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– PLANET AT THE END OF THE CITY: How Climate Changes the Nature of Urban Theory

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Abstract

Is the city good or bad for climate? You would think we would know. Stories abound in newspaper op-eds, policymaker commentaries and climate reports about the presumed environmental benefits of cities. For critical urban theorists the goodness and greenness of the city is not always so evident, but so far critical urban theory seems unable to shift the emerging consensus about the state of the city at the possible end of the planet. I examine urban theory in a space and time of planetary boundaries. Bringing critical urban theory into dialog with ideas from ecological economics and land change science about urbanization and a not-boundless planet, I show that foundational ideas about cities have been externalizing, not only as processes but also as concepts. Paying closer attention to the nature of socionatural change and critical urban theorists' own theoretical precepts, I probe the limitations and possibilities of particular urban theoretical frameworks to take on problems of planetary nature. I end with a proposition for a meshwork of urban frameworks—interfaces between urban frameworks and other ways of seeing processes of planetary significance—and a view on the political stakes of a better way to see city and planet.

Introduction: on city and climate

Is the city good for climate? Or is the city bad for climate?

You would think we would know. Stories abound about the presumed environmental benefits of cities; we see these in the op-ed pages of major newspapers where prominent economists extol the virtues of denser urban development, in commentaries by influential policymakers such as those convened in the US-based Climate Mayors network, in the framework of UN Habitat's New Urban Agenda, which envisions the sustainable and equitable future of cities, and in IPCC reports noting that higher rates of urbanization might mean increasing greenhouse gas emissions but they also have the potential to increase efficiency and decarbonize at scale.

However, for critical urban theorists the goodness and greenness of the city is not always so evident. We have been the ones to sound the alarm about the uneven social and environmental outcomes of urbanization. We see how climate actions harm marginalized urban residents and reinscribe patterns of inequality. We see the extended impacts of urbanization beyond the city. And yet, so far critical urban theory has not intervened in the climate change debates in ways that might shift, complicate or enrich the emerging consensus about the state of the city at the possible end of the planet. How might we rethink city and planet to change this?

In this article I examine urban theory in a space and time of planetary boundaries. I not only ask how critical urban theory might respond to rampant invocations of good and green cities; I also take this opportunity to explore, on a more theoretical level, a critical question: How do we think of the city with respect to the planet in this time of global environmental change? This involves a framing and reframing of the sociospatial

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processes and conceptual viewpoints of urban theory, in order to understand how processes of planetary change might be entangled with—or possibly exist outside of—particular urban political economic frameworks. In the more practical realm, it also enables us to consider how more theoretically grounded explanations of urbanization and climate change might have a greater impact in popular discourse, policymaking and political activism.

Overall, I will trace the following arc of an argument. First, the framing of urbanization has always been externalizing, determining what is inside and what is outside the city in both process and concept. We see this if we look both backwards and forward to key moments in urban theory. Second, the theoretical developments and debates in recent decades have been efforts to account for this externalizing in one way or another; planetary urbanization, postcolonial and feminist urban theory, urban political ecology and disease landscapes all address this issue in their way. However, in viewing the externalizing from within a viewpoint of the urban, they stand to replicate it, or otherwise ignore or neglect it. Third, taking concepts of socionatural change seriously and bringing nature back in offers critical urban theory a renewed engagement with the problems of the planet, and a reflexive, delimited and open approach to the urban and planetary—a 'meshwork' of frameworks. Fourth, the political stakes of seeing city and planet differently include significant questions of scientific knowledge production and policymaking, as well as social movement building for more climate-just futures.

Urbanizing the planetary boundaries

Climate change is understood to be a matter of the planet. Key metrics such as the concentration of atmospheric carbon dioxide, while measured in particular locations, are understood and represented on the scale of the planet.[1] Scholarly and public scientific commentaries about a possible sustainable future highlight the ways in which human activities are testing the biophysical and biological limits of the planet (Foley, 2017; Hickel, 2019; Folke *et al*., 2021). Climate and earth scientists, considering the anthropogenic pressures on planetary-scale systems, propose the concept of 'planetary boundaries' to denote safe operating spaces across nine categories. These include: climate change, change in biosphere integrity, stratospheric ozone depletion, ocean acidification, biogeochemical flows, land-system change, freshwater use, atmospheric aerosol loading, and introduction of novel entities (Steffen *et al*., 2015; see also Rockström *et al*., 2009).

At the heart of the matter is the recognition that the planet is not boundless. We may not yet know its absolute limits, but as a collective, humans on the planet are conducting life in a way that is pushing at its boundaries.

How, then, do we understand the place of the city in the space of the planet?

Mainstream and scholarly accounts are not always helpful. Oft-quoted statements about this or that percentage of the world's population living in cities are dubious on both conceptual and empirical grounds.[2] Further, going by various studies of physical land use change, only about 2% or less of the earth's land is categorized by researchers as urban or 'built-up'.[3] In those terms, the city seems to matter rather little—and yet the prevalent discourse in most urban policy spheres suggests that cities are clearly considered to be important for the planetary-scale problem of climate change.[4]

1 See, for example, publications by NASA and NOAA describing the measurement of atmospheric carbon dioxide at NOAA's observatory in Mauna Loa, Hawai'i, and explaining how rising levels of CO_2 cause warming on the planet: https://climate.nasa.gov/vital-signs/carbon-dioxide.

