

Boring cities

The privatisation of subterranea

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Most of the world's major cities are now undergirded by complicated subterranean infrastructures; buried communication networks, water and waste management systems, storage vaults, transportation corridors, and even underground housing. In the past, only states, backed by tax revenue, could afford to undertake the boring and excavation required to build such spaces. Today however, the private sector seeks to profit from building, maintaining, and owning urban undergrounds. In this article, we traverse five underground assets in five cities—Sydney, Mexico City, Singapore, Los Angeles and Beijing—to query the political implications of underground privatisation. In allowing municipal underground infrastructure built for public provision slip into the hands of individuals and corporations, we suggest that the boring taking place under cities is far from boring, it's the next chapter of neoliberalism, where we hand over control of the critical infrastructure that makes urban life possible.

The underground has, and will continue to be, a productive space for three-dimensional urban and border geopolitics. (Squire and Dodds 2020, 4)

I. Introduction: from subterranean geopolitics to sub-urban politics

It has been less than two hundred years since human beings began seriously coring through Earth's underground. The deepest hole human beings have ever dug was the 22 cm wide Kola borehole in the Russian Arctic, a 12.2 km

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Figure 1: A public-private borehole through the urban underground (Photo by Bradley Garrett).

deep dive into the crust excavated at the tail end of the Cold War (see Kozlovsky 1987). Drilling ceased in 1992, when the temperature in the hole reached 180°C . Researchers recently initiated the Integrated Ocean Drilling Program (IODP), which aims to complete the job, drilling all the way to Earth's mantle. Doing so will require substantial international investment and cooperation. Meanwhile in Switzerland, the longest tunnel in the world—the Gotthard Base Tunnel—was completed in 2016. Sunk 2.3 km below the Alps, it took 17 years to dig and cost more than 12 billion Swiss francs. The Chinese government now plans to build a 123km tunnel underneath the Bohai Strait twice that length.

As impressive as these boring projects are, they are anomalies because they are outside of cities. The majority of underground excavation around the world is taking place in the most densely populated areas across a dizzying array of stratigraphy (Figure 1). The boring of holes, tunnels and digging of trenches for all manner of urban infrastructures creates what geologist Greg Brick has called 'swiss cheese cities' (Brick 2009, 7). In this article, we highlight the increasing importance of vertical geographies that are steeped more in urban spatial government rather than international geopolitics (Gandy 2017; McNeill 2019a). At the same time, we also seek to pull urban infrastructure research into a more overtly political frame. The challenge for critical urban theory is to think about those two things together. Urban spatial politics can no longer be stuck at street level, it must open a front underground. As such, this article complements existing work within social sciences around 'vertical' and 'volumetric' geographies (Elden 2013; Garrett 2016; Graham 2016; McNeill 2019a), and asserts that all the boring going on under our cities is far from boring. We must deepen our urban geographical imaginations to take account of underground infrastructure

as a means of combating 'horizontalism', a view of the world that recognises problems associated with urban sprawl, for instance, whilst often ignoring the multiple layers of sprawl beneath and above us (Graham and Hewitt 2013). This is a conceptual move, but also one that is increasingly necessary in urban planning and policy spheres if we seek to maintain any stake in the governance of day-to-day urban life.

The move of the majority of the world's population into cities would not have been possible without significant vertical densification of critical infrastructure. Skyscrapers and tower blocks are the most obvious example (see Harris 2015), but as Rosalind Williams (2008, 52) has written, 'the triumphs of modern industrial and urban life arise from connections buried below the surface of the earth. These structures rest on hidden infrastructures.' The fact that they are largely hidden from view is important, because spatial contestation and the consequences of control are not always immediately obvious; the underground has long been 'our planet's most abstract landscape, always more metaphor than space' (Hunt 2019, 11). Critically engaging the boring, coring, and excavation under our metropolises is just as crucial as combating gentrification, the loss of public space, and systems of control and surveillance on the horizontal axis (Garrett 2017). The tendons of tunnels that stretch through the underbelly of most major cities on the planet are not privileges or curiosities, they are crucial to sustaining urban life and the inevitable growth and densification of cities.

