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An Urban Political Ecology of Concrete

Matthew Gandy

Concrete is integral to the material landscapes of modernity, encompassing roads, tunnels, reservoirs, airports, bridges, tower blocks and almost every other type of physical structure that we might associate with urbanization. Around 80 percent of the "average city" is built from concrete (Dunford 2020). Some 30 billion tonnes of concrete are used every year for construction purposes, with cement manufacturing now responsible for as much as 8 percent of global carbon dioxide emissions.[1] As the architectural theorist Adrian Forty (2012: 11) notes, however, the materiality of concrete has consistently spilled over into other registers of meaning, so that a "cursory inspection of even the most debased lump of concrete rapidly takes us into a fugacious world of beliefs and counter-beliefs, hopes and fears, longings and loathings."

[1] See, for example, Editorial (2021) in *Nature*.

In this essay, I consider how useful the analytical lens of urban political ecology might be in taking us on a critical itinerary through the world of concrete. In broad terms, the urban political ecology literature is concerned with the production of space as a historically contested field of developments, driven in large part by the circulatory dynamics of capital and its intersection with a series of structural inequalities spanning class, gender, race and caste.[2] In comparison with water, though, concrete has received comparatively little attention within the political ecology literature. More often we encounter a metaphorical rendering of concrete through reference to "concrete practices" (Escobar 1996: 341), "concrete solutions" (Radonic and Kelly-Richards 2015: 403), "concrete utopias" (Gómez-Baggethun 2020: 6), or in philosophical terms "a concrete understanding of class and nature" (Ekers 2015: 546). In other contributions the physicality of concrete has been approached, sometimes obliquely, through studies of sand, gravel and other materials, often allied with the analysis of mining, extractive frontiers and wider geopolitical concerns with resource extraction (Myers 1999; Dawson 2021; Lamb and Fung 2022; Miller 2022). Yet as we move closer to the lived experience of urban space, the analytical lens of urban political ecology becomes less certain. The everyday realm of concrete, with its interweaving of cultural, material and affective elements, becomes increasingly elusive as an object of study.

[2] I have suggested elsewhere that the fields of political ecology and urban political ecology are closely related yet not synonymous (Gandy 2022).

Minhocão elevated highway, São Paulo. Entrance from Consolação Avenue.
Photo: Laura Belik, 2016.

Concrete clearly forms part of the political economy of urbanization as a distinctive element in the "secondary circuit of capital" and the speculative dynamics behind the production of urban space (Harvey 1985: 7). The theorization of capital à la Harvey can be supplemented by post-positivist empirical insights such as forensic accountancy. A forensic approach to the study of infrastructure opens up new possibilities for the production of counter-hegemonic knowledge. As the investigative journalist Jonathan Watts (2019) points out, the construction industry is characterized by a scale of bribery

and corruption that dwarfs every other sector, including mining, energy, real estate and the arms industry. Watts highlights the example of the 3.5km-long elevated expressway known as the Minhocão (Portuguese for 'big worm') in São Paulo.[3] Completed under the military dictatorship in 1971, and masterminded by disgraced former mayor Paulo Maluf, this expressway was the largest reinforced concrete project in Latin America, and involved kickbacks on a vast scale that have been traced to a variety of offshore bank accounts in the British Virgin Islands and elsewhere. More recently, public perspectives on this moribund structure have become divided between its complete removal or transformation into a linear park (Belik 2020). Indeed, the conversion of former infrastructure networks into new kinds of public space is now an integral element in landscape design discourse (Acosta 2023).

[3] See also Eli Elinoff's (2017) study of concrete structures in Bangkok.

Concrete as microbiome. The darker patches contain cyanobacteria. Bedford Way, London. Photo: Matthew Gandy, 2021.

Turning to the ecology of concrete itself, the material offers a series of distinct surfaces that form part of the urban biosphere. The formation of microbiomes, for example, constitutes part of the largely unseen or unnoticed dimensions to urban ecology. The presence of algae, bacteria, fungi and other organisms is often only betrayed by blotches, streaks or other visual clues (Gandy 2024). These organisms can also act as sensors for ambient parameters such as levels of air pollution, moisture or temperature gradients. The study of lichens, in particular, connects with the longstanding fascination with the flora of walls, ruins and other kinds of artificial substrates. The presence of microbiomes illustrates a blindspot within the existing urban political ecology literature: namely, a lack of engagement with recent developments in the science of urban ecology, including the significance of epigenetics, the intensified evolutionary dynamics of urban space, and methodological advances in fields such as DNA barcoding. Indeed, attempts to develop an analytical framework that spans the social and biophysical sciences remain much more frequent within the dominant systems-based approaches to urban ecology, despite the limitations of existing models of epistemological unity.

