, humanitarian interventions and foreign aid remained one of the few sources supporting the underdeveloped public sector. Additionally, externally-imposed public spending retrenchment vis-à-vis World Bank and IMF structural adjustment policies resulted in high donor dependence (Benton and Dionne, 2015). And as NGOs have become the primary providers of healthcare services, it is precisely this dependence on and growing distrust of external entities that made initial attempts to curb the spread of the disease particularly arduous.

As mentioned previously, the resulting socio-political landscape in Liberia is not dissimilar to that of Guinea or Sierra Leone. Indeed, neo-colonial strategies of indirect rule deployed by foreign mining companies have similarly facilitated the underdevelopment of the Sierra Leone's social and health infrastructures vital for dealing with the outbreak (Frankfurter et al., 2018). Though thinkers like Walter Rodney did not primarily conceive the problem of underdevelopment in public health or ecological terms, his work proves vital for understanding how colonial plunder and exploitation of Africa's land and people in service of capitalist expansion in the West provided a historical basis for new forms of predation that exist today (Rodney, 1972). The incorporation of African environments into the global space economy of extraction, now mediated through recycled colonial practices, has profoundly influenced the relationships between African natural and built environments and between city and non-city spaces, while also ossifying Africa's position as a material source (and target) of global urbanizing processes. Seen in this way, colonialism is not merely an historical or local/regional affair, but a contemporary dialectical force of urbanization through which multiple and integrated 'circuits of extraction' mediate uneven development and sociometabolic relations on a global scale (Arboleda, 2020, p.2).

The continuity of colonial logics and practices had substantial implications for health governance during the Ebola pandemic, both in terms of how Western nations perceived the initial causes and drivers of the outbreak and how they would devise its ostensible solutions (Richardson, 2019). However, we see colonialism and its linkages with structural underdevelopment as a defining feature of the political pathology of EVD in West Africa, the consequences of which had been long in the making and became painfully evident when West African nations could not mount effective outbreak responses of their own given the region's underdeveloped social and health infrastructures. That West Africa was forced to rely on external responses and aid exemplifies the essence of the dependency relationship. The next section discusses in more detail how these broader historical, politico-economic contexts filtered down and influenced governance of the outbreak in West Africa.

Infectious disease governance and the Ebola response

Tensions arising from a shared colonial history of resource exploitation and predatory capitalism have resulted in political and social instability that set the conditions for dictatorships, unbridled corruption, recurrent military coups, and devastating civil wars in Liberia and Sierra Leone. Aside from the wide scale displacements they produced, civil conflicts rendered the two countries fertile ground for the amplification of Ebola spread by destroying any possibility of a public health and social welfare safety net that would have supported Liberians through the EVD epidemic (Kieh, 2017: 90). Indeed, this underdevelopment consistent with that of the rest of the continent (see Rodney, 1972) resulted in what Farmer (2015) has referred to as a 'public health desert'. The diversion of investment away from healthcare and other critical infrastructure (such as roads, water, sewage, and electrical networks) led to fragmentation and a lack of healthcare accessibility in rural areas. The effects of these inadequacies during the outbreaks were profound:

> "Road systems, transportation services, and telecommunications are weak in all three countries, especially in rural settings. These weaknesses greatly delayed the transportation of patients to treatment centres and of samples to laboratories, the communication of alerts, reports, and calls for help, and public information campaigns". (WHO, 2015)

Compounding these difficulties was the decimation of underdeveloped and fragile health care systems by civil war. During the peak of the outbreak, there were only 10,052 health care workers in Liberia (mostly located in Monrovia) and many highly trained health staff such as doctors, nurses, and other health professionals had already fled the country for safety (Kieh, 2017: 93). Similarly, Sierra Leone's healthcare system became known for having one of the lowest healthcare worker to population ratios in the world, with most facilities and qualified workers concentrated in or near the capital (Abdullah and Rashid, 2017). Many hospitals lacked basic necessities such as electricity, medical supplies, and clean water. Poor or absent disease surveillance systems and little to no inter-jurisdictional or inter-agency protocols to manage epidemics ensured the detection of new cases and accurate contact tracing would be difficult to conduct (Kieh, 2017).

The presence of foreign extractive entities also posed major structural barriers for containing the outbreak. It is worth noting that in Liberia the Firestone and ArcelorMittal (formerly Mittal Steel) concession areas were located in counties where the initial spread of EVD began (Abramowitz et al., 2017: 59). Margibi County, for example, contained the Firestone concession area where EVD first hit before reaching Monrovia, and recorded the second most infections after Montserrado County. Notably, Margibi County had the second largest number of Ebola survivors likely attributable to the Firestone response that quickly moved to contain the spread by deploying

draconian measures and rapidly constructed treatment centres for the exclusive use of company employees (Chamberlain, 2014).

