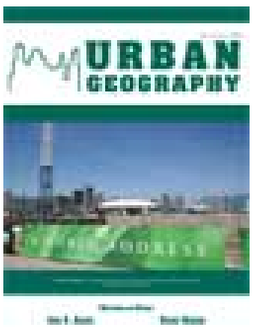

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Governing urban infrastructures under pandemic conditions: some thoughts

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ABSTRACT

Urban infrastructure has appeared as a central feature in a range of commentaries on the COVID-19 pandemic. Understanding the imprint of the pandemic on cities and the power-laden processes through which they are being rebuilt requires an attention to the politics and governance of infrastructure. In this intervention, we understand the pandemic as a moment to rethink claims over how infrastructures work and how they might be studied. We focus on three dimensions where COVID-19 has underscored the importance of infrastructure governance: as pandemic condition, as pandemic vulnerability, and as pandemic response. We argue that a strand of future academic work must be attuned to the continued importance of the governance of and by urban infrastructures in a world of cities in which COVID-19 and its associated economic, environmental, and social implications are likely to remain pervasive.

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Introduction

It seems axiomatic to note that almost all aspects of urban life will be touched by the immediate and longer-term effects of the COVID-19 pandemic (Acuto, 2020; Chen et al., 2020; Connolly et al., 2020; Foreign Policy, 2020; McCann, 2020). Running across much of the contemporary work on the "world we are leaving behind, and the one being remade" (Serhan, 2020: np), has been an attention to "infrastructure" (Carney et al., 2020; KTN, 2020; Powrie, 2020; World Economic Forum, 2020). In its harder and softer, physical and social, forms and in the fields of care, education, energy, transport, waste, or, of course, health, commentaries have focused on the importance of urban infrastructure to pandemic dynamics. In some cases the onus has been on longer-term, transformational change (Katseff et al., 2020; Lam-Frendo & Davisson, 2020, np), while in others the emphasis is on getting by through provisional fixes (Bhan et al., 2020) or emergency orders (Teskey, 2020). Some discussions have taken their cue from already established, tech-focused private infrastructural initiatives such as those offered by Cisco and IBM. For others, the point of departure is altogether different, centered upon relations of care and reciprocity (Kern, 2020) or mutual aid (Springer, 2020). Understanding the imprint of the pandemic on cities

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and the means through which they are being rebuilt demands we put "infrastructure" at the center of our analysis.

Notably, what is clear in the diverse forecasts, plans, and strategies being generated by cities is that any "building back better" will be structured by the infrastructural conditions under which cities and their different populations entered the pandemic. "Befores" and "afters" are co-present and interwoven in this crisis. The changes brought about in recent months have been swift and remarkable and yet the present moment is equally defined by preexisting conditions and projected futures.

The two city regions from which we write this intervention are cases in point. We start in Greater Manchester in north-west England. Since mid-March last year the notion of "infrastructure" has appeared and reappeared in various ways in the reporting of COVID-19. We highlight three examples. First has been the emergence of digital infrastructures around the collection and sharing of COVID-19 data as a site of contestation between different branches of the state and civil society.

Second has been the ongoing debate over lockdown forms of mobility and the pandemic's capacity to catalyze quick-fix transport projects. Vehicular traffic on the city region's roads dropped by over 60%, while at the same time, there has been a growth in cycling and walking with subsequent demands from various groups both to increase the width of pavements and to introduce new protected cycle routes as a means of redistributing space from cars to other modes of transport.

Third, the decline in air travel has slowed to almost standstill logistical, rental and retail economic activity in and around Manchester Airport. All 10 local governments of Greater Manchester are invested in the Manchester Airport Group (MAG) and current estimates put the Combined Authority losing over £100 million in dividends alone.

Turning to Greater Toronto, Canada, we see infrastructure working in similar yet distinct ways. First, race- and class-based inequalities in infrastructure coverage and essential service provision pre-COVID-19 have made some places and populations in the city more vulnerable to infection than others (City of Toronto, 2020; on this dynamic in the U.S. and its racist logic, see especially; Taylor, 2020).

Second, COVID-19 is threatening the viability of future infrastructural investment as well as the operation of existing services. Sidewalk Labs' ambitious "smart city" plan to redevelop Toronto's Waterfront has been canceled, and the survival of the Toronto Transit Commission (TTC) is in question due to dramatic drops in public transport usage (Spurr, 2020).

Third, under the broad category of "social infrastructure," the pandemic has exposed an urgent and ongoing crisis of care and social reproduction as well as the gendered division of labor upon which the economy is premised. On the one hand, the majority of COVID-19 deaths in the Greater Toronto region (and indeed, across Canada more generally) have occurred in long-term care facilities for seniors. On the other hand, the prolonged closure of childcare and schools and the shuttering of community centers, libraries, and playgrounds have had devastating effects on children's well-being and on working families and women (Brethour et al., 2020).