Private players know there is money to be made and power to be gained through these changes. In 2018, Bruce Flatt, chief executive of Brookfield Asset Management, told reporters for the *Financial Times* that 'We're in a 50-year transformation of the infrastructure world. We're 10 years in; we have 40 left to go. By the end of that 50 years most infrastructure in the world will be transferred to private hands' (Evans and Smith 2018, np). It is neither coincidental nor inconsequential that the privatisation and corporatisation of infrastructures coincides with on-going expansion of a privately-excavated and privately-owned urban underground, since

both logistics and finance are heavily involved in the expansion of literal extractive activities. In the case of logistics this is apparent in processes of transport and power supply as well as in new infrastructure developments and projects whose scale rivals that of mega-mining. (Mezzadra and Neilson 2017, 193)

This article acts as an entree to just such private anthropogenic urban stratigraphy, traversing five major cities and touching upon five types of crucial underground infrastructure: communication, water, storage, transport and dwelling.

II. Communication, Sydney

Telecommunication grids are mostly subterranean. Their extensive networks exist below the surface in a complex array of cables, junctions, nodes and conduits. Sydney's network is exactly that - a puzzle under the pavement. How the puzzle works, or how many pieces form it, is increasingly complex. Initially, the people who created it were the engineers and employees of Telecom (later

Telstra), the national provider of telecommunications. However, since 1997, with Telstra's privatisation, the grid has been fragmented and the underground infrastructure has proliferated. Unlike other privatised infrastructures such as water and gas, in which corporate operators compete for a designated market, telecommunications providers compete within existing urban markets to provide telephone and internet connections. With its inheritance of pre-existing Telecom infrastructure, when competition was introduced, Telstra was required to *share* existing infrastructure with other telecommunication providers so as to mitigate any unfair 'advantage' in the market.

What is there to share? The short answer is conduits. Conduits are plastic pipes that contain precious telecommunications assets and they are essential to the grid. Ownership of conduits belongs mainly to Telstra, and with this ownership comes control over access to maintain, repair and expand the grid. If a different telecommunication service provider (e.g. Optus) is interested in delivering service to a particular zone, they have two possible options: (1) To create (if space allows) a new subterranean space with its cables and conduits; or (2) to use existing ones, in which case a rent must be paid to the owner (i.e. Telstra). This subterranean real estate system, originally promoted to avoid the monopoly of Telstra over communications, has had repercussions into how subterranean access has been privatised. Footpaths and roads across the city are now scarred with the visible traces of competing 'telcos' digging their own trenches and pits to service their customers where Telstra infrastructure has been either inaccessible or inadequate.

Australia's National Broadband Network (NBN) is now being rolled out through the formation of a government-owned corporation which acts as a monopoly wholesale provider of broadband access. Rather than building their own network of underground conduits for broadband cables, NBN Co recently paid Telstra 1.1 billion Australian dollars to acquire its underground infrastructure such as ducts, conduits and pits (Beltrán 2014). Here, infrastructure that was once publicly owned, and then was privatised, is now being bought back by a state-owned corporation at great expense. NBN Co has also purchased some Optus cable assets in order to provide broadband access in some areas. While this may seem to signal a consolidation of underground telecommunications infrastructure in the hands of the state, there are already discussions about future privatisations of the NBN Co and its recently acquired underground assets. The subterranean corridors of communication are only going to become increasingly complicated, materially and politically. Reversing processes of subterranean privatisation will be required if we wish to achieve a situation in which universal access to a high standard of connectivity does not depend on one's capacity to pay the players in a market who have access to the most reliable conduits and cables.

III. Water, Mexico City

Mexico City, emerging on the site of the Aztec capital of Tenochtitlan, was originally situated on an island in the lake of Texcoco. The early settlement enjoyed relative water abundance, drawing on the nearby lake and the region's

underground aquifers. The Spanish colonisers, however, began draining Texcoco in the 17th century and rapid increases in water extraction of aquifers underlying the city have occurred since the 1900s (Delgado-Ramos 2015). As Mark Anderson has noted,

excessive pumping of water from Mexico City's Aquifers has resulted in a situation in which the city's ground routinely, if unevenly, subsides fifteen or more centimetres per year ... [a] subsidence makes it undeniable that we live in volumes and not in areas. (Anderson 2016, 105)

Mexico is, through its water consumption, in some way, consuming itself.