In Sierra Leone, close ties between political and economic elite originating from the colonial era proved detrimental to the country's containment strategy. According to Frankfurter et al. (2018: 535), 'the same political actors, institutions and para-institutions that over the past 120 years have facilitated foreign access to diamond deposits were the ones that ultimately commanded the outbreak response'. This included a paramount chief who served on the board of a major diamond mine in Kono and who was appointed the highest position in the Ebola response by Sierra Leone's president (ibid). Furthermore, Frankfurter et al. (2018) point to evidence that suggests much of Sierra Leone's Ebola relief funds were squandered, with nearly one third unaccounted for in 2015. This and other events served to further erode local trust in the governing regimes.

Social networks in urban informal settlements

Often overlooked in conventional epidemiological accounts of outbreak response in informal settlements is how social networks already present in these locales prior to an outbreak may contribute to the eventual success of the response (Abramowitz et al., 2015). Since the advent of colonial exploitation, informal settlements have maintained functioning social networks that have evolved out of necessity to provide for residents in the absence of formal/governmental provision of services and social welfare infrastructures (McFarlane and Silver, 2017). During the Ebola outbreak, social networks and community governance structures that developed to address the void in services, namely the community-based strategy (see Ali et al., 2022), was found to be an especially effective outbreak response. This strategy involved direct participation of community leaders (e.g. leaders of religious congregations, youth, and social clubs, teachers, etc.) and community members in the outbreak response (Fallah et al., 2015b), taking up roles in: case identification and contact tracing; response training; raising community awareness; hygiene; disease surveillance; creation of local support infrastructures for the provision of food and water during quarantine; and implementing isolation, quarantine, and triage measures (ibid). Such community-based initiatives have been acknowledged as playing a critical and indispensable role in the EVD response (ibid), especially since by mobilizing the existing social infrastructure, they were able to address an important obstacle to effective outbreak response within as colonial context – that is, the issue of institutional distrust.

Distrust

A long history of colonialism, political corruption, and exploitation by foreign entities has fostered multiple crises of legitimacy to the point that many West Africans harbour deep mistrust of their governing regimes (Barry, 2017; Kieh, 2017). During the initial response, many had become deeply suspicious about public health interventions such as forced quarantines, prohibition of cultural burial rites, consumption of bush-meat, and even medical care. Richardson (2019) observes that local distrust of and non-compliance with Ebola responders is commonly criticized as being the irrational response of uneducated populations who needed to be convinced of the veracity of the (Western) scientific approach and to reject their false cultural practices and beliefs (e.g. funeral rites). Richardson notes however that such a perspective is not only inaccurate but reinforces Orientalist biases. It reinforces a particular colonialist paradigm of causality that obscures the role that determinants of health and political and social contexts play in creating distrust. To capture a true picture of what leads to local distrust would therefore require a greater understanding of the types of contextual issues we have emphasized in our chapter – the influence of colonial

history and the contemporary extractive political economy. Without considering these contextual dimensions, the analysis will miss the importance of power relations that cultivate distrust and reinforce common colonial discourses based on perceptions of backwardness, irrationality, and the need for outside saviours. To consider the contextual factors means that we must take seriously the political aspect of the UPP and consider the forms that political contestation, negotiation, and decision-making may take within the specific context we are considering. Thus, as we mentioned at the beginning of this paper, governance is a critical component of any discussion of political pathology.

Conclusion

Cultural explanations that have dominated global understandings of the West African Ebola epidemic (Bah, 2017) are problematic because they 'de-historicize the political and economic forces that have promoted the pandemic' in the first place (Richardson et al., 2016: 9). An overemphasis on culture as a causal explanation obscures the historical legacies of the Atlantic slave trade, imperialism, colonialism, and more contemporary ramifications of civil war, political corruption, and extractive capitalism that have profoundly shaped the developmental pathways of West Africa and its people (Bah, 2017; Howard, 2017). Less antagonistic, yet also problematic is the notion that Ebola emerged 'randomly' from the forest. This too diverts attention away from considering in-depth a socio-political context that has enabled large-scale degradation of ecosystems, or the evisceration of 'agro-ecological friction' (Wallace and Wallace, 2016: 11), thereby ultimately predisposing many to increased risk of EVD (Azétsop et al., 2020). Such explanatory narratives disguise the colonial character of urbanization that so violently transforms material landscapes (Keil et al., 2020).