In these examples, the abundance or lack of infrastructure in its blue, gray, green, or social manifestations is an essential element structuring how cities and their communities are experiencing COVID-19 and how they might emerge from it. We argue in this intervention that infrastructure functions in three main ways: it has conditioned the

pandemic as an urban crisis, it is a key site of vulnerabilities within urban systems, and it is a central element in strategies to respond, rebuild and renew. It is at once *cause, effect*, and *solution* to pandemic conditions. Deploying this analytic highlights the uneven nature of infrastructure provision, variations in infrastructural responses within and across cities, the range of actors and institutions vying for influence, and the ongoing revaluation of what support systems are deemed essential for sustaining urban life. Building upon recent urban scholarship that has begun to open up the "black box" of infrastructure (Addie et al., 2020; Anand et al., 2018; Dodson, 2009; McFarlane & Rutherford, 2008; Steele & Legacy, 2017) and that has identified the essential intersection of infrastructure, governance, and urbanization, in this intervention we argue that the governance of and by urban infrastructure demands renewed attention as those that govern cities seek a way through the current crisis.

The governance of urban infrastructures under pandemic conditions

Diseases have long had a dramatic impact on the nature and shape of urban infrastructures, while being subject to these conditions in turn. Modern urban design is founded on housing, sanitary and social reforms with the development of accessible drinking water, public parks and wastewater systems emerging as responses to, for example, cholera and yellow fever epidemics (Carr, 2020). The need for disease and disaster response have exposed and transformed urban governance institutions and practices and they have inspired new forms of collective action (Brown, 1999). Moreover, public health crises are moments where we are forced to reconsider our ideas about the "public good" and "public interest" and the strategies utilized in their pursuit.

While given impetus by the current pandemic, however, the focus on the significance of infrastructure also reflects a longer-standing, paradigm shift through which attention has turned to the relationship between infrastructure and urbanization. The much-heralded "infrastructural turn" (Dodson, 2009) across the social sciences constitutes a rethinking of infrastructure as "a focus of empirical research, an ontological disposition and a methodological orientation" (Addie et al., 2020, p. 12). This turn reflects a rise to prominence of infrastructure-oriented urbanization, characterized both by a qualitative revalorization of technical systems as solutions to urban age challenges and a quantitative shift in the scope and size of global urban infrastructure investments. As a result, academic understandings of infrastructure are shifting and expanding to encompass a wide range of networked systems and socio-material ecologies (Berlant, 2016; Carse, 2016).

Attending to the "governance" of urban infrastructure, that is, "the sum of the many ways individuals and institutions … plan and manage the common affairs of the city" (UN-Habitat, 2002, p. 14) thus offers a useful framework for analyzing pandemic-related urban trends. We understand governance here in two-ways. The first is the governance *of* infrastructure. This refers to the accumulated decisions and collective actions that produce infrastructure and infrastructure space. Here infrastructure is created by "techniques, politics, practices, ideologies and representations" (Ekers et al., 2012, p. 407). The second is governance *by* infrastructure, which signals how infrastructure itself actively conditions urban space, institutions and subjects. In other words, infrastructure is a socio-technical force that acts to make and maintain urban ways of life.

A focus on governance *of* and *by* infrastructure highlights the materiality of urbanization and urban politics and policy, and links the composition of urban space and the lived dimensions of urban society. With attention to infrastructure's physical and the social coordinates, this perspective clarifies struggles and negotiations of collective action, institutional coordination, and resource-distribution. However, it also reveals the dynamics of governance in a deeper sense – in delimiting an urban citizenry, demarcating the limits of the private and the public, and determining the values and habits of urban society. Urban research that bridges these dimensions is particularly promising for the complex and variegated ways in which infrastructure has come to matter under COVID-19.