2 See, for example, the United Nations Population Division data on rates of urbanization for standard counts of urban population at https://population.un.org/wup/, and Neil Brenner and Christian Schmid's critique of the so-called 'urban age' discourse (2014).

3 See, for example, the Global Rural-Urban Mapping Project (GRUMP) or information in Our World in Data at https://ourworldindata.org/how-urban-is-the-world/.

4 There is an extensive literature on cities and climate change that I look to and engage with in my research, although I will not be addressing this in detail here. See Goh (2020) for a brief overview.

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To understand the issues better, we might first consider three ways to view urbanization and the not-boundless planet. These are not exhaustive, but rather points of view that highlight distinctive intellectual approaches to the problem. The first comes from ecological economics. For William Rees and Matthis Wackernagel (1996), cities as such cannot be sustainable. Making the argument—then more novel—that the human economy is embedded in the planetary ecosystem, these authors bring the language and concepts of ecology and thermodynamics to bear on economics in order to analyze human 'industrial metabolism' and its impacts on 'natural capital stocks'. Building on ideas about natural capital (Costanza and Daly, 1992) and their own work on ecological footprints (Rees, 1992; Rees and Wackernagel, 1994), they explain how such an ecological footprint concept, when applied to the commonly understood political-administrative unit of cities, shows how cities are 'entropic black holes', necessarily consuming resources beyond their boundaries and reliant on an increasingly global hinterland. Cities are responsible for ecological footprints often several hundred times larger than the area of the city itself—on the face of it complicating, if not refuting, the idea of the city as good for climate.[5]

Rees and Wackernagel use their analysis to suggest that humankind is indeed at the point of what Herman Daly called 'full world economics' (1992), when economic 'externalities', often unaccounted-for transformations of so-called natural resources, can no longer be ignored. Rees and Wackernagel not only make an argument about the inherent unsustainability of cities, but, more broadly, indict the role of urbanization in globalized economic exchange when seen in the context of flows of nature. They stress how it perpetuates the persistent ecological imbalances between the global North and South from colonial times to the present, which Juan Martínez-Alier (1997) and others have more pointedly referred to as 'ecological debt'. However, the authors are not quite ready to abandon cities entirely; they also point to the leverage of population concentration, particularly around economies of scale, the possibilities of institutionalized changes and governmental interventions in industries and societies, and the benefits of exploiting linkages in complex urban systems toward less fossil fuel reliant modes of development.

The second view comes from land change science, often based on remote-sensed data collection and the analysis of biophysical changes of the Earth's surface. Here, Karen Seto and colleagues' ongoing research shows the continuing and accelerating impact of urbanization on the planet. Consider, for example, Gurney *et al.*'s (2022) analysis of greenhouse gas emissions from global cities projected through to 2100, which details the highly variable CO_2 emissions from cities across and within diverse sites and developmental contexts. Bren d'Amour *et al.* (2017) examine how urban expansion is causing prime global cropland loss and increasing the exposure of remaining cropland to climate hazards. And Huang *et al.* (2019) show how warming from urban heat island intensification will be equivalent to, or in some cases greater than, that caused by GHG emissions.

Broadly, the research by Seto and her colleagues explains the ways in which urbanization accelerates and intensifies planetary-scale problems, often beyond the physical land change itself (see also Seto *et al.*, 2017; Seto and Pandey, 2019). Urbanization, Seto has noted, needs to be understood as an issue of global environmental change in a way that it simply isn't today. Is the city good or bad for the climate, then? For these authors, it depends![6] In many of their studies these authors implore governments and

5 This is in some ways in contradiction to myriad claims that per capita emissions in denser cities tend to be lower (see e. g. Dodman, 2009), but broadly in alignment with studies of consumption-based household carbon footprints which point to more complex relationships between density, income and emissions (see e.g. Jones and Kammen, 2014).

6 From a talk at the UCLA Department of Urban Planning, May 5, 2022.

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policymakers to demand more accountability in various sectors of urban policymaking, planning and the governance of urbanization in order to mitigate cities' direct and indirect effects on climate change. Again, however, this is not a call to turn away from cities, but rather to understand their greater significance—and to change them.

These two viewpoints and sets of findings are consistent with a broadly-held position among those who study cities and climate change: cities are both a major cause of climate change and a necessary part of the solution (see e.g. Rosenzweig *et al*., 2010). It seems especially clear for those after Rees, and for Seto and colleagues, that it is the *broader and extended impacts of urbanization* that are concerning and which demand attention. This understanding of the broader effects of the city across spatial scales is an aspect that is crucially missing from prevalent policy discourses. However, what is it about cities per se that tends to produce these extended impacts? These findings and discussions often do not interrogate the object of the city itself—in other words, the process of urbanization.