As argued in our introduction, the intensified political *and* ecological activities occurring across the field of extensive urbanization must be given greater attention. This includes a consideration of what are sometimes quickly overlooked or dismissed as 'non-places' such as airports, oil fields, and landfills. Informal settlements also tend to be relegated to holding such status, because they are often perceived as 'out-of-sight-out-of-mind'. However, during times of pandemic, informal settlements situated on the urban peripheries are jarringly brought back into the picture. As Wilkinson (2020a; 2020b) and Muggah and Florida (2020) note, it is here where viral transmission explodes due to high population density, poor access to clean water and sanitation, under-nourishment, and weak healthcare systems, making those residing within more susceptible to disease spread.

At the same time, recent research has shown that despite severe resource constraints faced in informal settlements, an effective outbreak response is still possible through the mobilization of self-governance mechanisms based on community-based initiatives and mobilizing existing social infrastructures (Ali et al., 2022). This corroborates the findings of Richards (2016: 40) who notes that the pandemic response to some extent was easier in informal settlements because the logistics of engaging citizens in activities that support the response, such as case-finding and quarantine, may be more readily pursued.

This paper has discussed the urban dimensions of the 2014/5 Ebola outbreak in West Africa with the objective of bringing spatialized political ecology and political pathology approaches into a generative conversation with each other. We were able to demonstrate that the focus on the political and geographical shifts in the countries where the outbreak of Ebola occurred could be explained well by this joint application of UPE and UPP. We believe that such a combined strategy can be usefully applied in similar cases and can enhance our understanding of those, while also 'provincializing' the two approaches themselves that have often previously been thought of – and critiqued – as linked to urban natures and urban infectious disease outbreaks in the global north and west.

If, finally, Lefebvre was concerned with 'the prodigious extension of the urban to the entire planet' (2003: 169), the outbreak of Ebola at the frontier of this 'prodigious extension' has an important lesson for the process overall. We may remind ourselves of the opening idea of this paper that for Lefebvre, the production of space and the production of nature in urban society has generative, not just destructive, effects. The 'urban revolution' is not a linear path but contains in itself the possibilities for new societal relationships with nature that go beyond the teleology of urban encroachment often found in narratives of the urban. We have argued here that this generative capacity are best seen in bringing urban natures (UPE) and human natures (UPP) into conversation with each other along the way.[5] Urban society must develop new approaches to meet the continuing biophysical challenges embedded in the political ecologies of distended urban ecologies, including the management of health and disease, and develop functioning models of political pathologies that rise to these challenges in new modes of governance that dispel the tendency to remain stuck in the culturalization of the colonial urban world which is now the majority urban world in which we live (Bhan et al., 2020).

Highlights

- Capitalist relations transform sociocultural and material flows in ways that increase possibilities for emergence and spread of infectious disease.
- We must examine the dynamics and governance of sub-urban, ex-urban, and peri-urban space as they relate to infectious disease emergence.
- West African case of EVD provides a case study to analyze the intersections between political ecologies and political pathologies.
- Three key dimensions of the outbreak include deforestation, intensified mobilities, and rapidly growing informal settlements.
- The Ebola response cannot be understood outside of particular (neo)colonial context in which many West Africans struggle for basic survival.

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Notes

1. We thank one of our anonymous reviewers for asking us to expand and define these new forms as we have tried to do here. We borrow the concept of stretchiness from a discussion hosted at Syracuse Architecture in

the fall of 2019. One of the authors is grateful to have been invited to present some of his ideas in this context as part of this conversation at the time which can be viewed here: https://www.youtube.com/watch?v=MMQVrFI6qdM.

2. Popular discussions in this context include those on the Anthropocene and on human-induced rapid evolutionary change (see Quammen, 2014).
3. The larger study entitled 'The Role of Social, Cultural, and Environmental Factors in Improving Ebola Virus Disease Response and Resilience' was led by S. Harris Ali, Mosoka Fallah, and Joseph McCarthy.
4. Empirical findings of the larger project can be found in Ali et al. (2022).
5. We recognize here the work done along the global One Health agenda which we are unable to discuss at any depth in this paper. See for example, Federal Ministry (2021); Hinchliffe (2015); Wolf (2015) that touch on aspects of the debate relevant to our discussion here. We thank Raphael Aguiar at York University's Dahdaleh Institute for his suggestions in this regard.

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