There are three modes of thinking through how the presence and absence of infrastructure combine in particular settings that are particularly relevant for understanding the current pandemic condition. First, the emergence and spread of COVID-19 have highlighted the range of actors and agencies of varying geographical reach present in the governance of urban infrastructure. The complex infrastructural geographies of public health, for example, have been revealed in the form of how divisions of labor have been negotiated, information has been shared, interventions have been coordinated and resourcing decisions have been made. Comparative analysis has indicated significant differences between national health system infrastructures (Delaney, 2020), including variations in how governance is actualized and performed. Yet national institutions of public health comprise but one relevant node in more complex infrastructural ecologies which cross administrative and territorial boundaries. Acuto (2020) and Connolly et al. (2020) highlight how urbanization and its networked and topological nature challenges some of the more traditional and well-established multi-level modes of the governance of infrastructure where, for example, there exists friction between the involvement of agencies of different jurisdictions and territories in urban health infrastructures. Related to the notion of the "territorial trap", (Wang et al., 2020), this echoes earlier points made in relation to the emergence and spread of SARS (Ali & Keil, 2008; Keil & Ali, 2011). The uneven nature of the COVID-19 pandemic is, in part, due to variations in institutional, legal, and regulatory contexts (the governance *of* infrastructure). Notably, however, it also emerges from the unevenness of infrastructure networks themselves (the governance *by* infrastructure). Connolly et al. (2020, p. 214) argue that infrastructures "play a role in the emergence of potential outbreaks." That is, urban infrastructures are both one of the causes of global pandemics, such as COVID19, and they also condition how they are experienced, understood, and lived by those who call cities home. The emergence and circulation of recent pandemics, such as Ebola, MERS, SARS, Swine Flu, and Zika, have been supported through the expanding presence of aviation infrastructures that encourage and support regular mobility within and between countries (Ali & Keil, 2008). Emerging Infectious Diseases (EIDs), it might be argued, are products of the emergence of extended urbanization, "embedded in complex hierarchical networks of scaled topologies" (Keil & Ali, 2011, p. 142). Infrastructure thus governs through the controlling of behavior and the ordering of movement within and between cities.

Moreover, how global pandemics are experienced is profoundly shaped by relations of ability, class, ethnicity, gender, geographical location, and race. These systemic conditions are themselves infrastructural, with disadvantage and injustice frequently marked by the absences of services in marginalized areas and to populations who have been

historically oppressed. The pandemic has put health and wellness at the forefront of people's minds and has highlighted the inequalities in provision of social infrastructure in many communities" (Carney et al., 2020, np). For example, many governmental responses to COVID-19 assume access to certain forms of social infrastructure. Requirements to perform paid work from home assume a home that can support this work and the existence of various elements of infrastructure such as Wi-Fi. It also assumes someone is able to do the caring work where there are older or younger dependents (Lacovone et al., 2020; Manzo & Minello, 2020), with evidence suggesting a reproduction under COVID-19 of the gender division of labor, while guidance over hygiene assumes access to sanitation and waste systems, as well as being able to afford potentially increased usage. Much has been made of the virtues of green infrastructure and of the returns to regular exercises and walking, particularly in those communities where own-gardens are the exception. Yet, for many urban dwellers especially the most disadvantaged groups, they neither have access to their own green space nor to forms of public green infrastructure. Infrastructural disadvantage also works conversely through the over-presence of infrastructure in some urban communities, drawing upon longer-standing patterns of data surveillance technologies, policing, and the governance through dashboards or smart city-type data strategies (Everts, 2020; James et al., 2020).

Second, the exposure and vulnerability of a city can be read through its infrastructure, which can be abandoned, can break down and can be suspended during times of crisis. Under COVID-19 the absence of universal educational infrastructures, such as kindergartens, libraries, or schools, or to forms of green infrastructure, such as parks or health infrastructure has also revealed how this vulnerability is relationally and unevenly distributed across social groups. This relative "absence" is also manifest in the mixed ways in which existing infrastructure is or is not being maintained and future infrastructure is being realized. The dynamics of public transportation here are exemplary. Whereas some networks were shuttered completely during lockdown, others were designated "critical" and kept open to ensure the continuation of vital urban functions. Both options engendered differentiated forms of risk and reward (George & Jaffe, 2020; Roy, 2020). Varied responses and contradictory tendencies also mark construction and upkeep. On the one hand, public transit projects around the world have been put on pause, and the assumptions upon which decisions were made called into question. "Until the pieces stop moving, many transport projects may be difficult to progress" (Carney et al., 2020, np). Financing for public transit projects is also being reconsidered as future usage becomes less certain. On the other hand, in some cases transport maintenance is being completed quicker than planned, as reduced usage of it has meant additions and repairs are able to be undertaken without the disruption associated with the rescheduling of services (Hu & Goldbaum, 2020). An element of this vulnerability stems from the extent of the robustness of the system of governance that are either already exist or that can be generated, perhaps hastily, in a crisis (Bhan et al., 2020). Here too, infrastructure is governed and governs, and its effects are felt through a play of absence and presence.

Third, infrastructure is being asked to perform a set of functions in the making of urban futures. A host of local, national, and international governmental and non-governmental agencies are talking and writing about infrastructure being built back better (see, for example: https://www.buildbackbetteruk.org; https://www.hoganlovells.com/en/publications/uk-build-back-better-podcast; https://www.oecd.org/coronavirus/