The third view of the city and the planet is an urban political economy approach drawn from critical urban theory. Here, Neil Brenner, Christian Schmid and colleagues question the object of the urban and its extents in the context of globalized capitalist urbanization. For them, the new scales, articulations and intensities of urbanization in this historical period demand a rethinking of urban theory (see Brenner, 2013a; 2013b; Brenner and Schmid, 2014; 2015). Building on Henri Lefebvre's ideas about a planetary urban society, they argue that urbanization needs to be understood as a planetary process. They conceptualize three mutually constitutive moments of urbanization: concentrated urbanization (the agglomeration of built form commonly recognized as cities), extended urbanization (the 'operational landscapes' that often extend far beyond areas of population concentration and which are necessary for the agglomeration process), and differential urbanization (the ongoing capitalist 'creative destruction' of configurations of society and space) (Brenner and Schmid, 2015). A key claim here relates to the operational landscapes of extended urbanization—how globalized, capitalist urbanization has become generalized, transforming not only the agglomerations but also operationalizing the erstwhile hinterlands to support agglomeration processes and urban ways of life. This involves the construction of fixed infrastructures of transportation or communication and the enclosure of land and resources, including in spaces across the planet that are relatively unpopulated such as alpine regions, rainforests, deserts, polar regions and oceans.

The theorizing of planetary urbanization serves two key purposes: an elaboration of urban theory to conceptualize the expanded scales and scopes of urbanization in this period; and a critique of unquestioned invocations of the city as a kind of shorthand for what we think we know about it, either as a bounded place or a particular spatial form. This argument has opened a range of spirited debates and lines of inquiry in the field, serving as a critical body of thinking about how the urban must be understood in relationship to the planetary.

These are quite different points of view, underpinned by sometimes irreconcilable theoretical frameworks. However, each is an effort to account for what is generally considered *external* to the urban—whether related to energy and material flows, biophysical impacts, or implicated political economic processes—on a planetary scale. In a more economic sense, the notion of attempting to account for externalities may be easily understood. In our sense here, however, the emphasis is related, but different. It is as much about externalizing concepts as it is about externalized impacts.

Externalizing ideas of the city

Ideas of the city have always been externalizing. By externalizing I mean that knowingly or not, ideas are formulated by relegating or otherwise assigning spaces and processes that are not considered analytically relevant parts of the city external to

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the model of the city. These ideas are focused on what counts, and invariably dismiss what does not. The theorizing of cities has been a conceptually exclusionary act, a selective epistemological determination. We make outsides by thinking cities, with such externalizing apparent around urban sociospatial processes that are neglected or ignored (for example, the operational landscapes theorized by Brenner and Schmid), and also around particular conceptualizations and histories.

In 'Defining the Urban' (1984) Andrew Sayer attempts to reconcile what he recognizes as multiple possible definitions of the urban, between the *objective* and the *expressive*. He asks us, as urban researchers, to think about our concepts. With regard to the question at hand, we cannot simply point at something and say, 'That's a city'. According to Sayer (1984: 280, italics in original), 'the world can only be known under particular descriptions and by means of concepts. We therefore need to be told *how* to look at and think about the object being pointed at, which aspects to ignore and which to consider, and what other objects it is *like*'. *Which aspects to ignore and which to consider* ... Identifying or making assumptions about these are fundamental to the task of theorizing the city.

I will offer two classic illustrations from economic geography and urban sociology to explain how this externalizing plays out. Much formative urban thinking goes like this:[7] the city is as it is because of economic or social forces that extend outwards, in the classic example of a city and its hinterland. In economic terms, these ideas find a basis in Johann Heinrich von Thünen's *The Isolated State* ([1826] 1966; see Clark, 1967; Sinclair, 1967), an idealized economic geographical model of a central city and its agricultural hinterland. In this model the spatial arrangement of city and outlying land is conditioned by land rents and transport costs. Different types of land use, such as intensive farming, dairy production, firewood, extensive grain farming and ranching, are arranged according to perishability and weight of the respective resources. For von Thünen, a central city is imagined in order to formulate cost and distance relationships around it. Here, make a city—a center—in order to describe the ex-city landscape. From the point of view of formulating the urban, this is about theorizing the presumptive outside. The thesis offers an effective way to understand how and what might be left out in order to make sense of a city. For urban economists who follow, either directly or indirectly, the propositions about space and cost, a formative notion of a monocentric city goes essentially like this: the city is a function of necessary, extended spatial and environmental relationships.

This notion exhibits externalizing in two ways. First, there are the more typically understood economic externalities (which researchers like Rees and Wackernagel attempt to account for). Second, the theorizing is from the point of view of the city and how its necessary resource landscape might arrange itself. The ideals of the von Thünen model, or debates about or permutations thereof, are all clearly in place in economic geography and urban economics (see e.g. Fujita *et al*., 1999; Fujita, 2020), and, rather less explicitly, in urban studies broadly. A key question here is whether the 'outside' of the city is considered in constitutive ways or not—that is, whether and how the outside matters analytically in inquiries about the city. Von Thünen considers what is outside the city constitutively; indeed, it is a primary focus. However, Brenner and Katsikis (2023: 110) assert that much urban scholarship has not done this, leading to a kind of 'black box' hinterland.[8] While not all urban thinking refers back to von Thünen's model, much of it

7 By 'urban thinking' I mean the lineage of urban social scientific scholarship of the last 125 years or so in Euro-American institutional contexts, published in or translated into English—from the development of urban sociology in the early twentieth century, through the development of critical urban theory in the later part of the century, up to the recent discourse around planetary urbanization, postcolonial urban theory, urban political ecology and so on.

8 This is one of the key propositions of planetary urbanization theory, as formulated by Brenner and Schmid, illustrating how such un-considered hinterlands now bear the brunt of capitalist urbanization's externalized impacts.

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relies on an assumption of spaces of centrality formed by the concentration of activity as an externalizing force.