Beyond the broad scale volumetrics of this water extraction, there are political questions that surround equitable distribution of these extractive aquatic sources from aquifers—and increasingly via aqueducts from neighbouring watersheds. A subterranean network of pipes has been constructed over the past centuries that moves water around the city, and extracts sewerage beyond its environs. The physical distribution of these pipes, and their governance, has emerged as a key contested policy domain since the 1990s (for complementary story in Mumbai, see Gandy 2008; Moreno-Tabarez 2020).

In the wake of Mexico's Revolution, water was declared a public good in the country's 1917 Constitution. Among other challenges, the rapid growth of Mexico City—from half a million in 1900, to more than 15 million by the 1990s, and reaching more than 21 million in 2019—has meant that 'democratic control over water and water services continues to be one of the unfulfilled promises of the Mexican Revolution' (Castro 2004, 329). Neoliberal economic transformations that began to take shape in Mexico during this period created a political juncture that reshaped how water was treated. Far-reaching reforms implemented in 1992 ruled that water should be treated just like any other commodity, and paid for at its market value, while, around the same time, contracts were given to four private companies, with strong affiliations to transnational corporate firms, to administer the Federal District water supply system (Romero Lankao 2011). These private contracts, which were finalised with no public consultation, were defined as 'service contracts' rather than concessions, which meant that the private sector's role has largely been hidden from the public. As David Barkin has noted, 'surprisingly, many residents of the capital are unaware that significant parts of the city's water system were transferred to private operators more than a decade ago' (Barkin 2007, 26). As such, public ire at water rate increases has tended to be 'directed at politicians, rather than the foreign companies, about which most people remain unaware' (Barkin 2007, 27). Privatisation of Mexico City's drinking water, arguably, has occurred via subterfuge.

IV. Storage, Singapore

Singapore is running out of land. The state is terraforming—building new land—to expand their territory horizontally, but sea level rise as a result of the climate crisis may eventually reclaim whatever is built. So, despite the fact that

it can often be more costly to build underground, they're burying infrastructure, retail shops, pedestrian walkways, highways, storage, homes, offices, and, crucially, creating large 'rock caverns' to house fuel, fresh water and waste. The volumetric expansion of the city is being carefully charted on three axes. Singapore will be the first city to map their underground space in totality as of 2020 as part of the creation of a 'subterranean masterplan'. Zhiye Zhao, the Director of the *Nanyang Centre for Underground Space*, explained to us that his team of urban planners and engineers imagined the future of Singapore as moving in only one direction: down. And there is money to be made underground. Through public-private partnerships, the government has recouped up to 50% of excavation costs by selling extracted rock. Where once excavation of rock was the primary industry, it has now become a by-product of necessity. In all aspects of excavation, according to Donald McNeill (2019b, 864), 'the underground, in its various guises, thus becomes a key frontier in Singaporean territorial strategy'. Who will own that territory, however, is not as clear.

The foundation of property under common law was historically enshrined in the Latin phrase *Cuius est solum, eius est usque ad coelum et ad inferos* which roughly translates to: 'Whoever owns the soil, holds title up to the heavens and down to the depths of hell'. This is no longer the case in cities like Singapore; property laws are being revised to allow for the excavation of critical infrastructure under homes with no compensation to property owners. Underground urban land grabs are hard to argue against because there's less of a sense here of something being 'lost' or 'taken', as the land is seen to be unused, awaiting 'activation' through technologies of 3D mapping, selling/authorising, boring, and eventual transfer into private hands. However, in order to 'release' volumetric space for development, what is underground must be known, mapped, and planned. Along with Singapore, Helsinki and Hong Kong are examples of cities that are developing underground masterplans to bolster this market. Mapping the underground has the capacity to open imaginations to those spaces, but this sort of mapping also has a potential to become a neo-colonial method of parcelling out land. It is no coincidence that tightly controlled and regulated cities hold better data in this regard. It is immensely more complicated to do so where private developers are digging and burrowing into cities like London and Los Angeles, often by exploiting loopholes in planning permission.