Urban political ecology has a potentially distinct role to play in highlighting the need for more nuanced conceptions of the interface between human and nonhuman forms of agency. Concrete itself can be regarded as a component of "accelerator landscapes" within which the epigenetic and evolutionary dynamics of urban space have been accentuated (Gandy 2023: 3).

Concrete channel section of the Los Angeles River at Glendale Narrows. Photo: Matthew Gandy, 2013.

Concrete represents a decisive contribution to the surface topographies of urban space, making cities warmer than their hinterlands and rendering them more susceptible to flooding. The predominance of concrete in poorer neighbourhoods, often characterized by fewer trees and parks, exacerbates thermal inequities across urban space (Mojaherani et al. 2017; Marks and Connell 2023). The capacity of concrete to retain water also has significant epidemiological implications in terms of providing ideal breeding grounds for insect-vectors for disease, and especially the dangerous *Aedes* genus of mosquitoes that has substituted tree-hole ecologies for the diverse micro-niches available in urban environments. The capacity of concrete to accentuate existing sources of epidemiological risk is often greater in low-income neighbourhoods where poor-quality housing and inadequate infrastructure systems can foster perfect conditions for the rapid spread of dengue, Zika and other health threats. The absence of reliable water supply necessitates the use of multiple means of temporary water storage, whilst lack of drainage infrastructure can allow the proliferation of standing water (Acevedo-Guerrero 2022). Concrete is thus intricately related to the socioecological hybridity of urban space, corporeal vulnerabilities and epidemiological forms of slow violence.

When we consider modes of cultural representation in cinema, literature and other media we can discern the presence of a 'concrete imaginary' evolving in parallel with a variety of ecological imaginaries. Both utopian and dystopian modes of representation can be delineated, in some cases for the same structures. The exuberant Autopia described by architectural critic Reyner Banham (1971) in response to his experience of the Los Angeles freeway system in early 1970s can be contrasted with the eerie disorientations of the David Lynch movie *Mulholland Drive* (2001). Similarly, the concretized channel of the Los Angeles River has served as both a lived space of resistance for working-class Latino communities, as captured in the poetry of Luis J. Rodríguez, as well as a locale for postwar nuclear anxieties such as the threat of giant ants in *Them!* (1954) directed by Gordon Douglas. More recently, these quotidian concrete landscapes have become a focus of contestation between competing ecological imaginaries under the speculative dynamics of capitalist urbanization. The introduction of new kinds of ecological approaches to flood control, for instance, has been accompanied by wider interest in the revalorization of riverside settings (Gandy 2014).

The abandonment of concrete structures forms part of a distinctive scenography of urban ruins, invoking a science fiction ambience with plants sprouting from empty roads or cascades of vegetation that resemble green walls or other aesthetic motifs deployed in ecological design. Concrete features widely in the near future of J.G. Ballard's fiction, for example, taking inspiration from London's then recently completed Westway in *Concrete Island* (1974), modernist housing complexes in *High-Rise* (1975), or the motif of the abandoned swimming pool in *Super-Cannes* (2000) (Gandy 2011). Concrete is also used to depict an absence of nature in dystopian future worlds such as *Blade Runner 2049* directed by Denis Villeneuve (2017), where conventional agriculture has collapsed and the industrialized rearing of insects has become a focal element of food production. Such scenarios suggest the persistence of global capital under post-apocalyptic conditions, so a key objective for urban political ecology as an idiom of cultural critique must surely be the delineation of alternative future imaginaries. In this vein, feminist science fiction literature exemplified by writers such as Octavia E. Butler and Ursula K. Le Guin, has consistently challenged the ideological perpetuation of structural inequalities that are pervasive within what we might term mainstream speculative fiction.

Concrete illustrates a series of problems and possibilities for a revivified field of urban political ecology that can extend to a wider variety of cultural and scientific developments, ranging from future ecological imaginaries to the epigenetic characteristics of urban environments. The exposed surfaces of concrete provide numerous insights into the complexities of the urban biosphere as well as meteorological and epidemiological challenges for future cities. The weathering of concrete intersects with the temporalities of capital to produce distinctive ecologies of decay and abandonment. Equally, the presence of concrete within a variety of imaginary landscapes offers a powerful motif for making and remaking urban worlds, both utopian and dystopian. Concrete has simultaneously suffused the promise of modernity and also exposed its multiple interstices and contradictions.

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