From a more sociological perspective we can look to the Chicago School of Human Ecology, whose ideas about 'natural' urban change took cues from ecological science, in particular processes of ecological succession, and represented an early form of urban metabolism. Ernest Burgess' (1925) concentric zone model is an especially vivid representation of these ideas. Looking at sociocultural patterns in Chicago at the turn of the twentieth century, Burgess attempts to theorize urban expansion as a process. He denotes concentric zones emanating from the central business 'loop' through a transitional zone, and then through different residential zones. In search of a 'natural' spatial pattern of the growth of the city, especially in relationship to immigration and race, Burgess and colleagues explain how neighborhoods are formed through organization and disorganization into 'natural economic and cultural groupings' (1925: 56).

For the Chicago School, even though its urban model makes a direct analogy to ecological science, biophysical *nature* as such does not seem to matter. Nature is externalized in this 'ecological' model of churning sociocultural relationships (Angelo and Greenberg, 2023). So, for that matter, are political economies and the broader racial histories and power relationships of a country experiencing the start of the Great Migration.[9] This is less static than a model determined by economic rationalizing, but again it is a theory of an externalizing city, here in a dynamic, expansionist mode, always spilling over. The Chicago School's urban model has informed and infused many sociologically-inclined visions and theories of the city, as well as everyday discourse about it, including among those who may blanch at the framework's racialized and ethno-deterministic beginnings.

So, in many ways the conceptualization of urban space is an organization of externalities, involving the spatial and conceptual delineation of what is not the city, what is external to it. The thinking of a city makes an outside.

In terms of spatial externalizing, successive iterations of urban thinking have attempted to deal with this tendency. From Patrick Geddes' (1915) *conurbation* to describe the spilling over of urbanization processes and account for the explosive and expansive characteristic of the urban, we can look to Brian Berry's concept of a *system of cities* (1964), John Friedmann and John Miller's idea about the *urban field* (1965), Jean Gottmann's notion of a *megalopolis* (Gottman and Harper, 1990), Terry McGee's Southeast Asian *desakota* (1991), and the various wranglings with polycentric and globally networked urban regions at the turn of the twenty-first century. These are all attempts to include more, either conceptually or territorially, into an urban realm.[10] In terms of conceptual externalizing, one might look at the various critiques of understanding spatial relationships based on economic behavior, or deterministic social relations absent political economy. Formative concepts behind our understanding of the city, such as Manuel Castells' 'urban question' (1977) and David Harvey's 'urbanization of capital' (1985), probe the political salience of the urban and its internal contradictions.

This is not to say that conceptual determinations of the urban are unnecessary or to be avoided. After all, such abstractions help us to understand what it is we are looking at. However, we do need to understand how and from what point of view such determinations are made. Externalizing in urban studies can be understood both as sociospatial process and as concept. As I will elaborate, defining urban operations is an externalizing process that makes spaces outside, while thinking urban is an externalizing

9 However, see how nature *is* brought into the visions of the US urban professions in the decades following the early studies by the Chicago School in Jennifer Light's *The Nature of Cities* (2009).

10 For transparency, many of these examples were initially introduced to me during discussions with Neil Brenner in relation to the problems of theorizing planetary urbanization.

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process of building concepts (often from the viewpoint of the urban) without necessarily accounting for what cannot be known through our theoretical frameworks. We see the consequences of this in the discourse in urban studies about how to deal with our biggest contemporary problems.

The externalizing/internalizing urban

Read in this light, against the backdrop of a century of simultaneously externalizing and expanding urban thinking, ideas about a 'planetary' urbanization should not be misunderstood as a determination of who or what counts and why. Instead, they should be seen as an effort to take on the limited, ill-formed or contradictory conceptualizing engendered by urban theorizing's externalizing tendencies. In some ways, Brenner and Schmid's work may have complicated, if not exacerbated, the problem by pushing the notions of urban extension to the point where there is little space to see what's still out there.[11]

These probes into the boundaries of urban theory are evident today. In an instructive Covid-19-era exchange, Neil Brenner and Swarnabh Ghosh (2022) explore the geographies of emergent infectious diseases and pose a collegial critique of the related work of Roger Keil, Harris Ali and Creighton Connolly (two of whom, Ali and Keil, have been working on this topic since the SARS outbreak in 2003) (see e.g. Keil *et al*. 2020; Connolly *et al*., 2021). Brenner and Ghosh push back and elaborate on this issue by outlining a different understanding of extended urbanization, focusing on the other group's neglect of the broader production landscapes of globalized food production, in particular the global industrial feedlot matrix involved in disease transmission. In doing so, Brenner and Ghosh (2022: 878) critique the 'conceptual externalizations' of the latter authors. Instead, they assert these processes need to be understood as 'essential expressions' of the urban processes in question here (*ibid*: 877).

As these investigations and debates go on, it is hard not to wonder about the 'final' externalities of an urbanizing planet. Indeed, the conclusion drawn by Swarnabh Ghosh and Ayan Meer (2021) in their work on the co-constitution of urban and agrarian change, about the untenability of urban theory to have an 'inside' at all, points to the space that urban theorizing has reached. The situation is either unnerving or exciting, depending on where and who you are.

Read broadly in this light, one might consider other interventions and new avenues in urban theory as efforts to understand, account for and critique the externalizing of prior or other theorizing.