V. Transportation, Los Angeles

The sociologist Max Weber once described politics as 'a strong and slow boring of hard boards' (Weber 2009). The boring taking place under Los Angeles, however, seems to have bypassed the staid necessities of political expediency. In 2016, billionaire Elon Musk bought a tunnel boring machine and, without legal consent, started carving a path under his *SpaceX* property in Hawthorne, providing proof of concept for a new private transport system for small pods called 'skates' and Tesla automobiles, new private transit tunnels constructed through his 'Boring Company'.

According to the Boring Company's website, tunnelling will take place partly 'beneath public right-of-way'. In other words, since Musk is already invested

in the automotive industry via Tesla, he might just bore a pipeline underneath existing roads. The company's vision reinforces this, suggesting that 'roads must go 3D' and that cities can 'just keep adding levels' as more roads are required. Where New York planner Robert Moses famously quipped while building free-ways that 'in an overbuilt metropolis, you have to hack your way with a meat axe', Musk plans to burrow his way under this problem with a boring machine. As with Singapore, there is a neo-colonial tinge to these arguments, an assumption that subsurface space is an infinite *sub terra nullius*, when in fact the underground is bounded not only by geology but by subterranean sprawl. The framing of the underground as an empty space is a 'political nothingness that allows for underground urban projects to be generally framed in terms of technology and funding, with the physical underground space—prior to construction at least—being epistemologically rendered as a blank slate' (Melo Zurita 2020, 2). The LA City Council, who now seem to be tentatively backing Musk, would be wise to study cities like London, where 150 years of trenching, digging, boring and pouring have caused logistical nightmares in volumetric planning, currently being exacerbated by private excavation of giant basement that simply would not have been financially expedient twenty years ago (Graham 2016).

Imagine, for a moment, the complications of urban planning exploded into 3D (Bridge 2013), where the future extension of a transport line, for instance, requires knowing the location of sewer and water systems, electricity, utility tunnels, bunkers, foundations, basements, cellars, vaults, passageways, archaeological remains, data centres, and of course other transport tunnels. Now imagine the complications involved in navigating the political and legal aspects of tunnelling through or around the subterranean traces. Negotiating the nuances of geology has been complicated enough for urban excavators; introducing subterranean eminent domain may be completely stiling. We should be wielding the lessons learned from surface struggles over space and applying them pre-emptively to our collective infrastructure, which is quickly slipping out of the public domain.

VI. Dwelling, Beijing

Modern technology has a deeply vertical structure. Just as the skyscraper might be considered the architectural form that defined the 20th century, its foil, the geoscraper, a resilient structure built for density, might come to define the twenty first. This is already taking place in Beijing, where over one million people, or 5% of the city's population, live underground in 5000 km of defunct subterranean tunnels and command bunkers from the Cold War (Ming 2017). Inhabitants of these tunnels are called *shuzu*, or the 'Mousetribe'. Kim (2016) suggests seeing 'Beijing's underground cities not as a relic of the Cold War but as a possible precursor for urban living in densely populated Asian cities.'

All over the world, the infrastructures of the 20th century are appropriated informally from below in the context of increasing housing scarcity and economic precarity. State-owned undergrounds in Beijing have become a place of refuge in circumstances where surface infrastructures are failing. Burrowing underground allows for a limitation of external factors and a bolstering of defences, which may become increasingly important in our uncertain futures.

Yet the underground will become living space as well as urban connective tissue. Lewis Mumford once presciently suggested that for anyone who has worked in a cubicle in an office skyscraper, with air conditioning, 24-hour fluorescent lighting, and a paucity of natural light, working a hundred feet below the surface wouldn't be much different (Mumford 1998, 203). Except for this fact: in July 2012, Beijing experienced the heaviest rain and flooding it had seen in six decades. The mouse tribe tunnels were flooded, killing 79 people who were trapped in the quickly filling cavities (Huang and Yi 2015).