policy-responses/building-back-better-a-sustainable-resilient-recovery-after-covid-19-52b869f5/; https://www.wemeanbusinesscoalition.org/). Drawing upon humanitarian studies of post "natural disasters", such as earthquakes (Mannakkara et al., 2014), here urban infrastructure and the governance of and by it are positioned as potential solutions to the issues generated both by COVID-19 and its immediate and longer terms effects. Of course, different cities entered into particular localized forms of lockdown with different governance arrangements. This has shaped and structured how this process has been overseen, how divisions of labor between different elements of government and related private and third sector agencies were arrived at, and then how cities have begun to reemerge from lockdown to manage and oversee the continued presence of COVID-19. The argument goes that the current condition demands those governing urban infrastructures revisit the norms underpinning their decision making. So, the governance of infrastructure is being rethought. Of course, what is meant by the "new normal" in part depends on who and where you are. For some, the immediate future is one that allows for the rethinking of the assumptions underpinning neo-liberal urban growth models. This includes the designing, the evaluating, the financing, the governing and the zoning that underpins the production of urban infrastructure. For example, the redesigning of the governance of infrastructure to include more citizens or community involvement or the governance by infrastructure in terms of redistributing space away from the car and toward cycling and walking. For others, the requirement is for less radical change. Instead, the new normal is to look very much like the old normal with some relatively minor tweaks, with less questioning of the status quo and less use of the opportunities afforded by COVID-19 to rethink the economic and environmental basis of some decision-making.[1] Here the tendency is to emphasize off-the-shelf or "shovel-ready" infrastructure projects, or to exploit the crisis to push through agendas of "coronavirus capitalism" (Klein, 2020) that might otherwise have been opposed. For others still, responses to the pandemic are less monumental and ambitious, rooted not in grandiose fixes and predetermined agendas, but in more ad-hoc collective life arrangements through which "the urban majority is trying to survive and cope within structures of inequality that now bear both the new imprint of COVID-19 while equally holding the continuities of older forms of distancing and exclusion" (Bhan et al., 2020, np).

Conclusion

In this intervention, we have argued that governance *of* and *by* infrastructure are essential features of urban politics and practice. We have further suggested that foregrounding questions of governance can clarify the relationship between infrastructure and COVID-19. In particular, we highlighted three ways that infrastructure has emerged in urban COVID-19 discourses, starting with our own city regions of Greater Manchester and Greater Toronto. Infrastructure as a causal element contributing to the pandemic and shaping how it has been experienced, infrastructure as a site of urban vulnerability where cities are threatened and put at risk by pandemic conditions, and infrastructure as an essential feature of our economic, environmental, political, and social imaginaries of response and recovery (see Table 1).

Table 1. Infrastructure and pandemic urbanism.

	Absence of Infrastruture	Presence of Infrastructure
Condition/Cause of the COVID-19 pandemic	A historic lack of infrastructure conditions and predisposes disadvantaged locations and populations to ill health.	Infrastructure, especially mobility networks, are essential vectors of viral outbreaks. The over-presence of certain kinds of infrastructure (or their negative externalities) and/or a reliance on particularly harmful infrastructures enacts violence and increases risk and exposure.
Vulnerability/ Effect of the COVID-19 pandemic	Under crisis conditions, existing infrastructures are closed, put on hold, or fall into disrepair. New infrastructure projects and upgrades are canceled or postponed due to uncertainty.	The pandemic triggers an escalation and entrenchment of infrastructural violence.
Solution/Response to the COVID-19 pandemic	A prolonged suspension of vital infrastructures. The public/private/social provisioning of infrastructure is reconfigured along with its administrative and spatial structures.	Infrastructure is positioned as vital to post-pandemic response and recovery. A roll-out of new and improved infrastructural investments to generate future cities and territories – either within or against the status quo.

Understanding the infrastructural dimensions of the COVID-19 pandemic through this framework promises new insights into the dynamics of contemporary urban politics. It will also contribute to the wider research agenda on the governance of urban infrastructure. The management of COVID-19 highlights how various actors and administrations, some more present in cities than others, conceptualize, plan, finance, build, organize, and use infrastructure as well as the contentious politics underlying these processes. These insights can form the basis of studies into the workings of megaprojects, the volatility of infrastructural finance, the expediency of infrastructure in policy-making, and experimentations in informal, multi-level, and regional planning and governing. The varied experiences of the health crisis globally have also reminded us that the design and operation of infrastructure shapes daily life, and it embeds modes of knowledge and political rationalities into arrangements of authority, built forms, and social worlds. These aspects thus suggest new attention to the *dispositifs* of infrastructural governance and to "big" and "small" ways in which infrastructure controls behavior, orders movement, and conditions the conduct of politics. Lastly, the COVID-19 pandemic has exposed the interconnected nature of various infrastructural ecologies and the shared vulnerabilities and responsibilities that bind us to one another and to the non-human world. Our argument is that it is incumbent upon researchers to devise ways to understand these entangled, more-than-human, and "lively" (Amin, 2014) dimensions of urban infrastructure.

Note

1. Many initiatives, such as the World Economic Forum's call for an infrastructural "great reset," confound this distinction, couching established ideologies of resiliency and sustainability, as novel and radical transformations.

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