With regard to 'nature', scholars of urban political ecology (UPE) assert that cities have to be understood as contests over the metabolic, *socioecological* production of urban space. Critiquing both the lack of environmental thinking in urban studies (including the 'denatured' Chicago School) and the lack of a strong political-economic framework in environmental studies, UPE scholars emphasize the political, always conflicted and power-ridden nature of intertwined urban social and ecological change (Heynen *et al*., 2006). The work in and around UPE and the contested nature of urban change has driven important understandings of issues such as green gentrification and climate apartheid. This research not only brings nature back into political studies of the city, it also often traces urbanized socionatures beyond the city; see, for example, Matthew Gandy's (2002) historical and spatial investigation of New York City's water, and also, more pointedly, Hillary Angelo and David Wachsmuth's (2015)

11 'Urban theory without an outside' wrote Brenner (2013b), a description that might be read as a challenge to search for and hold up everything outside (see also Brenner, 2018). For a roundup and some analysis of urban theory and the planetary, see Angelo and Goh (2021), and for an earlier theoretical explication of urban theory debates and climate change, see Goh (2020).

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critique of 'methodological cityism' and their call for UPE researchers to go beyond the acknowledged spaces of the city.

We might also consider urban thinking that plumbs different histories of empire, state and city, and different embodiments. Ananya Roy (2016), critiquing the continued universalizing of dominant strands of theory, stresses alternate sites, alternate lineages of thinking and alternate histories of development, as well as the power relationships embedded in each of these. This is a plea for scholars to take seriously the notion of the urban as a historical process that has been both unevenly produced and unevenly understood. Roy brings *in* processes, histories and bodies, not simply to be inclusive but to articulate a different urban theory. I think of the vibrant study of climate colonialism as a particular way to unearth and re-entangle the externalizing on multiple conceptual areas and levels (see e.g. Sultana, 2022). Even if the climate colonialism discourse so far has not been explicitly about the urban, it should matter to us as urban theorists, since urbanization and its impacts on global environmental change have been intimately tied to colonialism.

Of note also in this discussion is the emerging and expanding effort to recenter indigenous thinking into analyses and understandings of urbanization. See, for example, a special interventions issue in *IJURR* on indigenous urbanisms (Blatman and Mays, 2023), including contributions from scholars such as Naama Blatman, Kyle T. Mays, Heather Dorries, Areej Sabbagh-Khoury, Tomonori Sugimoto, and Rebecca Kindle and colleagues. This is notable because in theorizing indigenous life in urban settler colonies, these scholars are exploring and recounting ways of life that have typically been considered not only external but even antithetical to urban life. These are different—not to say new—views of the urban from within the city.

I also see efforts, including those by urban theorists, to tangle with the broader discourse around the planetary or planetarity, as provoked by Gayatri Spivak (2003; 2012), Dipesh Chakrabarty (2009; 2021) and Achille Mbembe (see Bangstad and Nilsen, 2019), as efforts to shift and dislocate an urban focus in the context of planetary exigencies that are not always climate-related in topic (see e.g. Sheppard *et al*., 2013; Leitner and Sheppard, 2016; Jazeel, 2018; Loftus, 2018; Myers, 2020; Reddy, 2021).

This is not to resign my analysis here to an undifferentiated or equalizing embrace of approaches or positions among various theories. I do not wish to flatten, deny or ignore serious differences in theoretical positions among these scholars, particularly in the debates around planetary urbanization (which I have written about elsewhere; see Angelo and Goh, 2021). Neither do I wish to deprioritize the salience of analyses of large-scale political economic change, or cede any ground on the necessity of conceptual abstraction. My own thinking and approach very much builds on these, and as I've argued before, embodied, positional struggles and planetary urbanization processes are invariably intertwined in this moment of climate change (Goh, 2020).

Rather, I wish to draw another line of possibility to understand the points of view underlying the differences. For me, the wrong way to see the provocations of theories of extended, alternate, different or other urbanizations is as further attempts to formulate the urban from within—that is, to think a city (however processual) and thereby construct its outside. Another, better way to understand these provocations is as invitations to dislocate the practices of urban understanding from within an outside-making urban thinking.

The problem of nature on a planet made urban

One might ask, then, about the extent to which efforts to take on this externalizing, to question urban theory's boundedness, and to search out and include that which that have deliberately or inadvertently been made external, have been able to make urban theory more capable of dealing with the planetary boundaries we confront today.

In a special issue of *Ambio* (see Boonstra, 2021), scientists who have played key roles in conceptualizing planetary boundaries, coupled human and natural systems, and the Anthropocene came together to reflect on the state of the science about, and

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respond to, a problem broadly construed as *humans overwhelming nature*. It is striking how often scientists who are comfortable with their craft hit a wall of sorts when it comes to understanding the context for actions and solutions. In relation to this, Karen O'Brien (2021: 1795, italics in original) noted that what remains to be addressed is '*how* deliberate transformations to sustainability come about, particularly how transformations in perceptions, meaning making, and relationships with nature actually can and do shift, and how such changes play out in the political sphere'. It is also striking how rarely the urban makes it into these discussions of humans, nature and planet at a meaningful level.

So, returning to the problem of planetary boundaries and externalizing urban thinking, what do we do about the problem of nature in a world made urban?