As Mathew O'Brien's (2007) work under Las Vegas has shown, these problems are not limited to China. There are hundreds of people living in the city's storm drains at any one time, many of whom are killed by flash flooding every year. Lacking a social safety net, the underland denizens of Las Vegas are being killed because they are being forced to use public infrastructure as housing. Storm drains are meant to channel rare desert storms, that is their original function. Technological success to divert water and protect the surface of the city from flooding creates a space that enhances vulnerability and causes the death of those that the state has abandoned.

VII. Boring futures

As Brett Christophers (2018) writes in his recent book *The New Enclosure*, state ownership of land is condition but not guarantee of democratic control over what is possible. Though our sample of cities is geographically and culturally diverse, we rely on a lingering ideal of public infrastructure as an assemblage of institutions that can embody a public good, where citizenship rather than private wealth assures access. Since cities would become ungovernable and unliveable without subterranean infrastructure, those underground commons must belong equally to an entire community. That idea was never perfectly realised even in capitalist democracies, let alone in authoritarian contexts where state control has never really had such democratic pretensions. The world is also filled with authoritarian undergrounds used to exert power over populations, such as when state-controlled communication is shut down specifically to prevent democratic organisation. We do not seek to uncritically celebrate state ownership and control of sub-terra, but to make clear that putting power over these systems in the hands of corporations can be equally problematic. Urban undergrounds must remain a public provision, not a privilege provided which may be withdrawn. And as our case studies highlight, we are already losing control over many of them, and it is happening without much critical debate.

Many 20th century underground infrastructures, such as the New York subway and London Underground began as private endeavours and were later municipalised. Since the 1980s however, concurrent with the privatisation of street level architectures, governments began privatising vertical space (Graham and Marvin 2001). Will there be another round of this kind of nationalisation when we finally realise what's going on? Or is that idea of state provision going to be a blip, private ownership and splintered urbanism as the default historical-geography of urbanisation? To return to the ominous vision of Bruce Flatt, the CEO of Brookfield Asset Management, he suggests the latter will be the

case. 'We're in the business of owning the backbone of the global economy', he told the *Financial Times*. 'The road you drive on, most people think it's owned by the government. Even if it is a toll road, they wouldn't actually know who owned it' (Evans and Smith 2018).

As Naomi Klein (2001, np) writes, 'neoliberal economics is biased at every level towards centralisation, consolidation, homogenisation. It is a war waged on diversity.' The consequences of privatising the underground seem less pressing than what we see at surface level, but will inevitably come back to bite us, because these are the infrastructures of everyday urban life and, increasingly, the infrastructure of human existence, now that the majority of the world's population lives in cities. Robert Macfarlane (2019, 8) writes that in underland 'the same three tasks recur across cultures and epochs: to shelter what is precious, to yield what is valuable, and to dispose of what is harmful ...'. By allowing volumetric space to be colonised by private forces, even if we had no personal capacity to bore it in the first place, we lose our future rights to shelter, to dispose, and to enjoy, as we already have at street level in many cases. In losing the underground, as well as airspace to corporations and police seeking to carve out air lanes for drones (see Garrett and Anderson 2018), we will be hemmed in on all sides. As privatisation of the city takes place by boring, the city is made boring through privatisation. To take urban politics seriously, scholars must engage with the underground.

As humans continue to burrow deeper into the Earth, now reaching hundreds of metres deep over many layers, it has become clear that 'the extensive, large-scale disruption of underground rock fabrics ... has no analogue in the Earth's 4.6 billion year history' (Zalasiewicz, Waters, and Williams 2014). This focused, intentional anthropurbation is the hallmark volumetric spatiality of the Anthropocene (Melo Zurita, Munro, and Houston 2018); the privatisation of such activity is a continuation of the mentality that created the Anthropocene, which is being brought to a grim crescendo through infrastructure built for profitability over public provision.

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