As I hope will be clear by now, *urban* is not only a place, or even only a process. It is a mode of thinking and knowledge making. However, there are so many problems with this in the present moment. How do we see 'outside' the urban, when we're mostly all 'in' the urban? (That is to say, how do we see the externalities when we're inside the system?) I would speculate that most of those who don't ostensibly study the urban are nevertheless largely studying *from the point of view* of the urban. That is, we are embedded in urban political economic and sociospatial processes. Even concepts such as the production of nature (Smith, 1984), which is a powerful way to think about how political economic systems are intertwined with socionatural change, don't necessarily place us outside the worldmaking and externalizing processes of urban thinking. There continues to be an uneasy relationship between theories of the urban and the predicament of the planet. This has not been missed by theorists like Gandy (2022a), who has called for more attention to the *ecology* in urban political ecology, and for more precise engagements with the natural sciences.

On a more practical and everyday level, there is the matter of a nature that resists urban theorizing in meaningful terms. Maybe this is too plainly put; going back to Sayer and how meaning is made, it is challenging to claim that nature is urbanized, or produced through urban processes, when the expressive definition of nature is not really urban to most people. Furthermore, at a more intertwined political and conceptual level, there is also the problem of the nature of planetary boundaries—how struggles for all kinds of nature still figure in considerations around climate knowledge and action across all spatial scales, among both scientists and activists.

It is constructive here to keep in view ideas about the planetary that are outside the lens of North-to-South globalized capitalist urbanization. For example, I see Chakrabarty (2009; 2021) development of ideas about the planet as very much informed by his longtime thinking about the postcolonial, such as the notion of a globe constructed by European imperialism and the creation of a world market (2018). The call to keep the globe (of social domination and world markets) and the planet (of earth system science and more) in view together attests to this view and approach. Another is Spivak's notion of planetarity, which I see as existing alongside Chakrabarty (2009; 2021) planet, although they are not the same. For Spivak (2003; 2012), the planet is an 'alterity'—an other to the global. Rather than hinting at a kind of planetary knowledge, however, it is more about unknowing and the unknowable. As in Mbembe's insistence that decolonization is necessarily about the planetary (see Bangstad and Nilsen, 2019), these are roads to the planetary by other means.

It is between this *knowing and unknowing* that I think we must proceed. Such a stance will help us be more reflexive about questions of nature.

Taking the foundational theorizing of urban political ecology seriously—for example, Swyngedouw (1996) on the historical-geographical production of socionature—and paying attention to Gandy's (2022a) recent call, the *nature* of socionatural change might be more precise. What, then, is the nature of the planet, especially in relation to the urban? The answers are diverse, variegated, almost all-encompassing. They range

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from the concentration of greenhouse gases in the atmosphere (possibly the most immediate climate change planetary nature) that is at least partly related to accelerating urbanization, to the warming and rising of the oceans and their effects on global and local ecosystems (a matter that traverses scales from changing ocean currents to the variably soaking edges of settlements), the burgeoning recognition of the 'rights of nature',[12] to evolving encounters between species including those between humans and big cats (see Mathur, 2021) and, as already noted, humans and viral pathogens.

I embrace the aforementioned unknowing in order to speculate that there are natures that are not known, and maybe cannot be known, through *particular* urban frameworks. In a previous work I suggested that looking at issues of urbanization and climate change from the point of view of global climate justice brings together the struggles of a capital-oriented and class-focused anti-globalization movement with those of the community- and identity-oriented, place-based, embodied, positional environmental justice movement (Goh, 2020). In a parallel and refracted manner, I would like now to take that argument further by observing that looking at urbanization and planetary crises with a renewed engagement with nature invites us to consider more carefully the differences and varieties of natures of the globalized urban sphere, and of human- or other-than-human-embodied experiences across scales.

This does not mean that nature is 'outside' society, or somehow 'untouched'. Instead, it means that there might remain natures that elude particular, historically specific urban political economic frameworks, including that of the present historical moment. For a while now the study of what might be termed 'critical urbanized nature' has been building on a notion of capitalist expansion—the idea that 'capital stalks the earth' (Smith, quoting Marx, 1984)—and envisioning the production of the city through socionatural transformation (Heynen *et al*., 2006). This has been immensely fruitful. The appropriation of nature on a world scale meant something in a particular period of globalized capitalism. Now, in a period of climate crisis and planetary boundaries, it is useful to consider how socionatures might be changing in specific ways across scales, and how, where and why that might intertwine with urban processes—not only enclosing and producing nature, but also possibly changing once-stable relationships, however crisis-ridden, between extraction and accumulation. We invoke the specter of green capitalism fairly loosely sometimes, but do we really understand the nature of something like a carbon-neutral or carbon-negative capitalist urbanization? This is not to disavow capitalist urbanization frameworks or deny structuralism, especially when capitalist urbanization is so central to the problem of climate. Rather, it involves taking our own theoretical precepts seriously, and thinking of more reflexive, relational, delimited and open frameworks.

For urban theorists, this invites both modesty and ambition. We must learn from and with the various scales of planetary science (not only the one planetary-scale Earth system), and learn from multiscalar engagements in all the planetary spaces, especially from those for whom an urban viewpoint and framework is not necessarily the prevailing one.

A meshwork of urban frameworks

We need, in effect, a meshwork of frameworks, open and interlaced, with particular attention to interfaces between urban frameworks and other ways of seeing that may elucidate processes of planetary significance that are entangled with, or possibly outside of, specific political economic frameworks. This is not necessarily with the hope to keep on internalizing more and more, but rather to take account of possible outsides or unknowns. Further, aligned with the emancipatory political theories of

12 See the Global Alliance for the Rights of Nature, https://www.garn.org/.

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urban nature such as those espoused by urban political ecology scholars, we need to understand the more or less just outcomes associated with particular configurations of socioecological regimes within the meshwork.

Such a meshwork would not imply that particular examples of critical urban research reside only as a part of one or another framework—although it would be fair to assume that much research will dwell or focus within one or other framework. Rather, I suggest that it is the meshwork itself that is critical if we are to grasp the extents of knowledge possibilities and boundaries. In other words, it is not a survey of subfields of urban research relevant to planetary climate change, but a proposed open mesh of mutually constitutive frameworks that 'see' different aspects of the problem.[13]

Here is one set of frameworks, by no means comprehensive, that seems to me especially pertinent for urban research:

- Theoretical frameworks that, broadly, move relationally between scales of urbanization and scales of planetary change without being 'one-to-one'. These might include, for example, the links between particular processes of urbanization and subglobal level boundaries, potentially a useful realm to understand urban socionatural processes in relation to concepts in Earth system science (see e.g. Steffen *et al.*, 2015). Concepts might account for slippages and gaps, as well as incommensurabilities.
- Frameworks to denote particular scalar sociospatial and socioecological relationships, such as the urbanized watershed in this specific period of globalized capitalism and global climate change. Consider, for example, the watershed not as a biophysical unit, but rather as a socioecological and spatial process (not so unusual; see e.g. Cohen, 2012)—places with multiscalar intersections within broader, global socioecological processes; Massey ([1991] 1994) socioecologized.
- Frameworks to show how urban political economic processes spatialize across various scales. This is at least in part the work of planetary urbanization theorizing. Expanding on Brenner and Schmid's theoretical formulations, researchers have investigated a range of particular spaces, processes and material flows in relation to extended urbanization (see e.g. Schmid and Topalović, 2023).
- Frameworks encompassing the kinds of other-than-human urban natures—maybe more nature-society than society-nature here—that thrive or 'find a way' amid intense urban processes (see e.g. what Gandy calls 'the ecological dynamics of urban space itself' (2022b, 13) and 'urban nature itself' (2022b, 30)), which may reflect changes on a planetary scale. Where and how does a more expressive nature matter?
- Frameworks of how particular transformations of urban natures reflect the historical worldviews of dominant urban development processes, including the relational developments of colonial cores and peripheries. Here, a broad scholarship of colonized nature (see e.g. Adams and Mulligan, 2003) might be drawn into deliberate conversation with processes of global urbanization and environmental change (see Obeng-Odoom, 2021, which hints at this without engaging with urban studies directly).

13 Thanks are due to the reviewer who pointed out potential parallels between this idea of a meshwork and ideas of epistemic pluralism and critical realist 'open systems' (Sayer, 1981). I spent some time thinking about this. I consider this meshwork to be a development from a particular lineage and position of critical urban theory, and less immediately plural than epistemic pluralist approaches might suggest. Furthermore, while I'm compelled by the notion of the meshwork as an open system of a sort, the phenomena it is framed to explain are not necessarily about abstraction and contingent relations, as addressed by Sayer's work.

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- Frameworks to show how struggles for lives and livelihoods, often in the face of socioecological transformation, might be struggles against urbanized nature and for other, different natures—not as exceptions in a framework, but more as co-generative of theory and future visions. For example, I think of the struggles for place, social relationships and economic networks among informal settlement residents, which often seem quite separate from the broader discourses around climate change but which nevertheless constitute claims for different kinds of socionatural relationships (see Goh, 2021).
- Finally, frameworks showing how analyses of struggles over places and environments that may lie quite far from the planetary are still part of transformations of society and nature of planetary significance. This includes work by researchers who have plumbed the complexities and the power of embodied, positional approaches to socioecological change, but have not as yet examined the broader, climate-relevant, planetary significance of such understanding (see e.g. Heynen and Ybarra, 2021 on abolition ecologies).

In line with the prior discussion of process and concepts, the meshes here constitute frameworks that primarily involve sociospatial processes, those that primarily involve conceptual viewpoints, and those that implicate both. Future theorizing might investigate the various sociospatial processes, spatial scales and particular territories involved, intersections, overlaps and relationships among frameworks, and the conceptualizing and categorizing of the interfaces, particularly with ostensibly non-urban fields or modes of knowledge.

The politics of planetary urban nature

I started writing this lecture thinking it would be titled 'the city at the end of the planet'. However, as I wrote and thought, the title turned into 'the planet at the end of the city'. This has a double meaning; it's about the planet at the boundaries of an increasingly expansive city, or it's about the planet at the conclusion of what we might call the city. I think it's both. The double meaning and the quandary raised very much reflects the conflicted state of the city in these times of planetary boundaries.

The stakes are political; this externalizing idea of the city is why we see careless invocations of cities as good and green in everyday life. This is not a trivial matter, since it feeds back into important policymaking spheres at scales from the local to the global. This externalizing is also why we see increasingly complex and sophisticated conceptual articulations of urbanization, including and enclosing more and more to try to make sense of what's going on out there. And yet these don't always reflect back on experiences of everyday life—and, relatedly, they don't always constitute grounds from which to advocate for different ways in which to see and live in the world.

One big political stake of all this is the practice through which knowledges of our most challenging problems are synthesized into mainstream climate change assessment reports of global policy significance, but with uneven and sometimes only scant attention to some of the primary culprits (such as globalized capitalist urbanization). For example, the reports of the IPCC arduously survey the relevant physical and social science, but in their policymaker summaries they foreground some of the same narrow ideas of the city, particularly around the goodness of 'compact urban form', as a solution to climate change.[14] The evident and abundant knowledge of the complex and conflicted nature of urbanization, planetary change and greenhouse gas emissions contained within the very same IPCC reports receives far less attention. Policy discussions and advocacy following

14 See, for example, the IPCC's Sixth Assessment Report in Working Group III's Summary for Policymakers (2022b: 30), and its full report (2022a: 887). See also an interview with Hélène Chartier of C40 Cities, who claims that sustainable living is 'not viable outside cities' (Hahn, 2022).

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these high-profile policy summaries take at face value the reports' assertions about the value of cities.

The biggest political stakes are the social movements not built—that is, the grounded struggles that ought to be seen and brought together but are largely not, in part because of how the city and the planet are drawn. We see this in Kasia Paprocki's (2020) explanations of the conflicts between climate adaptation projects and agrarian livelihoods in Bangladesh. She notes how the increasing vulnerability experienced by small-scale rice farmers in the coastal Sundarbans and their migration to slum-like settlements in peri-urban Kolkata, India, is produced by a WWF-India-supported urban economic development program couched in the language of climate adaptation and managed retreat. Paprocki shows how globally-oriented, urban-centric initiatives for climate resilience, alongside agrarian dispossession, socioecological change and ensuing migration, also marginalize and harm poor urban residents, including those who have been wrenched away from their agrarian livelihoods. Optimistically, Paprocki points to the agrarian, cross-class social movements that are emerging to contest the dispossession, but this is not yet a *cross-sociospatial* coalition, formed among struggles for and linking urban and agrarian welfare.

We see this also in the Jakarta region, a site of my own research, where severe and chronic flooding links politics and ecologies within and beyond the city. In the city center, informal *kampung* settlement residents along the notorious Ciliwung River struggle against both the floods and plans to evict and demolish their settlements, while city and national authorities, supported by international consultants, propose techno-infrastructural and developmentalist solutions to flooding, overcrowding and congestion (Goh, 2021). However, the flooding, caused by rapid land subsidence along with sea level rise, uncertain precipitation and inadequate or degraded infrastructure, is also dependent on historical patterns of uneven development dating back to colonial times and the regional hydrological system, where canals, catchments and 13 rivers and associated watersheds bring water from deep in Java Island through the region to Jakarta Bay.

It floods in Jakarta even when it rains not in the city but far outside it. In the upper reaches of the watersheds, near the headwaters of the Ciliwung and other rivers, whether water soaks into the ground or gushes into the rivers, causing flooding downstream, is determined by soil conditions, land use and development rights. The urbanized, infrastructural watershed knits together the plight of the most vulnerable residents living in the kampung in the central city and coastline with ideas about and struggles around development in the upper watershed (see Goh, 2019). There are incipient, potentially powerful efforts to build organizing movements along and across the watersheds, but city-centric narratives of disaster, urgency and green solutionism persist. Here, the intertwined social, spatial and ecological processes of the urbanized watershed link the outcomes of distant struggles, but also create the possibility for new movements.

We also see this in the United States. The assertions made by policymakers and commentators about the presumed environmental benefits of cities neglect the clear and significant impacts of income and wealth on consumption-based carbon emissions (see e.g. Jones and Kammen, 2014). Combined with the enduring trope of the urban-rural political divide,[15] cities are cast as green and progressive while non-cities are depicted as conservative and environmentally backwards, despite political economic processes that stratify socioeconomic conditions and environmental impacts within and beyond the urban centers, in cities and non-cities alike (see e.g. Gilmore, 2008). Such a context masks the fact that marginalized and working-class communities across the assumed

15 See, for example, Love and Loh (2020) on the problems of this binary narrative of an urban-rural political divide.

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divide often share lower carbon footprints and are less responsible for the climate crisis. This makes it challenging to envision and put into action political coalitions across the so-called urban and rural—including working-class people and communities of color—who, without the obscuring effect of city-centered green-tinted lenses, might recognize their shared interests in racial, economic and environmental justice. A broad, ground-up socioenvironmental justice movement in the US would have planetary implications, considering the US's primary role in contributing to global emissions.

A clearer view and grasp of externalizing urban processes and thinking might help us to understand better the imposed political fractures that hinder movement building for more meaningful, more just socioecological futures. It is not that the city, the rural or the 'non-city' are by nature critical or essential; rather, this is how political positions and possible futures are constituted, not just because of ways of life but also ways of seeing (see Angelo *et al*., 2025). We need a better way to do this, that is more reflective of the relationships between city and planet. Such a view is already at work in the building of a global climate justice movement, bringing broader political and conceptual alignments to local socioenvironmental struggles. Right now, as planetary boundaries are actively tested by political, economic and socionatural processes, a new epistemological and political vision is necessary. Between a kind of 'right to the city' movement cast in a planetary light, and what Kasia Paprocki (2020) calls 'imaginaries of rural futures'.

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